Studies in Morphology 4

Geert Booij *Editor*

The Construction of Words

Advances in Construction Morphology

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Volume 4

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Editor

The Construction of Words

Advances in Construction Morphology

Springer

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Preface

This book emanated from an invitation by Jolanda Voogd, senior editor at Springer, to edit a volume for the series *Studies in Morphology* on a topic that is close to my (linguistic) heart. It was obvious to me that this topic should be the further development and articulation of the theoretical model of Construction Morphology, a model that I have been working on since the beginning of this century. The proposal I wrote met with enthusiasm both from the editors of this book series and the colleagues I invited to contribute to such a volume. The pleasant and smooth cooperation with these colleagues has resulted in the present volume.

All articles have been reviewed by one or more anonymous reviewers. This led to revisions and improvements of all submitted articles and to various forms of intellectual exchange between the authors and the editor. I thank the following colleagues for their constructive reviews: Jenny Audring (U Leiden), Harald Baayen (U Tübingen), Harald Clahsen (U Potsdam), Onno Crasborn (Radboud U Nijmegen), Michel de Vaan (U Lausanne), Laura Downing (U Gothenburg), Peter Eisenberg (U Potsdam), Charles Forceville (U Amsterdam), Hélène Giraudo (U Toulouse), Stefan Hartmann (U Bamberg), Jeffrey Heath (U Michigan), Martin Hilpert (U Neuchâtel), Larry Hyman (U Calif. Berkeley), Ray Jackendoff (Tufts U), Hideki Kishimoto (U Kobe), Peter Lauwers (U Ghent), Torsten Leuschner (U Ghent), Francesca Masini (U Bologna), Andrew Nevins (University College London), Mary Paster (Pomona College, Claremont Calif.), Peter Petré (U Antwerpen), Franz Rainer (WU Wien), Ardi Roelofs (Radboud U Nijmegen), Erich Round (U Queensland), Wendy Sandler (U Haifa), Bogdan Szymanek (Catholic U Lublin), Freek Van de Velde (Catholic U Leuven), Ton van der Wouden (U Leiden), Janet Watson (U Leeds), Jeroen Wiedenhof (U Leiden), and Pienie Zwitserlood (U Münster).

It is my sincere hope that the articles in this book will contribute to a better understanding of the organization of grammar, the nature of lexical knowledge, and the way in which we acquire, use, and store complex words and the patterns

underlying these words. The combination of detailed descriptions of linguistic facts and theoretical discussion in the articles of this volume will certainly help obtain a deeper insight into both the conventional and creative aspects of language.

Leiden, The Netherlands Geert Booij
9 September 2017

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Part I
Introduction

The Construction of Words: Introduction and Overview

Geert Booij

Abstract In Construction Morphology, morphological patterns are expressed by constructional schemas that motivate properties of existing complex words, and state how new complex words can be formed. This article briefly summarizes a number of theoretical assumptions of Construction Morphology, and how they play a role in the various contributions to this volume on advances in Construction Morphology. Key features of this theory are that morphology is word-based, that morphological patterns are interpreted as constructions (form-meaning pairs), and that there is no strict separation of grammar and lexicon. Paradigmatic relationships play an essential role in structuring lexical and grammatical knowledge. These ideas can be applied fruitfully to the study of sign language, visual language, language change, language acquisition, and language processing.

Keywords Constructicon · Construction morphology · Motivation · Paradigmatic relations · Word-based morphology

1 Introduction

The word *construction* in the title of this volume, *The construction of words,* has both an action and a result interpretation. When used as an action noun, *the construction of words* denotes the formation of words. In its result interpretation, the phrase *the construction of words* denotes the morphological structure of existing words. Both interpretations of this word are relevant in the articles in this volume on advances in Construction Morphology, because morphology has to account for the properties of existing complex words, as well as for the formation of new ones.

Construction Morphology is a theory of linguistic morphology in which the notion 'construction' plays a crucial role. A linguistic construction is a systematic

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pairing of form and meaning, and this notion applies to the analysis of both syntactic and morphological phenomena. The constructional approach is referred to as Construction Grammar (Hoffmann and Trousdale 2013), and its application to the analysis of words as Construction Morphology (Booij 2010), abbreviated as CxM.

The model of CxM uses constructional schemas to account for the systematic form-meaning relations between words. For instance, there is a systematic form-meaning relationship between the following two sets of corresponding English words (data from Bauer et al. 2013: 304):

(1)

noun	*adjective*
art	arty
bitch	bitchy
girl	girly
rust	rusty

The meaning of the adjectives can be paraphrased as 'possessing characteristic properties of N, where N denotes the meaning of the corresponding noun'. This systematic paradigmatic relationship can be captured by the following morphological constructional schema:

(2) form: $[[x]_{Ni}\ y]_{Aj}$
meaning: [possessing characteristic properties of $SEM_i]_{SEMj}$

An alternative formalization that is common in Construction Morphology is (3):

(3) $[[x]_{Ni}y]_{Aj} \leftrightarrow$ [possessing characteristic properties of $SEM_i]_{SEMj}$

The double arrow stands for the form-meaning correspondence. The variable x stands for the phonological form of the noun. By means of co-indexation it is indicated that the meaning (SEM) of the noun is a component of the meaning of the corresponding adjective. This schema presupposes that the meaning of the noun is specified separately. Hence, this schema is based on paradigmatic relations between words.

The function of such a constructional schema is primarily to provide motivation for the properties of English denominal adjectives ending in *-y*. In other words, the form and meaning of such adjectives are not completely arbitrary. Thus, it is a primarily declarative approach to morphological knowledge. However, such schemas also indicate how new words can be formed. By replacing the variable in schema (3) with a noun, for instance the noun *perfume*, we derive a new adjective, *perfumy*.

The basic ideas of CxM have been explicated and defended in Booij (2010), and in a number of introductory chapters on CxM in various linguistic handbooks (Booij 2013, 2015, 2016, 2017). The present volume aims to show the relevance and fruitfulness of the model of CxM in various domains of linguistic research.

CxM is word-based morphology. That is, complex words are not seen primarily as a concatenation of morphemes, but as independent meaningful units within

which certain subcomponents (morphemes) may be distinguished on the basis of paradigmatic relations with other words. That is, morphology is not to be equated with the 'syntax of morphemes'. Morphological schemas characterize the 'Gestalt' of complex words and their holistic properties. This view of the nature of linguistic signs is also fundamental for a proper analysis of sign language and visual language, as Lepic & Occhino (Chapter "A Construction Morphology Approach to Sign Language Analysis", this volume) and Cohn (Chapter "Combinatorial Morphology in Visual Languages", this volume) argue in detail.

The articles in this volume are organized as follows. First, a number of articles argue that the CxM model can deal with various phenomena that pose theoretical challenges for models of grammatical organization such as non-concatenative morphology, partial and multiple motivation of words, discontinuous lexical items, the interface between morphology and phonology, sign language, and visual language (Part 1). Secondly, various articles show how CxM can be fruitfully applied in the description of the morphology of individual languages. The morphological analyses of these languages lend empirical support to various theoretical concepts of CxM (Part 2).

An important criterion for the adequacy of linguistic models is that of 'graceful integration' (Jackendoff 2011). Graceful integration means that the model of grammar that one assumes should allow for the incorporation of, or be in harmony with relevant findings in related subdomains of linguistics, such as psycholinguistics and historical linguistics. This position is similar to what is referred to as 'the cognitive commitment': "a promise to build linguistic descriptions and postulate theoretical concepts which are at least informed, if not fully justified, by what is now known about the human brain and human cognition" (Dancygier 2017: 2). Therefore, this volume also contains studies that deal with the relevance of CxM for historical linguistics (Part 3) and psycholinguistics: language acquisition and language processing (Part 4).

Two articles deal with the application of CxM to languages conveyed in a modality other than speech such as sign languages and visual languages, and show how some concepts of CxM are enlightening in these domains of linguistic research as well.

Lepic & Occhino (Chapter "A Construction Morphology Approach to Sign Language Analysis", this volume) propose that American Sign Language utterances should be analyzed as constructions, as they draw on conventional patterns of meaning and form exhibiting fixed and variable slots. They show that the CxM approach leads to a uniform analysis of "monomorphemic" lexical signs and "multimorphemic" classifier signs. They show that the CxM analysis can then be extended to the analysis of multimodal spoken English utterances, as well.

Cohn (Chapter "Combinatorial Morphology in Visual Languages", this volume) argues for the relevance of the concepts of Construction Morphology for the analysis of visual languages. Just as structured mappings between phonology and meaning make up the lexicons of spoken languages, structured mappings between graphics and meaning comprise lexical items in visual languages. Such representations may also involve combinatorial meanings that arise from affixing, substituting,

or reduplicating bound and self-standing visual morphemes. Hence, they show a striking parallelism with the way that morphological constructions are created in ordinary language.

2 Schemas and Subschemas

Constructional schemas for complex words generalize over sets of existing complex words. They can account for holistic properties of morphological constructions, properties that cannot be derived from those of their constituents. A prototypical example of such a holistic property is that the meaning of words formed by means of total reduplication is evoked by the copying configuration as such. For instance, in many languages, the meaning component of intensity of an action is expressed by doubling the verb that denotes the relevant action. Reduplication in Italian is discussed in Masini & Iacobini (Chapter "Schemas and Discontinuity: The View from Construction Morphology", this volume). Holistic properties of constructions are also discussed by Lepic & Occhino (Chapter "A Construction Morphology Approach to Sign Language Analysis", this volume), Cohn (Chapter "Combinatorial Morphology in Visual Languages", this volume), and by Amiot & Tribout (Chapter "De-adjectival Human Nouns in French", this volume).

A second fundamental property of schemas is that they are output-oriented, as has also been stressed in Bybee's work (Bybee 1995). They specify output forms, and language users make generalizations based on these output forms. This is important for understanding the interaction of morphology and phonology (Caballero & Inkelas, Chapter "A construction-based Approach to Multiple Exponence", this volume), for the description of prosodic morphology (Davis & Tsujimura, Chapter "Arabic Nonconcatenative Morphology in Construction Morphology", this volume, Tsujimura & Davis, Chapter "Japanese Word Formation in Construction Morphology", this volume) and for understanding morphological change (Norde & Van Goethem, Chapter "Debonding and Clipping of Prefixoids in Germanic: Constructionalization or Constructional Change?", this volume, Van de Velde, Chapter "Iterated Exaptation", this volume).

The declarative nature of schemas makes it possible to express generalizations over sets of words even when the morphological pattern involved is no longer productive. This is shown in Booij & Audring (Chapter "Multiple Motivation, Partial Motivation: The Role of Output Schemas in Morphology", this volume), an article that deals with Dutch verbs with stems ending in *-el* and *-er*. The constructions with these suffixes are not productive anymore. Yet, verbs of these form exhibit recurrent semantic properties such as the expression of attenuation and repetition of an event. In some cases, these verbs can even be linked to more than one schema, and thus receive motivation from more than one source. Tsujimura & Davis (Chapter "Japanese Word Formation in Construction Morphology", this volume) observe the same for Japanese: reduplicated adverbs that express intensity may not have a corresponding base word, and yet they convey the meaning component of intensity that is linked to reduplication.

The possibility of schema unification is another advantage of the use of schemas. It has often been observed that multiply complex words may have a base that does not exist as a word by itself. Many Dutch *on*-adjectives ending in the suffix *-elijk*, for example do not have a base word that exists on its own:

(4)

negative adjective	*base word*
on-beschrijf-elijk 'un-describable'	beschrijf-elijk
on-doorgrond-elijk 'un-fathomable'	doorgrond-elijk
on-verget-elijk 'un-forgettable'	verget-elijk
on-verzett-elijk 'un-compromising'	verzette-lijk

The base words (positive adjectives) do not exist by themselves. They are potential words, as they are well-formed. The formation of these negative adjectives can be accounted for by a unified schema, the unification of the schema for *on-A* adjectives and that for deverbal adjectives in *-elijk*.

(5) $[on\ [x]_A]_A + [[y]_V elijk]_A = [on\ [[y]_V elijk]_A]_A$

The co-occurrence of two word formation processes in the formation of multiply complex words can thus be expressed straightforwardly, whereas it would be a problem for a rule-based account of word-formation processes. In Kempf & Hartmann (Chapter "Schema Unification and Morphological Productivity: A Diachronic Perspective", this volume), this type of co-occurrence of word formation processes is discussed in detail for German, and these authors provide diachronic evidence for the necessity of unified schemas.

It is important to be able to express generalizations about complex words on different levels of abstraction, since a set of complex words may consist of subsets with properties of their own. For instance, for Chinese, a language with massive compounding, we need, in addition to a general schema for compounding in Chinese, subschemas for left-headed and right-headed compounds (Arcodia & Basciano, Chapter "The Construction Morphology Analysis of Chinese Word Formation", this volume). Therefore, we may represent the knowledge of complex words as a hierarchy with the most abstract schemas at the top, and the concrete individual complex words at the bottom, with intermediate schemas that express generalizations about subpatterns. This is the idea of a hierarchical lexicon.

Subschemas can be used to solve a classic problem in morphology, the existence of a gray area between compounding and derivation (Booij 2005). The phenomenon involved is that words embedded in compounds may have specific meanings that they do not have when used as words by themselves. This phenomenon may be referred to as 'bound meaning'. An example is the use of the Dutch noun *pracht* 'beauty, glamour' as a word of positive evaluation, as in:

(6) pracht-baan 'great job'
pracht-cadeau 'great gift'
pracht-dag 'great day'
pracht-kerel 'great guy'

The question then arises: should we call this use of *pracht* an affix, because it has a meaning tied to its appearance in complex words, just like affixes have? This classification would not do justice to the fact that the link to the noun *pracht* is still there, also because there is a related denominal adjective *pracht-ig* 'beautiful'. It is here that subschemas can be used. The bound meaning of *pracht* can be specified in a subschema for Dutch right-headed NN compounds:

(7) $[[\text{pracht}]_{Ni}\ [x]_{Nj}]_{Nk} \leftrightarrow [\text{beautiful}_i\ \text{SEM}_j]_{SEMk}$

Such a schema, with at least one position specified lexically, is called a constructional idiom. It is an instantiation of the general schema for Dutch NN compounds, but is more specific in nature. Words with a bound meaning are also referred to as affixoids.

The necessity of such constructional idioms for a proper account of affixoids, words with a bound meaning when forming parts of compounds such as Dutch *reuze-* 'giant', and English *top-* 'excellent', and the possible category change of words with such bound meanings is discussed in Norde & Van Goethem (Chapter "Debonding and Clipping of Prefixoids in Germanic: Constructionalization or Constructional Change?", this volume). Van Huyssteen (Chapter "The *hulle* and *goed* Constructions in Afrikaans", this volume) argues that the pronoun *hulle* 'they' of Afrikaans, when used to express the associative plural (as in *pa-hulle* 'father and his family/friends') is also best interpreted as an affixoid. That is, the word *hulle* has a specific meaning bound to its occurrence in the right position of a compound. This requires a constructional idiom of the type [x-*hulle*].

In Chinese there are many compounds with constituents that do not appear as words by themselves, even though they have a lexical meaning. These roots can be specified as constructional idioms that define the class of compounds with that root, and the corresponding meaning (Arcadio & Basciano, Chapter "The Construction Morphology Analysis of Chinese Word Formation", this volume). This implies the existence of compounding subschemas with one slot lexically fixed.

3 Non-concatenative Morphology

Non-concatenative morphology denotes the kind of morphological operations that are used to form words that do not consist of the concatenations of words and bound morphemes. The general problem is that the signer part of a complex word is not always a linear representation of sounds, as discussed in detail in the contribution to this volume by Jeff Good (Chapter "Modeling Signifiers in Constructional Approaches to Morphological Analysis", this volume). A complex sign is not always a linear concatenation of simplex signs. Morphological structure may deviate from this canonical type of word formation, and it is in these cases that, as Good argues, Construction Morphology offers the formal means to account for such more complicated types of relationship between form and meaning, between signifier and signified. These include the absence of a formal marker of a mean-

ing component, the use of suprasegmental phonology, prosodic morphology, and morphological templates. In addition, signifiers may consist of discontinuous parts as in circumfixation, and in particle verbs. Masini & Iacobini (Chapter "Schemas and Discontinuity: The View from Construction Morphology", this volume) present several cases of discontinuity, which can be captured by constructional schemas.

Semitic languages are well-known examples of languages that make extensive use of non-concatenative morphology, in particular the combination of vocalic and consonantal patterns. In Davis & Tsujimura (Chapter "Arabic Nonconcatenative Morphology in Construction Morphology", this volume) is it shown how CxM schemas can account for this kind of morphology in Arabic.

Words may formed by imposing specific prosodic forms on them. This is called prosodic morphology. The morphological operation may consist of reduction of the base word to a shorter form with a specific prosodic shape, or a combination of a prosodic shape and adding certain sounds. This means that output forms of words have to be specified in terms of prosodic templates. The CxM analysis of this kind of word formation in Japanese is given in Tsujimura & Davis (Chapter "Japanese Word Formation in Construction Morphology", this volume). This CxM analysis makes use of schemas that specify phonological form (PHON), morpho-syntactic form (SYN), and semantic/pragmatic properties (SEM). Thus, we see how constructional schemas require the tripartite Parallel Architecture of grammar proposed in Jackendoff (2002).

The relation between CxM and Parallel Architecture is also discussed in Booij and Audring (2017), who discuss various types of non-concatenative morphology that require schemas with these three levels. An important presupposition of such CxM analyses is that constructions may be related paradigmatically. The importance of paradigmatic relations is discussed in more detail in Sect. 5.

The phonological exponence of morphological constructions is also dealt with by Caballero & Inkelas (Chapter "A Construction-Based Approach to Multiple Exponence", this volume), who focus on the phenomenon of multiple exponence, a form of mismatch between phonological form and morpho-syntactic information. They focus on the computation of the proper phonological form of morphological constructions with multiple exponence, and show how this can be done by combining Optimality Theory with a constructionist approach to word structure.

4 The Demarcation of Morphology and Syntax

The demarcation of morphology and syntax has been an important topic of debate for decades in discussions of the architecture of grammar. In Construction Grammar and Construction Morphology, there is no strict separation of grammar and lexicon. The 'constructicon' of a languages comprises both abstract syntactic and morphological schemas, and their fully or partially lexicalized instantiations, words and phrases (Booij 2010; Culicover et al. 2017). Lepic & Occhino (Chapter "A Construction Morphology Approach to Sign Language Analysis", this volume)

demonstrate, for example, that the strict separation of grammar and lexicon leads to unintuitive analyses of morphosyntactic constructions in American Sign Language.

Note, however, that in CxM the distinction between words and phrases is maintained. Words are islands for syntactic operations. However, complex words do not differ from phrases in that phrases, unlike complex words, are always created anew, and normally not stored: both complex words and phrases can be stored. Therefore, we need morphological and phrasal schemas that specify the predictable properties of stored instantiations of these schemas. Moreover, syntax and morphology interact in that certain types of phrase can be embedded in complex words.

Phrasal lexemes in various languages illustrate this conception of grammar. Phrasal lexemes are lexemes that are stored in the lexicon but have a phrasal form. In this volume, Cetnarowska (Chapter "Phrasal Names in Polish: A+N, N+A and N+N Units", this volume) gives an analysis of phrasal A+N lexemes in Polish, and Masini & Iacobini (Chapter "Schemas and Discontinuity: The View From Construction Morphology", this volume) discuss Italian phrasal lexemes. Particle verbs in Germanic languages form another class of phrasal lexemes. In some Germanic languages, these lexemes can even be discontinuous (Good, Chapter "Modeling Signifiers in Constructional Approaches to Morphological Analysis" and Masini & Iacobini, Chapter "Schemas and Discontinuity: The View From Construction Morphology", this volume). In CxM, both complex words and phrasal lexical items can be listed, and at the same time their recurrent properties are specified by abstract schemas.

For some languages it is even hard to determine if a certain type of construct is a word or a phrase, as pointed out in this volume by Baker for Australian languages (Chapter "Super-Complexity and the Status of 'Word' in Gunwinyguan Languages of Australia", this volume), and by Arcodia & Basciano for Chinese (Chapter "The Construction Morphology Analysis of Chinese Word Formation", this volume). The advantage of CxM is that we are not forced to make an arbitrary decision in such cases, because the fact that such constructs are lexemes does not necessarily require a choice between morphology and syntax. Moreover, the Parallel Architecture approach which is part of CxM (Booij and Audring 2017) makes it possible to account for constructs which may be more than one word on the level of phonology, whereas they are one word on the morpho-syntactic level. Baker (Chapter "Super-Complexity and the Status of 'Word' in Gunwinyguan Languages of Australia", this volume) argues that this architecture is necessary for a proper account of words in a number of Australian languages which exhibit this asymmetry between the phonological and the morpho-syntactic level.

Another type of interaction between morphology and syntax is the phenomenon of construction-dependent morphology (Booij 2010; Booij and Audring to appear): a syntactic construction may require words of a certain morphological make-up to appear. For instance, in phrases of the following type in Dutch, the adjective must be suffixed exclusively with *-e* in order to be used as a noun in the *op het* [A-e]$_N$ *af*-construction with the meaning 'almost A':

(8) op het smerig-e af ‘almost dirty’
op het gemen-e af ‘almost mean’
op het komisch-e af ‘almost comical’

The choice between a morphological and a syntactic account of category change pops up in cases of conversion of words into another word class. In French, for instance, adjectives can be used as nouns as in *un gagnant* ‘a winner’. If we consider phrases as constructions, we can say that in this case the NP construction coerces a noun interpretation of the adjective *gagnant* ‘winning’. Constructions, whether phrasal or morphological, have coercion power (Audring and Booij 2016; Booij and Audring to appear). In the French case, discussed in Amiot & Tribout (Chapter “De-Adjectival Human Nouns in French”, this volume), where deadjectival human nouns are created, conversion is neither a morphological nor a syntactic operation. Instead, it is a case of coercion. The holistic properties of the syntactic construction [*le A*]$_{NP}$ as a whole impose a nominal interpretation on adjectives. The role of coercion is also illustrated in the article by Tsujimura & Davis on Japanese (Chapter “Japanese Word Formation in Construction Morphology”, this volume). In this language, nouns can be coerced into use as prenominal adjectives. The construction ‘N-*na* N’ imposes a “property” interpretation on the first noun.

5 Paradigmatic Relationships and Bracketing Paradoxes

The analysis of words as having complex morphological structure primarily depends on a systematic form-meaning relationship with a corresponding, less complex word. However, there are also cases where the interpretation of complex words depends on a paradigmatic relationship with complex words of the same degree of complexity. A stock example is the relation between English nouns in *-ist* and in *-ism* such as:

(9)

atheist	atheism
anarchism	anarchist
autism	autist
Bolshevist	Bolshevism
Calvinist	Calvinism

The meaning of the nouns in *-ist* can be described as a compositional function of the meaning of the corresponding noun in *-ism*, even though the noun in *-ism* is not completely present as a subconstituent of the noun in *-ist*. For instance, an atheist is someone who adheres to atheism, and an autist is someone who suffers from autism.

Such paradigmatic relationships can be accounted for in CxM by means of a second order schema, that is, a schema of schemas (Booij and Masini 2015):

(10) $[x\text{ -ism}]_{Ni} \leftrightarrow SEM_i \approx$
$[x\text{ -ist}]_{Nj} \leftrightarrow [\text{Person related to } SEM_i]_{SEMj}$

where ≈ symbolizes the paradigmatic relationship between the two schemas that is formally expressed by means of co-indexation of a semantic variable in the two constructional schemas. Hüning (Chapter "Foreign Word-Formation in Construction Morphology: Verbs in *-ieren* in German", this volume) shows that paradigmatic relationships play a crucial role in deriving German words and in the integration of foreign words into the German lexicon. Second order schemas, that is, schemas of schemas, serve to express these systematic paradigmatic relationships.

As argued in Masini & Iacobini (Chapter "Schemas and Discontinuity: The View From Construction Morphology", this volume), second order schemas can be used to solve bracketing paradoxes of the type *flautist barocco* 'baroque flutist' derived from the noun *flauto barocco* 'baroque flute'. Here, the suffix *-ist* has semantic scope over *flauto barocco*, but is not attached to the last word of the noun phrase, but to its head noun *flauto*. Similar mismatches are observed for Polish in Cetnarowska (Chapter "Phrasal Names in Polish: A+N, N+A and N+N Units", this volume).

The formal expression of paradigmatic relationships is crucial for a proper account of various forms of prosodic morphology and abbreviatory morphology in which words are coined by means of reduction of the base word. Due to reduction, the base word is not fully present as subconstituent of the derived word, while the meaning of that base word is part of the meaning of the reduced word, thus leading to form-meaning asymmetries. The meaning of the derived word can therefore only be computed by referring to its paradigmatic relation with the base word. This is amply illustrated in the contribution on Japanese by Tsijimura & Davis (Chapter "Japanese Word Formation in Construction Morphology", this volume).

Paradigmatic relationships and second order schemas play a crucial role in the analysis of inflectional systems as well. After all, both word formation and inflection concern lexical relatedness, systematic relations between words and word forms (Spencer 2013; Jackendoff and Audring 2016). In the present volume, focus is on word formation. The CxM approach to inflection is discussed in Booij (2016: 439–44, 2017: 243–44), and in Van der Spuy (2017).

6 The Interface of Morphology and Phonology

A proper account of the interface of morphology and phonology is a continuous challenge for the adequacy of models of the architecture of grammar (see Trommer ed. 2012). The CxM model starts from the assumption of a tripartite Parallel Architecture (PA) (Jackendoff 2002; Booij and Audring 2017). An overview of the ways in which phonology interacts with morphology is given in Inkelas (2014), who shows that phonological properties of words are often exponents of specific morphological constructions. One type of interface is that of Prosodic Morphology, the formation of words by means of prosodic templates. That is, there may be prosodic constraints on morphological constructions. As mentioned above, this also implies that paradigmatic relationships play a crucial role, because words that are truncated in accordance with a prosodic template do not contain their

base words completely, and yet their meanings are a compositional function of the semantics of these base words. The templatic morphology of Semitic languages, as discussed by Davis & Tsujimura (Chapter "Arabic Nonconcatenative Morphology in Construction Morphology", this volume) can also be accounted for insightfully in a CxM model with PA.

The application of phonological processes is often conditioned by specific morphological structures. In other words, there is a lot of construction-specific phonology (Inkelas 2014). In this volume, Caballero & Inkelas (Chapter "A construction-based Approach to Multiple Exponence", this volume) broach the topic of multiple exponence, the multiple marking of morpho-syntactic properties in a complex word. They argue that certain types of multiple exponence can be accounted for by combining a constructionist approach to word structure with an Optimality Theoretical approach to phonology: the phonological form of a morphological construction can be computed by a system of ranked constraints in a number of steps that reflect the steps in the morphological construction of words. For this purpose, they combine a constructionist approach to morphology with the output-oriented phonological model of Optimality Theory, a combination referred to as Optimal Construction Morphology.

7 Diachronic Construction Morphology

Three articles in this volume deal specifically with the relevance of CxM for understanding language change. Drawing on corpus analyses of data from the Early New High German period (1350–1650) and from the early stages of New High German, Kempf & Hartmann (Chapter "Schema Unification and Morphological Productivity: A Diachronic Perspective", this volume) show how the developments of the complex patterns created by unification of word formation schemas diverge from the developments of their building blocks. Furthermore, the unified schema [*un* -V- *lich*]$_{\text{ADJ}}$ 'un-V-able' is shown to have remained productive for a longer period of time than its simplex parent schema [V- *lich*]$_{\text{ADJ}}$. This shows that the concept of unified schemas serves to explain important differences in the development of the individual subpatterns in terms of morphological productivity and in terms of semantic aspects of the word-formation constructions.

Norde & Van Goethem (Chapter "Debonding and Clipping of Prefixoids in Germanic: Constructionalization or Constructional Change?", this volume) argue that debonding of prefixoids is a productive process of lexical innovation in Germanic languages, which may lead to the creation of new intensifying adverbs or evaluative adjectives. In addition, they explore whether debonding of prefixoids can be fruitfully analysed from a constructional perspective, and they discuss a number of alternatives. Van Huyssteen's study of the associative plural in Afrikaans (Chapter "The *hulle* and *goed* Constructions in Afrikaans", this volume) shows how a word (the pronoun *hulle* 'they') has grammaticalized into a marker of the associative plural, and became part of a constructional idiom with a bound meaning for *hulle*.

Van de Velde's diachronic study (Chapter "Iterated Exaptation", this volume) deals with exaptation, a process of linguistic change where obsolescent morphology is refunctionalized. Two cases of Proto-Indo-European morphology are looked at in depth, showing how they underwent iterated exaptation in Germanic, namely the nominal stem-building *-n-* affix and the *ŏ*-grade of the verbal ablaut system.

Van de Velde argues that exaptation is the consequence of word-based morphology and the central role of output forms of words, a basic tenet of CxM. As Van de Velde (Chapter "Iterated exaptation", this volume) summarizes it: "The motivation for exaptation is to be sought in the way morphology works: rather than concatenations of morphemes, language users are confronted with words that are sanctioned by one or more construction schemata [...]. Crucially, these construction schemata are output-oriented: morphemes are not independent carriers of meaning, but obtain their meaning by occurring in a paradigmatically related set of words. Language users may or may not see structure in those words, and associate certain recurring parts on the formal side with regularities on the semantic side. [...] Diachronically, this allows for morphological change, especially when under the influence of sound change or of a break in the regular transmission of language over generations, an original motivation gets obscured".

8 Psycholinguistics

An important criterion of adequacy for models of the architecture of grammar is that they are in harmony with findings in other domains of linguistic research. This volume features three articles on this topic. As mentioned above, morphological schemas characterize the 'Gestalt' of complex words. CxM is therefore a word-based approach to morphology.

As to acquisition, the basic assumption of CxM general is that abstract morphological schemas are acquired in the course of time on the basis of knowledge of individual complex words that are stored in the mental lexicon. Storage of complex words is therefore an essential assumption of CxM.

Kapatsinski (Chapter "Learning Morphological Constructions", this volume) gives a detailed overview of the role of constructions, i.e. form-meaning pairings, in the acquisition of morphological knowledge, and discusses what this implies for our view of language learning mechanisms.

In CxM, the rule-list fallacy is avoided, as there is no contradiction between being stored and being formed according to an abstract schema. This is in line with psycholinguistics, since experiments with lexical decision tasks show that complex words are stored. Moreover, psycholinguistic experiments have shown that complex words, once stored, do not necessarily lose their internal morphological structure. Their structure may remain accessible. In CxM the lexicon is seen as a hierarchy, in which abstract schemas are linked to individual complex words. Thus, the predictable properties of stored complex words are captured by schemas. The schemas motivate properties of complex words, and thus reduce the arbitrariness of the form-

meaning correspondence in complex words. This view of the organization of the grammar is fully in line with the psycholinguistic results reported by Zwitserlood (Chapter "Processing and Representation of Morphological Complexity in Native Language Comprehension and Production", this volume) and Giraudo & Dal Maso (Chapter "Morphological Decomposition vs. Construction in Advanced Second Language Learners: Evidence From Different Speakers and Different Perceptive Tasks", this volume).

Zwitserlood (Chapter "Processing and Representation of Morphological Complexity in Native Language Comprehension and Production", this volume) provides a survey of the relevant psycholinguistic findings with respect to the processing and production of complex words. The debate centers around the issue whether and how the internal morphological structure of words plays a role in perception and production. Zwitserlood concludes that complex words must be listed as such, whereas at the same time their internal morphological structure must also be accessible. The assumptions of CxM concerning the representation of words and the nature of the lexicon appear to be in line with these psycholinguistic findings (the "cognitive commitment" mentioned in Section 1). However, the processing aspects of CxM need to be further developed.

Giraudo & Dal Maso (Chapter "Morphological Decomposition vs. Construction in Advanced Second Language Learners: Evidence From Different Speakers and Different Perceptive Tasks", this volume) give an overview of studies of the processing of complex words by L2 speakers. These results indicate that there is no sharp distinction between inflection and derivation in lexical processing, and that both inflected and derived words may be stored as whole words, whereas at the same time their internal structure is still accessible. These conclusions are in line with the assumptions of CxM about the lexicon and the balance between storage and computation.

References

Audring, J., and G. Booij. 2016. Cooperation and coercion. *Linguistics* 54: 617–637.

Bauer, L., R. Lieber, and I. Plag. 2013. *The Oxford reference guide to English morphology*. Oxford: Oxford University Press.

Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, F. Rainer, D. Kastovsky, and O. Pfeiffer, 109–132. Amsterdam/Philadelphia: John Benjamins.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2013. Morphology in CxG. In *The Oxford handbook of construction grammar*, ed. Th. Hoffmann and G. Trousdale, 255–273. Oxford: Oxford University Press.

———. 2015. Word formation in construction morphology. In *Word formation. An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, vol. 1, 188–202. Berlin/New York: De Gruyter.

———. 2016. Construction morphology. In *The Cambridge handbook of morphology*, ed. A. Hippisley and G. Stump, 424–448. Cambridge: Cambridge University Press.

———. 2017. The construction of words. In *The Cambridge handbook of cognitive linguistics*, ed. B. Dancygier, 229–245. Cambridge: Cambridge University Press.

Booij, G., and J. Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41 (S2): 277–302.

———. to appear. Category change in construction morphology. In *Category change from a constructional perspective*, ed. E. Coussé, K. Van Goethem, M. Norde, and G. Vanderbauwhede. Amsterdam/Philadelphia: Benjamins.

Booij, G., and F. Masini. 2015. The role of second order schemas in word formation. In *Semantics of complex words*, ed. L. Bauer, L. Körtvélyessy, and P. Štekauer, 47–66. Cham etc: Springer.

Bybee, J. 1995. Regular morphology and the lexicon. *Language and Cognitive Processes* 10: 425–455.

Culicover, P., R. Jackendoff, and J. Audring. 2017. Multiword constructions in the grammar. *Topics in Cognitive Science* 9: 552–568.

Dancygier, B. 2017. Introduction. In *The Cambridge handbook of cognitive linguistics*, ed. id, 1–10. Cambridge: Cambridge University Press.

Hoffmann, Th., and G. Trousdale, eds. 2013. *The Oxford handbook of construction grammar*. Oxford: Oxford University Press.

Inkelas, S. 2014. *The interplay of morphology and phonology*. Oxford: Oxford University Press.

Jackendoff, R. 2002. *Foundations of language*. Oxford: Oxford University Press.

———. 2011. What is the human language faculty? Two views. *Language* 87: 586–624.

Jackendoff, R., and J. Audring. 2016. Morphological schemas: Theoretical and psycholinguistic issues. *The Mental Lexicon* 11: 467–493.

Spencer, A. 2013. *Lexical relatedness. A paradigm-based model*. Oxford: Oxford University Press.

Trommer, J., ed. 2012. *The morphology and phonology of exponence*. Oxford: Oxford University Press.

Van der Spuy, A. 2017. Construction morphology and inflection. *Lingua* 199: 60–71. https://doi.org/10. 1016/j.lingua.2017.07.010.

Part II
Theoretical Issues

Modeling Signifiers in Constructional Approaches to Morphological Analysis

Jeff Good

Abstract Constructional approaches to morphology and syntax are based on the idea that the Saussurean sign is not only a powerful device for modeling the relationship between the form and meaning of morphemes, but, if appropriately adapted, it can be usefully extended to any kind of morphological and syntactic structure. Such approaches have been shown to be able to effectively account for a wide range of morphosyntactic phenomena, but an underexplored area is how different kinds of signifiers become associated with both lexical and constructional meanings. This article considers this issue by exploring the range of variation found in the shapes of signifiers in morphological constructions. A particular focus will be signifiers that deviate from a canonical linear ideal and the role of templates in constraining the realization of signifiers. The kinds of meanings that specific kinds of signifiers can be associated with in signs will also be briefly considered. The primary goal of this article is to establish the study of possible signifier shapes as an important issue for Construction Morphology. It will also be argued that constructional approaches are especially well suited for analyzing generalizations holding among the signifiers in a given language.

Keywords Construction Morphology · Signifier · Template · Typology · Tonal morphology

1 Linking the Signifier to the Signified

Constructional approaches to morphology and syntax are based on the idea that the Saussurean sign is not only a powerful device for modeling the relationship between the form and meaning of morphemes, but, if appropriately adapted, it can be usefully extended to any kind of morphological and syntactic structure (Hoffmann and

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Trousdale 2013: 1).[1] Consider, for instance, the representation of the English suffix *-hood* in (1), as found in a word like *motherhood*, based on Booij (2016). The symbol X here and below is used to represent an open slot in a morphological construction, in this case fillable by an appropriate noun stem.

(1) $\langle(((\text{X})_{\omega_i}\ ((\text{hud})_{\sigma})_{\omega_k})_j \leftrightarrow [\text{N}_i\ \text{SUFF}_k]_{\text{N}_j} \leftrightarrow [\text{Quality of SEM}_i]_j\rangle$

The representation in (1) models *-hood* in terms of three parallel structures, one for its phonological form, one for its morphological subcategorization requirements, and one for its semantics. In the first part of the representation, the phonological form is analyzed as a kind of prosodic subcategorization frame (see, e.g., Zec and Inkelas 1990: 368–369) consisting of two phonological words (represented with the ω symbol), one of which corresponds to the segmental material of the suffix (whose status as a single syllable is represented by the σ symbol) and the other to the "open" base form that the suffix must attach to in order to create a well-formed word. The morphological properties of the word are represented in the second part of the representation where, in particular, the requirement that the suffix attach to a noun is indicated. The final part of the representation represents how the *-hood* suffix creates a noun with the sense of "has the quality" of whatever noun it attaches to.

The conceptual similarity between the arbitrary form-meaning pairing of the classical Saussurean sign and the Construction Morphology representation in (1) is clear. The "tripling" in (1) is built on the same core idea that linguistic constituents should be described via the linkage of different kinds of linguistic objects, with a key innovation of constructional approaches being that the linkages can go beyond a simple pairing of "form" and "meaning"'.

Linguistic approaches making use of parallel architectures, such as what is found in (1), offer a powerful way in which to model many of the commonalities that can hold across large sets of linguistic constructions. For instance, the forms of all of the morphemes of a given language typically draw on a common set of segments and suprasegments. Separating out phonological representations from other aspects of linguistic structure allows such shared properties to be represented uniformly rather than forcing their details to be restated across every morpheme of a language. At the same time, this way of modeling cross-constructional similarity raises a new problem: If a morpheme, word, or phrase is to be represented via a set of parallel structures, then what mechanisms ensure that these structures will be linked together in a sensible way? Put another way, what kind of theories do we need to understand the nature of the correspondence relations, represented as double arrows in (1), between form, grammar, and meaning.[2]

[1]I would like to thank Geert Booij, Larry Hyman, and an anonymous reviewer for their comments on an earlier version of this article.

[2]The problem of developing theories and formal models of the relationships between parallel structures is explored in syntactic frameworks such as Lexical Functional Grammar (see e.g.,

This article examines a specific part of this question by looking at variation in the kinds of forms that are allowed to pair with lexical and constructional meanings in linguistic signs. To the best of my knowledge, this topic, which we might informally term "signifier typology" has never been considered systematically, though as will be clear from this article's reliance on previous investigations into morphological form, parts of an implicit typology can already be found in the literature. The primary goal will be to establish this as a significant topic for further work in Construction Morphology (and constructional approaches more generally) and to lay out some of the key issues that would need to be considered in the development of a comprehensive theory of the role of signifiers in constructional approaches to morphosyntax.[3] An important conclusion will be that the notions of schema and subschema relations, which have already been developed within Construction Morphology (see Booij 2010: 51–55), if suitably adapted, can also be used to model certain kinds of complex patterns of morphological realization that have yet to have seen close attention within the framework.

By way of background, a brief discussion of the theoretical context of this study is provided in Sect. 2. In Sect. 3, a number of illustrative form-meaning pairings will be presented to clarify the nature of the problem that is in focus here and to produce an initial typology of what will be termed "non-canonical" signifiers. This discussion will be introduced by examination of the properties of signifiers, as understood by Saussure. Section 4 will build on the work of Good (2016) to consider the special role of templates in shaping linguistic signs. Section 5 will explore the issue of how certain kinds of form-meaning pairings may be arbitrary but still show systematic patterns and what this means for models of morphology. Section 6 concludes the paper by looking at the value of constructional approaches to morphology for exploring the issues of interest here.

2 The Theoretical Context for This Study

As will become clear, the observations to be made below build on a number of different strands of previous work, and in many cases, the data to be examined has been the subject of extensive previous theoretical investigations whose insights are

Bresnan (2001: 50–56)) or the automodular approach developed by Sadock (2012: 30). So, the recognition of the problem is not new to this work. Rather, the intended contribution is to explore the problem in a domain not yet closely examined from this perspective: the linkage of phonological form to other grammatical properties.

[3]I use the term *signifier* to emphasize that the domain of interest are the forms associated with morphosyntactic constituents rather than full morphological constructions in and of themselves. Related terms, such as *exponent* or *formative*, could also be used, but these tend to be primarily used for specific kinds of morphology (e.g., inflection in the case of *exponent*) or emphasize specific ways that form does (or does not) pair with meaning (in the case of *formative*). The use of the term *signifier* also reflects a conscious attempt to relate work on constructional approaches to grammar to the Saussurean sign, the conceptual forebearer of the construction.

drawn on here. For instance, Sect. 3.1 will discuss tonal patterns of the sort that formed the basis of the development of autosegmental phonology (Goldsmith 1976) as well as CV-skeleton templates of the sort commonly associated with Semitic morphology that have also had a considerable impact on theoretical phonology (see, e.g., McCarthy 1979, 1981).

However, the goal of this article is not to provide a general review of work on these, and related, topics or to fully explore and give justice to available abstract and theoretical analyses of them. Rather, it takes advantage of the ways in which previous work has revealed interesting patterns of variation in the shape of morphemes to help create an initial proposal for a typology of signifiers and to evaluate the suitability of Construction Morphology for modeling a wide range of signifier types. Tsujimura and Davis (2011: 823) make a similar point from a Construction Morphology perspective in observing how work on prosodic morphology (see e.g., McCarthy and Prince 1995), again mostly done within theoretical phonology, can contribute to the development of models of "how the formal schema of a morphological construction can be prosodically delimited".

In developing the typology, work aimed at phonological, morphological, and, to a lesser extent, syntactic analysis will be considered. However, there will be a specific focus on the consequences of such work for understanding the kinds of shapes that signifiers can take on, thus providing a change in the orientation from which the data is considered. The aim is not to discount the contributions of earlier work but, rather, to see how this change in perspective, prompted by the development of constructional approaches to grammar, brings interesting new problems to light. Thus, for example, in Sect. 3.2.4, data involving the insertion of so-called empty morphs (Aronoff 1994: 44–53) in order to satisfy phonological minimality constraints (see, e.g., Hall 1999: 7–8) will be considered. The interest, though, will not be in the phonological conditions under which such morphs appear but, rather, in seeing how they fit within a typology of signifiers with non-canonical features.

Finally, it is worth noting that the methodological approach adopted here is deliberately intended to be surface oriented, as is typical of work done within typology as a subfield (Nichols 2007). Some of the apparently non-canonical patterns to be considered below could surely be rendered more canonical via abstract approaches to morphological analysis, and a possible example will be explicitly discussed for tonal data to be presented in Sect. 3.2.5. The adoption of a more surface-oriented approach is not intended to suggest that an abstract one is not superior. Rather, it has been chosen because it assists with the development of an initial catalog of the diversity of signifier patterns by providing a more unified basis for comparing attested patterns of variation across constructions. The patterns that a surface-oriented of approach uncovers can then form the basis of testing and refining a range of theories that have bearing on the understanding of the possible shapes of signifiers in the languages of the world, much as, for instance, surface-oriented work on word order universals has produced useful generalizations for further theorizing on grammatical variation even in frameworks making use of highly abstract representations (see, e.g., Cinque 2005).

3 The Shapes of Signifiers

3.1 The Limits of Linearity

Constructional approaches to morphology and syntax owe their conceptual foundations to Saussure's notion of the linguistic sign. Saussure's first principle regarding the nature of the linguistic sign, namely that the connection between the signifier and signified is arbitrary, is so deeply embedded in linguistic analysis that it scarcely seems possible to know what contemporary linguistics would look like without it. However, he also proposed a second principle, which has been largely overlooked by comparison and which anticipates many of the problems that will be considered here. It concerns the "linear nature of the signifier", and Saussure (1916/1959: 70) states that, while it "is obvious, apparently linguists have always neglected to state it, doubtless because they found it too simple; nevertheless, it is fundamental, and its consequences are incalculable. Its importance equals that of Principle I; the whole mechanism of language depends upon it…".

For Saussure, this principle derives from the auditory nature of the signifier in spoken language and the importance of time in structuring its articulation and perception. By the standards of contemporary approaches to phonological representation, it is clearly too simplistic in its "segmentalist" assumption that signifiers consist of a sequence of discrete sounds (see Aronoff 1992: 79). At least since the development of autosegmental phonology (Goldsmith 1976), a more complex view of phonological representations has dominated, most notably with respect to the representation of tone, which is generally modeled as encoded on a separate "tier" from segmental patterns. This results in two separate "streams" of linear representation which must be brought together in order create signifiers within tone languages.

Relevant data from the Mande language Kpelle, illustrating the classic kind of pattern that autosegmental approaches are designed to analyze, is given in Table 1. The forms are adapted from Hyman (2011: 207) and draw from Welmers (1962: 86). The crucial pattern in the data is the relatively limited number of tonal melodies found on words in Kpelle. The system can be analyzed with reference to only five abstract tonal patterns which surface in predictable ways. There are words with only high tones or low tones; words which show a falling contour, whether on a single vowel as in *kpôŋ* 'door' or across two vowels as in *kálì* 'hoe'; words containing only mid tones; and words containing a mid tone followed by a falling contour. As indicated in Table 1, the surfacing mid tone can be analyzed as connected to an underlying low-high sequence (see Hyman (2011: 207) for further discussion).

What is significant about the data in Table 1 is not only the patterns that are found but also the ones that are not. If tone was linked to vowels lexically, then we would expect a wider range of tone-vowel combinations to appear. For instance, if a falling tone is possible on the single vowel of a word like *kpôŋ* 'door', we might predict that there could be a word with two falling vowels in a row, though this is never found. Similarly, if mid-falling patterns are allowed, as in a word like *kōnâ*

Table 1 Tone patterns in Kpelle (Adapted from Hyman 2011)

WORD	GLOSS	SURFACE	UNDERLYING
pá	'come'	H	H
lá́á	'lie down'	HH	
ɓóá	'knife'	HH	
pílí	'jump'	HH	
kpòò	'padlock'	LL	L
tɔ̀nɔ̀	'chisel'	LL	
tòlòŋ	'dove'	LL	
kpàkì	'loom'	LL	
yɛ̂	'for you'	F	HL
kpôŋ	'door'	F	
tóà	'pygmy antelope'	HL	
kálì	'hoe'	HL	
kpōŋ	'help'	M	LH
sēē	'sit down'	MM	
sūā	'animal'	MM	
kālī	'snake'	MM	
tɛ̄ɛ̂	'black duiker'	MF	LHL
yūɔ̂	'axe'	MF	
kōnâ	'mortar'	MF	
kpānâŋ	'village'	MF	

'mortar', we might expect falling-mid patterns to be allowed, too, but these are not found either. By separating out tonal and segmental representations, data like what is seen in Table 1 can be readily accounted for: Surface tone patterns are limited in their realization since the language only has five basic underlying tone patterns to assign to lexical items.

The importance of data like that in Table 1 has long been recognized within theoretical phonology (see, e.g., Hyman and Lionnet 2018), and more striking examples of tonal phenomena that challenge the linear approach to signifiers will be considered below in Sect. 3.2. However, the implications for constructional approaches to morphology and syntax appear to have been underappreciated. Most work in such approaches implicitly assumes the "linear nature of the signifier" to be the normal state of affairs from a formal perspective, and the significance of apparent cases where simple linearity does not strictly hold is not specifically addressed. This can be seen, for instance, in the treatments of the forms associated with constructions in Sign-Based Construction Grammar, an especially carefully formalized variant of Construction Grammar (Sag 2012). Consider for instance the representation of the form of the clause *I forgot how good beer tastes* in (2) (Sag 2012: 75).

(2) $\begin{bmatrix} \text{PHON} & /aj\#fɚgat\#haw\#gʊd\#bir\#ˈtejst\text{-}s/ \\ \text{FORM} & \langle I, forgot, how, good, beer, tastes \rangle \end{bmatrix}$

Table 2 CV templates in Sierra Miwok

PRIMARY	SECOND	THIRD	FOURTH	GLOSS
tuyá:ŋ	*tuyáŋ:*	*túy:aŋ*	*túyŋa*	'jump'
polá:ŋ	*poláŋ:*	*pól:aŋ*	*pólŋa*	'fall'
t̪opó:n	*t̪opón:*	*t̪óp:on*	*t̪ópno*	'wrap'
huṯé:l	*huṯél:*	*húṯ:el*	*húṯle*	'roll'
telé:y	*teléy:*	*tél:ey*	*télye*	'hear'
CVCV:C	CVCVC:	CVC:VC	CVCCV	

The example in (2) presents the form of a clausal construction in a highly reduced way, treating it essentially as a concatenation of words (though an indication of stress is also provided). This accords well with the idea that signifiers must be linear in nature: The signifiers of signs above the level of the word can maintain their linear character if they are simply composed via the concatenation of signs which are themselves linear. (Within Sign-Based Construction Grammar, phrases are treated as signs on par with lexical items (Sag 2012: 67).)

It is clear that, in many cases, a simple concatenative model of construction formation is effective for analyzing the relationship between a higher-level construction and its constituent elements. It should probably be understood as the canonical means of construction formation (in the sense of the term as adopted within work on canonical typology (Brown and Chumakina 2012)) and will be referred to as such here.[4] However, it has been long been known that there are many kinds of deviations from this canonical pattern of construction formation. These are most well studied in morphological domains but are also found in syntactic ones. No systematic typology of non-concatenative structures has been developed, though specific examples are well known and have been of particular interest in work focused on their phonological analysis. To pick two (see also Sect. 3.2), consider the data in (3) and Table 2. In (3) a representation of patterns of ablaut, drawing on Booij (2010: 241), is given, based on the specific examples of English verbs such as *sing*/*sang* and *ring*/*rang*. In Table 2 examples of verbs from Sierra Miwok are provided (see Freeland 1951: 94) illustrating cases of CV-skeleton templates.

(3) $[\text{X i Y}]_{\text{V}} \sim [\text{X a Y}]$

The complications involved in the modeling of the composition of signifiers in verb forms exhibiting ablaut have long been the object of theoretical consideration (see, e.g., Hockett 1954: 223–224), and it is clear that they present a challenge to approaches that rely on the idea that signifiers should be "linear" objects. However, as indicated in (3), there are ways to model them that require relatively minimal adjustment to the canonical model—specifically, one simply needs to allow for operations that can alter the form of the basic segmental building blocks of linear

[4] In a morphological context, Bye and Svenonius (2012: 429) refer to this as the "concatenative ideal".

signs. If ablaut were the only kind of deviation that were encountered, then forms exhibiting it could be simply treated as a minor class of exceptions without the need for deeper consideration, especially given that, at least in a language like English, the class of verbs associated with such exceptional behavior is relatively small in number.

Data like that in Table 2 is more problematic in this regard. It exemplifies the four stem shapes associated with verbs of a particular inflectional class in Sierra Miwok. The alternations among these stem forms are governed by the suffix (e.g., a tense suffix) which immediately follows the stem (Freeland 1951: 96). As indicated in the bottom of row of the table, these alternations can be schematized via patterns of consonants and vowels (including indication of length). The forms of the stems across each stem class make use of the same consonants and vowels, in the same relative order respectively, but the lengths of the consonants and vowels change and the positioning of the consonants and vowels with respect to each other can change (as can be seen by contrasting the Fourth stem with the other three stems). Unlike the English ablaut pattern, the alternations seen in Table 2 are systematic and cannot be modeled in terms of a simple pattern of segmental replacement but, rather, require a level of abstraction where the linear patterning consonants and vowels is separated from the specific consonant and vowel segments found within a word. A standard device used to model data like that seen in Sierra Miwok is the CV-skeleton template, most familiar from work on Semitic morphology (see, e.g., McCarthy 1979, 1981; Ussishkin 2000: 5).[5] The modeling of these kinds of morphophonological patterns from a Construction Morphology perspective is considered in some detail in Davis and Tsujimura (this volume).

The examples seen so far begin to illustrate some of the ways in which signifiers can disobey Saussure's second principle, even if it is valid in some statistical sense. In the next section, I will catalog a range of additional examples of non-canonical signifiers as a first step towards a better understanding of the ways in which they can deviate from their default "linear nature".

3.2 Signifier Deviations

3.2.1 A Typology of Non-canonical Signifier Structures

The goal of this section is to discuss a range of ways that signifiers can deviate from the canonical linear ideal. The patterns to be considered have all been previously described. However, they have generally been seen as problems of "phonology" or "morphology" rather than in terms of their consequences for signifier typology. The nature of these patterns takes on new significance in light

[5]Smith (1985) gives an early application of a CV-skeleton analysis to Sierra Miwok, based on the descriptions of Broadbent (1964) and Freeland (1951) (see also Goldsmith 1990: 83–95). See Good (2016: 9–12) for further discussion of this kind of templatic pattern.

of the increased attention being paid to constructional approaches to grammar, and, in particular, Construction Morphology, due to their reliance on sign-based models for characterizing grammatical patterns, which is what makes them of interest here.

Section 3.2.2 begins the discussion by considering the well-known problem of so-called zero morphemes. Section 3.2.3 then looks at discontinuous morphemes. Each of these kinds of deviations from the canonical signifier have been given the most detailed discussion in work on morphology. The remaining deviations to be considered have seen more attention in work on phonology. Data from languages of Africa will play a prominent role in the discussion both because I am relatively familiar with them and because, as will be seen, tonal morphology is associated with a range of interesting deviations and African languages provide numerous examples of tonal morphology which can be explored in this respect (see also Hyman (2016) on this topic).

3.2.2 Significative Absence

Perhaps the most well-known non-canonical signifier is the lack of one entirely, commonly represented in terms of a Ø symbol or referred to along the lines of a "zero" or "null" morpheme. Of relevance here in particular are cases of apparent significative absence (see Stump 1997: 219) where the lack of a signifier is taken to be a kind of signifier in its own right.[6] As discussed by Stump (1997: 225), significative absence is a typical feature of inflectional morphology due to the fact that paradigmatic oppositions among inflectional forms necessarily render the lack of overt inflectional marking in a given form meaningful by virtue of its opposition to overtly marked forms in the paradigm.

Less typical, but also attested, are cases where there is evidence for zero roots, or even zero words. In Nimboran, for instance, a language with complex templatic morphology (see Sect. 4.3), there are a number of verbs whose root position contains no overt morpheme. In such cases, the verbal meaning can be determined on the basis of morphemes found in other positions (Inkelas 1993: 610–613).[7] Relevant examples are given in (4).

[6]Transformationalist frameworks also frequently make use of elements resembling zero morphemes, so-called null operators (see, e.g., Browning 1987). These devices are used to analyze certain kinds of phrasal syntactic relations. While they can occupy positions in a syntactic tree that can also be occupied by signs, they do not seem to be signs in the Saussurean sense. See also Baker (1990) on the distinction between two kinds of zero, one more morphological in orientation and the other more syntactic in orientation, as well as Lemaréchal (1997) for consideration of the role of "zeros" in linguistic analysis more broadly. Rhodes (1992: 413–414) provides an early discussion of zero morphemes from a constructional perspective, and Trommer (2012b) contains a recent overview of zero morphology from a theoretical perspective. The term *significative absence* is used here to make clear that a specific kind of zero morphology is in focus where a sign that is otherwise canonical lacks an overt signifier of any kind.

[7]Inkelas (1993) is based on the description of Anceaux (1965).

(4) a. *Ø-rár-ŋkát-t-u* ⟶ *rekátu*
laugh-PRT-ITER-PRS-1s/p
"I laugh repeatedly (here)." (Inkelas 1993: 610)
b. *Ø-rár-be-d-u* ⟶ *rebedú*
bring-PRT-to.above-FUT-1s/p
"I will bring from here to above." (Inkelas 1993: 610)
c. *rekéi-k-re-bá-r-am* ⟶ *rekéikrebáram*
turn-DU.SBJ-PRT-above-FUT-3M.s/p
"They two will turn above." (Inkelas 1993: 574)
d. *príb-tam^{e}-be-t-u* ⟶ *príptembetɨ*
throw-DUR-to.above-PRS-1s/p
"I am throwing him/Ø from here to above." (Inkelas 1993: 585)

The first position in the Nimboran verbal complex is reserved for the verb root, which is then followed by a series of affixes, some of which have relatively straightforward function (e.g., subject agreement) and others of which do not. In particular, there is a class of morphemes labeled *particles* by Inkelas (1993: 574–578) that combine with verb roots to encode verbal meanings in an apparently non-compositional way. (In this respect, they are reminiscent of verb-particle combinations, such as *give in* in English.) In (4c), an example is given for a verb root *rekéi-* appearing with the particle *-re-* to encode the meaning 'turn'. It is not obligatory for a verb root to appear with a particle, as seen in (4d), where the root *príb-*, on its own, encodes 'throw'.

What is of special interest in the present context are the examples in (4a) and (4b). In these verbs, there is no root morpheme. The meaning of the verb, however, can be determined by the appearance of a specific particle along with other fixed morphemes. In (4a), a zero root, along with the particle *-rár-* and the Iterative marker encodes the meaning 'laugh'. In (4b), the same particle appearing with a zero root and a member of a specific set of locative markers (including *-be-*, as found in the example) encodes the meaning 'bring'. Inkelas (1993: 611–613) provides specific arguments for an analysis of verb forms like this in (4a) and (4b) as involving the appearance of actual zero roots that are associated with meaning.

Significative absence does not even seem to be limited to bound morphology. Fortune (1942) documents a case of an apparent zero verb in Arapesh appearing in a syntactic construction where it codes the meanings of 'strike', 'kill', or 'fight'. Relevant examples are given in (5).

(5) a. *na ku̥*
3s.M.SBJ 3s.F.OBJ
"he strikes or kills her" (Fortune 1942: 66)
b. *kwa n*
3s.F.SBJ 3s.M.OBJ
"she strikes or kills him" (Fortune 1942: 66)

c. *kwa* *mitak an*
3s.F.SBJ clasp 3s.M.OBJ
"she clasps him" (Fortune 1942: 64)
d. *kwa* *mitak okuo*
3s.F.SBJ clasp 3s.F.OBJ
"she clasps her" (Fortune 1942: 64)

In Arapesh, the juxtaposition of arguments without an overt verb yields a clause interpreted as encoding an action where the first argument is the subject of a verb meaning 'strike', 'kill', or 'fight' and the second argument is the object, as in (5a) and (5b). In (5c) and (5d), there is an overt verb resulting in an SVO structure that provides the model for the zero verb analysis of (5a) and (5b).

Of the various deviations from canonical signifiers discussed here, significative absence poses the least problem with respect to the idea that signifiers should adhere to a canonical linear ideal. This is because zero morphemes can be straightforwardly interpreted as being "vacuously" linear. They are nevertheless noteworthy as a deviation from the classical Saussurean sign insofar as they provide evidence that it is possible for a sign to lack a signifier entirely and, as seen in the examples from Nimboran and Arapesh, they are not limited to being found in a specific, narrow morphological domain (e.g., inflectional morphology).[8] Zero morphemes can thus be considered a kind of "defective" sign, lacking one of the two defining features of signs, the signifier.[9] In Sect. 3.2.4 an example of the reverse kind of defectiveness, where there is a signifier that does not appear to have any signification, will be considered.

3.2.3 Discontinuities in Signifier Structure

Deviations from canonical signifier structure that present more obvious problems for treating signifiers as generally being linear arise from various kinds of signifier discontinuities. There does not seem to be a standard typology of this phenomenon, though Harris (2017: 1–26) contains a useful overview of many of these in her examination of the notion of multiple exponence (see also Caballero and Harris (2012), as well as Caballero and Inkelas (this volume) for consideration of multiple exponence within Construction Morphology). Work on the complications involved

[8]The opposite pattern where a sign has a signifier that does not clearly signify anything is found as well in the form of various dummy elements which appear for formal reasons but do not encode any specific semantics. An example of this can be found in Ndebele where a dummy morpheme with shape *yi-* appears in cases where a disyllabic templatic restriction must be satisfied in certain verbal forms but cannot be met automatically for verb roots whose signifiers do not have enough phonological material (see Hyman (2009: 186), Good (2016: 71–73), and Sect. 3.2.4).

[9]The use of the term "defective" here is extended from its application to domains such as paradigmatic gaps and certain kinds of prosodic irregularities (Baerman 2010; Zimmermann 2017).

with patterns of exponence more generally (see, e.g., Trommer 2012a) is also clearly relevant in this context.

An example of a signifier discontinuity can be found in the Mohawk data in (6). In Mohawk, the Dualic prefix *t-* is reported as obligatorily appearing with certain verb stems, such as the verb encoding 'stand up' but not the one for 'sit down', as seen in (6a) and (6b). Its position in the verbal template can allow it to appear quite distant from the stem it is associated with, as seen in the example in (7).

(6) a. *téstaʔn*
te-s-t-aʔn
DUALIC-2s.A-stand-INCH
"Stand up!"
b. *sátyą*
s-at-yą
2s.A-REFL-set
"Sit down!" (Mithun 2000: 237)

(7) *taųsahsaterąnó:tą*
t-aų-sa-hs-ate-rąn-ot-ą-'
DUALIC-OPT-RPT-2s.A-REFL-song-stand-CAUS-PFV
"You should sing again." (Mithun 2000: 237)

The morphological discontinuity between the Dualic and certain stems in Mohawk is paralleled by syntactic dependencies in other languages, such as German. In (8a), a German future coding construction is provided as an example of an auxiliary construction. The main verb, *anrufen* 'to call up', is in an infinitival form, and it is a member of a class of morphosyntactically complex verbs, with initial elements usually described as "separable" in the literature on German (see Müller (2002: 253–340) for an extensive overview). In the case of this verb, the relevant separable element has the form *an*, and it is simply glossed as a "prefix". In a different construction, involving a verb marked in the present tense, seen in (8b), the main verb appears in second position (the usual position for finite verbs in non-subordinate clauses), but the element *an* appears at the end of the clause in a position "separated" from the verb.

(8) a. *Peter wird Paul anrufen.*
Peter be.FUT.3s Paul PFX.call
"Peter will call Paul up."
b. *Peter ruft Paul an.*
Peter call.PRS.3s Paul PFX
"Peter calls Paul up."

Different possible analyses could be proposed for patterns like those seen in Mohawk and German. On the one hand, we could treat the relevant discontinuous elements in examples like (6a) and (8b) as constituting signifiers of distinct signs that cannot be assigned clear-cut semantics on their own. This would allow them to be treated as canonical signifiers with "unusual" meaning. Alternatively, they could be treated as discontinuous signifiers, consisting of two distinct formal pieces, each with its own linearization constraints but associated with a relatively readily identifiable kind of meaning. Depending on the details of the language in question, there may be reason to pick one of these alternative analyses over another—or even some other kind of analysis. However, it seems impossible for any analysis to be able to treat these patterns as solely involving canonical signs.

Booij (2010: 121–142) discusses related phenomena to what is seen in (8) in Dutch from a Construction Morphology perspective, arguing that an advantage of constructional approaches is their ability to model the hybrid morphological/syntactic features of phenomena like this effectively since they do not assume a strict divide between the lexicon and syntax. What is of special interest in the present context is understanding under what conditions such bipartite signifiers are allowed. Booij (2010: 131), for instance, models Dutch verbs which show patterns of separability as combinations of two word elements, one of which must be a verb and the other assignable to a more open set of word classes (namely, prepositions, adverbs, adjectives, and nouns). A question that might be considered more broadly is whether a pattern like this, where the morphosyntactic category of one element is fixed while the other is more open, may be a common one for discontinuous signifiers.

In the present context, cases of discontinuities where the data strongly favors an analysis in terms of discontinuous signifiers, as opposed to two distinct signifiers which must occur together, are of the most interest. One well-known category of such cases involves circumfixation, where an affix has both prefixal and suffixal components, and another involves infixation, where the signifier associated with an affix breaks up the otherwise linear structure of another signifier (see Štekauer et al. 2012: 197–212; Yu 2007).

An especially noteworthy set of cases of discontinuities of this kind involve phenomena that can be broadly classified under the term *endoclisis* (see Harris 2000, 2002) where a clitic (or clitic-like) element appears within the signifier associated with an independent word. Idiatov (2005) presents a detailed examination of a phenomenon like this in his consideration of the complex relationship between intensifiers and numerals in the Mande language Tura. Relevant data is provided in (9). (The overall facts are more complicated than what is presented here, and the interested reader should consult Idiatov (2005) for the full range of details.)

(9) a. *wo* *pììlɛ̂*
3p.SBJ.TAM two
"They are two." (Idiatov 2005: 36)

b. *àâ* *mɔɔ* *bháálá* *lefɪɪ* *kêɛ.á*
3s.SBJ.NEG.TAM can.TAM work even do.with
"He cannot even work." (Idiatov (2005: 60); citing Bearth (1971: 191))

c. *wáâ* *pìì* *lefɪɪ* *lê*
3p.SBJ.NEG.TAM t[wo] even [t]wo
"They are not even two/they are not two at all [but just one]."
(Idiatov 2005: 32)

The example in (9a) provides an instance of the numeral meaning 'two' in its typical form. In (9b), an example is provided of a specific intensifier in Tura that is translatable as 'even'. In (9c), the pattern of interest here emerges: Numerals can be "split" by intensifiers when modified by them. (The glossing of this example informally represents this splitting by similarly dividing the spelling of the English word *two*.) This splitting pattern is not restricted to just this one number or intensifier, but is more general in nature (and it can also be accompanied by partial reduplication). In examining this pattern, Idiatov (2005: 76) describes the analytical problem as follows: "The need for an adequate synchronic morphological analysis of the constructions at issue made it necessary to address some theoretical questions, such as endoclisis, word integrity, and constancy of the morphological status of linguistic entities." He ultimately treats intensifiers like *lefɪɪ* 'even' as alternating between having word and infix status and develops the notion of a *pseudoword* (Idiatov 2005: 74) to characterize the two elements corresponding to 'two' in an example like (9c) as a way to "describe a situation when a certain linguistic element can be analyzed as a word on the level of form but not on the level of meaning" (Idiatov 2005: 77).

Regardless as to whether or not one accepts this specific analysis, it is clear that data like that seen in (9) presents interesting questions for any model of signifiers since it provides an example of a case where signifiers that look canonical in some constructions can take on non-canonical behavior in quite specific contexts. The syntactic particularity of this pattern is, broadly speaking, clearly supportive of constructional approaches to morphology and syntax, while at the same time raising interesting questions about the modeling of signifiers in such frameworks, in particular with respect to the conditions under which a signifier may lose its linear "integrity".

3.2.4 Signifiers of Defective Signs

Patterns most often looked at from the point of view of phonology also present interesting cases of deviations from canonical linear signifiers. A well-known case,

Table 3 Ndebele stem minimality and insertion repair

IMPERATIVE	GLOSS	TRANSLATION
lim-a	'cultivate-FV'	'cultivate!'
bamb-a	'catch-FV'	'catch!'
thum-a (H)	'send-FV'	'send!'
nambith-a (H)	'taste-FV'	'taste!'
yi-dl-a (H) (**dl-a*)	'YI-eat-FV'	'eat!'
yi-lw-a (H/L) (**lw-a*)	'YI-fight-FV'	'fight!'
yi-m-a (H) (**m-a*)	'YI-stand-FV'	'stand!'
yi-z-a (H/L) (**z-a*)	'YI-come-FV'	'come!'

morphology involving CV-skeletons was discussed in Sect. 3.1. In this section and following ones, other cases of deviations connected to phonological patterns will be considered.

The first case where phonological restrictions are connected to the appearance of non-canonical signifiers which will be considered is segmental in nature. Specifically, the data in Table 3 from Ndebele, a Bantu language, taken from Hyman et al. (2009: 283), provides cases of what might be called "defective" signifiers in phonological terms (though the label "subminimal" is more commonly used in this context).[10] The second half of the table gives a number of Imperative forms for these phonologically defective roots, with shape -C-. Non-defective roots are found in the first half of the table.

The Imperative in Ndebele regularly consists of the verb root followed by an inflectional Final Vowel (of form *-a* in Table 3). In -CVC- (or longer) roots, this strategy automatically results in a surfacing word of at least two syllables, as seen in the data in the first half of the table. This is not the case for the -C- roots in the second half of the table. Based purely on the lexical shape of their signifiers, a monosyllabic form like *Ca* would be expected for their imperatives. Such forms, however, would violate a restriction that words should be disyllabic in the language. One of the available repair strategies for forming imperatives of such verbs is seen in Table 3, where a formative of shape *yi-*, which does not contribute to verbal semantics, is prefixed to the stem (see Sibanda (2004: 113–114) for discussion of other repair strategies).

The Ndebele situation presents us with the possibility that certain signifiers are permitted in the lexical specification of a sign despite the fact that their shape will inevitably violate restrictions of a language's grammar. In this case, the deviation from the canonical linear signifier is not in terms of the ordering of its elements, as was the case in the examples discussed in Sect. 3.2.3, but, rather in terms of patterns of length (see Good (2016: 73–75) for more on this distinction). In Ndebele, there are strategies available to "repair" words containing defective signifiers when necessary. Instances where defective signifiers result in ineffability—that is certain

[10]The abbreviations "H" and "L" in Table 3 indicate the tone class of the verbs they follow (Hyman et al. 2009: 308).

expected forms are simply inexpressible due to the lack of an available repair strategy—are also attested, with Turkish presenting such a case (Inkelas and Orgun 1995: 769–773) (see also Good 2016: 69–71).

There are two broad issues raised by defective signifiers from a Construction Morphology perspective. First, they suggest that grammars may contain constraints that, in effect, define an "ideal" signifier in a given morphosyntactic context (e.g., that a verb root should have at least -CVC- structure in Ndebele). That is, a full morphological model would need to describe not only how signifiers combine but also what kinds of signifiers are expected in the first place. Many constraints on signifiers can be understood as more or less purely phonological in nature, for instance involving aspects of their syllable structure. However, the Ndebele case is different from this: There is a phonological constraint on a *morphological* unit, which brings the pattern into the domain of morphology.

Second, in languages like Ndebele where there are repair strategies available for cases of defective signifiers, the possibility that they will involve the appearance of unpredictable dummy elements, such as the *yi-* seen in Table 3, provides us with examples of formatives that have the appearance of signifier but lack any association with meaning. These are, in effect, the "inverse" of zero morphs (see Sect. 3.2.2). Whatever analysis one might devise for patterns like the one exemplified for Ndebele in Table 3, they show that any full constructional model of morphology will have to assume that it is possible that the morphological forms of a construction will not necessarily only consist of the forms of its constituent morphemes. Grammatical constraints may force the appearance of other morpheme-like elements as well.

3.2.5 A Relative Signifier

Tonal patterns present a number of complications for the modeling of signifiers. Much of this is due to the well-known problem of aligning two independent sets of linearly structured patterns, namely tonal and segmental ones, a topic that was discussed in Sect. 3.1. However, there are other complications raised by tonal morphology. These can relate both to the ways that distinctions are coded via changes in tone as well as the ways that tones coding a specific lexical item can appear in an utterance. The latter kind of complication will be discussed in Sect. 3.2.6.

As an example of the first kind of complication, the data in Table 4 presents patterns of singular/plural marking via tone changes in words belonging to a specific noun class (Class 9/10 using Bantuist terminology) in the Bantoid language Mundabli (Voll 2017). The abbreviation *S* in the table refers to a super-high tone in a four tone level system where low (L), mid (M), and high (H) tones are also present. Mundabli is one of a number of languages of its area that show tonal patterns like this (see, e.g., Hombert 1980: 91–92). While some nouns in this class (given in the first section of the table) do not show any alternation between their singular and plural forms, most of them do. Generally, in such cases the singular form has a

Table 4 Mundabli tonal singular/plural alternations (Voll 2017)

SG TONE	PL TONE	SG EXAMPLE	PL EXAMPLE	GLOSS
M	M	*kū*	*kū*	'rat mole'
H	H	*dzáŋ*	*dzáŋ*	'sugar cane'
L	ML	*kù*	*kù*	'rope'
LH	S	*tsə̌*	*tsə̋*	'baboon'
L.L	M.ML	*tàmà*	*tāmà*	'lion'
L.LH	S.S	*làmbŭ*	*lă̋mbű*	'orange'

lower tone and the plural a higher tone. This lower/higher pattern is also observed in various elements showing agreement for noun class (e.g., the pronominal forms associated with these nouns have the shape *yì* in the singular and *yī* in the plural).

An important feature of the singular/plural encoding seen in Table 4 from the present perspective is that it cannot be described in terms of a fixed pattern, such as all singular nouns have low tone and all plurals have high tone. Rather, it involves relative higher/lower pattern. This cannot be straightforwardly modeled in typical approaches to signifier representation which treat signifiers as associated with "constant" phonology. It is possible to assign this encoding pattern concrete subpatterns (e.g., that a noun with a low tone in the singular typically will have a mid-low pattern in the plural), and presumably that level of concreteness would be encoded at some level of a constructional analysis of these patterns. At the same time, the lower/higher "metageneralization" is not only interesting from a descriptive perspective, it also has its own signifying quality insofar as, with few exceptions, nouns showing tonal alternations are only found within Class 9/10. So, it can be seen as encoding a kind of grammatical meaning in its own right.

The existence of abstract patterns that apply over classes of signifiers raises interesting questions regarding the range of devices needed to model signifier behavior in Construction Morphology. This will be explored in more detail in Sect. 4 when the role of templates in Construction Morphology is considered. In cases like this, the issue is not so much that any one signifier departs from the canonical linear ideal. Rather, it is that signifiers are not behaving simply as "inert" sound representations associated with a particular meaning, as suggested by the classical Saussurean sign. Instead, they seem to participate as elements within a kind of language-specific "signifier grammar" (see also Sect. 4).

Before moving on, it is worth reiterating a methodological aspect of this paper introduced in Sect. 2: A surface-oriented approach to cataloging different kinds of non-canonical signifiers has been deliberately adopted here. The pattern of relative tonal alternation seen in Table 4 has, therefore, been taken at "face value". However, in this case, as well various other cases to be considered below, it would clearly be possible to devise abstract analyses which would render these signifier patterns more canonical at an underlying level. For instance, one could posit a floating low-tone prefix in the singular forms of the alternating nouns and a high-tone prefix in the plurals, with various rules governing their precise realization, and this is presumably

the historical source of these tonal alternations (see, e.g., Hyman (1981: 11) for a historical analysis of similar alternations in Noni, spoken nearby to Mundabli). It may be the case that the best approach to the analysis of some of the signifiers considered here is to view them as canonical at some abstract level representation. A fuller survey would make this clearer to the extent that it might establish the existence of constraints on attested patterns for certain classes of non-canonical signifiers, such as relative signifiers of the sort seen in Table 4, which could be analyzed as falling out automatically from a theoretically motivated set of abstract representations.

3.2.6 A "Sheared" Signifier

Another pattern of interest here that is attested in signifiers containing tonal specifications is what one might term "tonal displacement". This is a special case of signifier discontinuity (see Sect. 3.2.3) where the segmental features of a word's signifier and its tonal features do not appear together. A particularly striking case of this comes from the Nigerian language Izon, following an analysis presented in Harry and Hyman (2014: 677–678) on the basis of data drawn from Efere (2001: 158–159), who describes the Bumo variety of the language. In noun phrases, the initial noun of the phrase determines which of four tone patterns appears on all subsequent words, and their lexical tones fail to be realized. Relevant data is provided in Table 5. In isolation, only two tonal classes of nouns can be observed, nouns with all high tones or nouns with a medial fall. However, in phrases, four tone classes emerge.

The first column in Table 5 schematizes the four tone melodies associated with nouns where a "+" indicates the division between the initial word and other words. The parenthesized L is used to indicate that nouns may appear with an initial low tone vowel. The second column gives example nouns associated with these patterns with their tones in isolation. The third provides a frame meaning 'man who owns/has' that consists of *náná kímí*. This frame can be used to show the different effects that nouns in each of these classes have on words which follow them. The first example in Table 5 gives a noun of the H+H class which has high tones throughout and assigns high tones to the following words in the noun phrase. Nouns in the HL+L class have a high-low pattern with all following words having low tones, as indicated. Nouns in the H+L class show high tones on the noun with low tones on the following words. Finally, words in the H+HL class show high tones

Table 5 Izon tonal classes (Harry and Hyman 2014: 677–678)

MELODY	NOUN	EXAMPLE PHRASE	NOUN GLOSS
(L)H+H	*bélé*	*bélé nánà kímí*	'pot(s)'
(L)HL+L	*sérì*	*sérì nànà kìmì*	'scarf'
(L)H+L	*wárí*	*wárí nànà kìmì*	'house'
(L)H+HL	*ìkíé*	*ìkíé nánà kìmì*	'friend'

on the noun with a high tone on the first syllable of the following words and then all low tones.

Harry and Hyman (2014: 677) analyze these patterns by suggesting that nouns in Izon are either accentless or associated with a pitch accent consisting of an HL contour that can be specified as being located in various positions in the word, reminiscent of what has been described for Japanese (see, e.g., Gussenhoven 2004: 186–187). They further treat accentless nouns as associated with a default H. The lexical specifications of the example words in Table 5 under this analysis are schematized in (10).

(10)	CLASS	H+H	HL+L	H+L	H+HL
	SEGMENTS	*bɛlɛ*	*sɛrɪ*	*wari*	*ikiɛ*
	TONES		HL	HL	HL

The representations in (10) separate the segmental and tonal aspects of the signifiers of these nouns across each of the four classes exemplified in Table 5. The pitch accents are associated with three possible positions: non-final syllable, final syllable, and post-final. In all accented words, the overall contour of noun phrases is characterized by a fall at some point in the phrase (along with the possibility of an optional rise if the noun begins with a vowel as is the case for *ìkíɛ́* 'friend'). Accentless words are associated with no such contour. For words with non-final accent, the fall will appear within the word, as seen for *sɛ́rì* 'scarf'. For words with final accent, the contour is realized across the boundary of the first word and the second word, as seen in the phrase beginning with *wárí* 'house' in Table 5. Finally, for words with post-final accent, the contour is realized on the word immediately following the noun, as seen for *ìkíɛ́* 'friend' in Table 5.

From a descriptive standpoint, it is convenient to characterize data like this in terms of one word "assigning" tones to a following word. However, if we assume the representations in (10), it would be more accurate to treat this as a case of a "split" signifier, where the segmental and tonal features of the signifier do not need to completely align, even to the point where the contour associated with accent is completely displaced onto the segmental material associated with the following word, as is the case for *ìkíɛ́* 'friend'. This raises interesting questions concerning wordhood in Izon: What is the morphological status of a "hybrid" element like *náná* in Table 5 when it has a falling tone contour after a word with post-final accent? Its segments are associated with one word but the tones are associated with another. Is it still a "word" in such cases?

From the perspective of understanding non-canonical signifier shapes, we do not have to address that question directly, but it is certainly of interest to note this as an instance of a kind of signifier "displacement" where part of one signifier can only be realized if material from another signifier is present. While it is well-known that phonological processes can blur word boundaries, for instance in cases of elision, coalescence, or tone spreading, those processes do not typically involve a significant part of the lexical material of a word only ever being realized in the

presence of another word. This provides us then with another interesting case where the linear nature of the signifier is violated: the segmental and tonal components of the signifier of a "word" may not be realized together.

The fact that non-canonical signifiers such as those seen in Tables 4 and 5 are found in the domain of tone is part of a wider pattern of tonal morphology exhibiting features not found in segmental phonology (see Hyman 2013). Other kinds of phonological features have been seen to show similar patterns to tone in their ability to be detached from specific segments in signifier (e.g., nasality) (see Akinlabi (2011) for overview discussion). However, the kind of signifier splitting seen in Table 5 appears to be unique to tonal phenomena, at least so far.

3.2.7 Phonologically-Blocked Signifiers

Another way in which signifiers can deviate from the canonical linear ideal are cases where the phonologies of the signifiers of two signs interact in a way which prevents one of the signifiers from appearing. Consider, for instance, the data in Table 6 which shows singular/plural pairings across nouns for a specific noun class in the Bantoid language Naki, where the singular forms can be associated with Bantu noun class 3 and plurals with Bantu noun class 6 (see Good and Lovegren 2017). Naki is a language with relatively robust singular/plural marking on nouns. However, nouns of the class seen in Table 6 sometimes fail to code a singular/plural distinction on the noun itself. The data in Table 6 shows three possibilities for coding the singular/plural distinction in these nouns: (i) the presence of an *ŋ* in the plural form not present in the singular, most typically in the coda position of monosyllabic words ending in a vowel in the singular, (ii) no formal distinction between the singular and plural, and (iii) for a small set of nouns, the loss of a labial articulation in the first consonant of the singular (see Kießling (2010) for discussion of this pattern from an areal perspective).

There is some degree of irregularity in the singular/plural encoding of these nouns, but, broadly speaking, a generalization holds that, if the singular form of the noun matches certain phonological restrictions, for instance has the shape of a monosyllabic open syllable or begins with a labialized consonant, it will code a singular/plural distinction, whereas otherwise, it will not. Patterns of "phonological blocking" like this do not seem especially rare. Akinlabi (2011: 1950), for instance, discusses this phenomena in the context of a broader study of featural affixation, also citing an instance where something comparable is found in Dutch.

Data like this is generally seen as the domain of phonology, not the "lexicon", and it is clear that phonological analysis has a significant role to play in understanding patterns like those seen in Table 6. Nevertheless, if one adopts a constructional approach to morphology which takes an (augmented) Saussurean sign as the primary building block of grammar, then phonological constraints on the actual realization of a signifier at all (here coding plurality) are of clear interest. In particular, they raise questions regarding the kinds of phonological environments

Table 6 Class 3/6 nouns in Naki

CLASS 3	CLASS 6	GLOSS
fō	*fōŋ*	'axe'
gí	*gəŋ*	'egg'
gú	*gúŋ*	'spear'
jū	*jūŋ*	'nose'
lī	*ləŋ*	'tongue'
wə́ní	*wə́ŋní*	'tail'
díd	*də́ŋ*	'whisker'
dəŋ	*dəŋ*	'pumpkin'
bɔ́d	*bɔ́d*	'fire/gun'
sɔ́ŋ	*sɔ́ŋ*	'flute'
yə́d	*yə́d*	'eye'
fimfì	*fimfì*	'quill'
bwɛ̀	*bɛ̀*	'foot'
kpə	*kà*	'palm (of hand)'
mgbáŋ	*ŋgáŋ*	'root'

that can be associated with lack of realization of a signifier and what kinds of signifiers (both from a formal and a semantic perspective) may be most likely not to be realized (see also Sect. 5).

3.2.8 Towards a Signifier Typology

The survey of ways in which signifiers deviate from the canonical linear ideal presented in this section is not intended to be exhaustive. Instead, the goal has been to present a range of deviations to make it clear that there is a wide variety of potential complexities involved in the grammatical modeling of signifiers. Zero morphemes, for instance, suggest that the presence of an overt signifier is not an essential part of a sign (see Sect. 3.2.2), and tone provides us with cases of "meta-signifiers" (see Sect. 3.2.5)—that is, abstract patterns holding among classes of more concrete signifiers—as well as cases where the pieces of a single signifier can be spread out over more than one word (see Sect. 3.2.6). Moreover, the deviations can be oriented primarily towards morphological patterns, as is the case for certain kinds of discontinuous morphemes (see Sect. 3.2.3) or be driven by phonological concerns (see Sect. 3.2.7).

Overall, it seems clear that signifier typology is in area in need of broader investigation. This point will be further underscored by the discussion below in Sect. 4, which considers a special class of signifier-like entities, so-called morphological templates (see Good 2016). The behavior of templates strongly suggests that understanding signifiers does not only require a better understanding of the range of typological variation attested for them but that we also need to recognize that the morphological systems of some languages may rely on something that we might call a "signifier grammar".

4 Templates as "Constructive Signifiers"

4.1 The Building Blocks of Signifiers

A final class of non-canonical signifiers (or, at least, signifier-like) elements that will be considered here are so-called templates. The term is understood here to refer to grammatical patterns where the form of some linguistic constituent appears to be well conceptualized as consisting of a fixed linear structure, whether in terms of the arrangement of its subconstituents or its overall length (see Good (2016: 1–22) for further discussion). Templates are not typically treated as signifiers, but they clearly have a similar function in that they define a linearization structure which is part of the means through which specific meanings are encoded.[11] This is especially the case for those instances where the template is the sole exponent of a given morphosyntactic category, as is found for certain Semitic CV-skeleton templates, though it is also true for instances of templates that are linked to segmental affixes, of the sort found for Sierra Miwok, discussed in Sect. 3.1 (see Davis and Tsujimura (2014) for further discussion of this distinction).

In Sect. 4.2 an example of a template involving phonological constraints on verb stems in the Bantu language Tiene will be discussed, and in Sect. 4.3 data from Nimboran (a language previously discussed in Sect. 3.2.2) will be considered as an example of templatic restrictions involving morpheme order. As part of the analysis, some initial proposals for incorporating templatic generalizations into Construction Morphology will be provided as a way of highlighting how the framework can be extended to these relatively complex morphological phenomena. In particular, they will be treated as a kind of "constructive signifier", i.e., an abstract specification of the possible shapes of a class of concrete signifiers, each associated with its own meaning.

4.2 A Morphophonological Template: Tiene Verb Stems

In order to make the discussion of templates more concrete, data illustrating some of the features of a template structuring the morphophonological realization of verbs in the Bantu language Tiene is provided in Table 7. Tiene verb structure is analyzed in detail in Hyman and Inkelas (1997) and Hyman (2010), and Good (2016: 154–166) considers it in the context of a broader comparison of templatic structures. (Some aspects of the data seen in Table 7, such as vowel alternations, will not be considered here but are analyzed in these other works.) All work on Tiene is based

[11]The work of Gurevich (2006: 54–57) within Construction Morphology employs templates to characterize ordering relations among morphemes, though the role of templates within the framework is not a central issue to the discussion.

Table 7 Causative verb forms in Tiene (Hyman 2010: 147–148)

INFINITIVE	CAUSATIVE	GLOSS
-lɛ	*-lées-ɛ*	'eat'
-lab-a	*-lasab-a*	'walk'
-lók-a	*-lósek-ɛ*	'vomit'
-mat-a	*-maas-a*	'go away'
-pal-a	*-paas-a*	'arrive'
-píín-a	*-píís-ɛ*	'be black'

on the description of Ellington (1977). For ease of exposition, an inflectional final vowel is parsed off from the stem in Table 7 where this is straightforward. This vowel is not relevant to the pattern of interest.

The paired forms in Table 7 give non-causative and causativized verb stems in Tiene. Causativized verbs appear with a Causative affix that can be associated with an underlying form along the lines of *-es-*. This can be seen most clearly in the first verb pair in the table *-lɛ* vs. *-léesɛ* 'eat'. However, there is an unusual set of restrictions on the shape of verb stems in this language which, among other things, disallows coronals as the third consonant of a stem. In causativized stems based on forms which end in labials, this restriction is satisfied by having the *s* of the Causative appear as the second consonant, seemingly behaving as a kind of infix. This results in verb pairs like *-laba*/*-lasaba* 'walk'. In causativized stems based on forms which end in coronals, the restriction is fulfilled by having the *s* of the Causative effectively replace the coronal that would otherwise be expected to appear, thus resulting in pairs like *-pala*/*-paasa* 'arrive'. These patterns can be roughly characterized via a template along the lines of CVTVK where T is used for any coronal consonant and K for a non-coronal. (The final vowel seen in the forms in Table 7 is left out of the template since its appearance can be attributed to independent aspects of the morphological structure of the verb.)

Assuming we accept that templatic analyses like the one just presented for Tiene—or the one presented above for Sierra Miwok in Table 2—are valid, what is their role in Construction Morphology? A template is not a signifier in its own right, but, rather, represents a kind of constraint on possible signifier shapes in specific constructional contexts (for Tiene, verb stems). Templates have been placed into the class of *significantia artificialiter* by Simpson and Withgott (1986: 173), following the use of the term by Jakobson and Waugh (1979: 30) (which they, in turn, attribute to Thomas Aquinas) to characterize phonemes, a class of grammatical elements which lack associations with meaning in their own right, but allow for the construction of signifiers.[12] One way to conceptualize templates would be to treat them as a kind of signifier "construction", providing a schema for how a certain class of signifiers can be formed without being signifiers in and of themselves. This

[12]Simpson and Withgott (1986) is focused on morphosyntactic templates of the sort associated with slot-filler morphology rather than morphophonological templates of the sort exemplified in Table 7, but their characterization would seem to apply equally well to both kinds of templates.

would seem to suggest that a Construction Morphology approach that incorporated templatic patterns would require that the notions of schema and subschema (see Booij 2010: 51–55), as applied to morphological constructions, may also be valuable as devices for characterizing relationships among classes of signifiers associated with a common template within a larger network of lexical relations (Booij 2010: 25–26).

Fully developing a model for templatic relations in Construction Morphology is outside the scope of this paper, but an informal schematization of the form that they might take on is illustrated in (11). A similar approach is taken by Tsujimura and Davis (2011: 811). In (11a), a simple constructional representation of the stem *-lab-* 'walk' from Table 7 is provided. In (11b), a constructional representation is provided of causativized verbs in Tiene. These representations collapse the phonological and morphosyntactic properties of the constructions into a single representation that is paired with a representation of their semantic properties. In (11c), I introduce a new convention to express the templatic restrictions imposed on Tiene verb stems. A CVTVK schema is enclosed by double parentheses indicating that this is not a signifier in and of itself but, rather, a pattern used to construct a signifier.[13] This is categorized as a π-stem, which here is used to refer to a category of prosodic stem in Tiene. This templatic restriction then is taken as part of the description of the signifier of a construction that is associated with the morphosyntactic category of a suffixed verb stem. The semantic properties of the verb stem in (11c) are not indicated since these are dependent on the specific verbal suffix that appears in the construction. (The Causative suffix is used here for illustration, but Tiene also shows applicativizing and stativizing suffixes whose appearance follows the CVTVK template, as described in Hyman (2010).) Tsujimura and Davis (this volume) provide analyses of comparable morphological patterns in Japanese in more detail than what is given here for Tiene, thus providing a useful comparison.

(11) a. $[\textit{-lab-}]_{\text{VSTEM}} \leftrightarrow$ ['walk']
b. $[[\text{X}]_{\text{VSTEM}_i}\ [\textit{-es-}]_{\text{VSUFF}_j}]_{\text{VSTEM}_k} \leftrightarrow$ [Causative of SEM_i]
c. $(\!|\ \text{CVTVK}\ |\!)_{\pi\text{-STEM}}$
$\downarrow$
$(\text{X})_{\pi\text{-STEM}_k} \leftrightarrow [\text{VSTEM}_i\ \text{VSUFF}_j]_{\text{VSTEM}_k}$

The particular templatic restriction depicted in (11c) for Tiene can be placed into the broad class of phonotactic restrictions, even if these are of an unusual kind. More usual kinds of phonotactic restrictions, e.g., on syllable structure, could also presumably be modeled as elements of signifier construction, though the extent

[13] Rhodes (1992: 418), in an early proposal for a constructional approach to morphology, suggests that a special feature can be associated with morphological constructions to specify the way the phonological material associated with the construction should be combined. The CVTVK schema could be viewed as a language-specific instantiation of such a feature.

to which they would be associated with a specific grammatical category would differ from language to language. Inkelas (2014: 44–59) provides an overview and examples of "morphological conditioning of phonology within a language", which can result in restrictions on signifier shapes specific to a given morphosyntactic class of elements, which is of clear relevance here. She cites Smith (2011: 2439), for example, who considers cases of phonological *privilege* where one word class can support a greater range of phonological contrasts than another word class and who finds in particular that noun privilege is more common than other types.

4.3 A Morphosyntactic Example: The Nimboran Verb

Templatic restrictions can be characterized not only in phonological terms, as in the example discussed above in Sect. 4.2, but also in morphosyntactic terms in languages exhibiting so-called slot-filler or position class morphology (see Good 2016: 12). These kinds of templates involve restrictions on linear realization that are characterized in terms of morphosyntactically defined categories, such as "subject marker" or "tense marker" rather than phonological ones. An example can be found in the Nimboran verb, following the analysis of Inkelas (1993). (See Sect. 3.2.2 for additional discussion of Nimboran.) In Fig. 1, the schematization of Nimboran verb structure given by Inkelas (1993: 597) is adapted for presentation here.[14] This represents only an overview of her analysis of the complex facts of the Nimboran system. (Good (2016: 117–130) discusses the templatic features of the Nimboran verb as well.) The relevant template is enclosed in large square brackets in Fig. 1. As indicated, not all of the apparent surface morphological positions in Nimboran are treated as part of the template. Two of the positions, zero and one, are outside of the template and classified as the verb stem, while the other positions are arranged templatically and, together, are given the label "modifier".[15]

The examples in (12) illustrate morphemes occupying each of the eight position classes that Inkelas (1993) analyzes for the Nimboran verbal system. Both an abstract morphological parsing and a transcription of the surface form of the verb are presented. In addition to the complications raised by its templatic ordering constraints, there are also significant morphophonemic alternations that, in some cases,

[14]The abbreviations for the position class labels in Fig. 1 are interpreted as follows (see Inkelas 1993: 561): PL.SBJ, Plural Subject marker; DU.SBJ, Dual Subject marker; PL.OBJ, Plural Object marker; M.OBJ, Masculine Object marker; INC.DU.SBJ, Inclusive Dual Subject marker; LOC, Directional–Locational markers; ITER, Iterative marker; TNS, Tense markers; SBJ.PERS, Subject Person (and gender) markers.

[15]There is some controversy in the theoretical literature as to whether or not linguistic treatments relying on complex position class systems of the sort developed by Inkelas (1993) should be considered valid as analytical devices (see, e.g., Downing and Stiebels 2012: 416–416). As discussed in Good (2016: 31–34), there are methodological reasons to consider how such analyses compare to other analyses of ordering restrictions at present.

root	PL.SBJ	DU.SBJ PL.OBJ	M.OBJ	INC.DU.SBJ	LOC	ITER	TNS	SBJ.PERS
0	1	2	3	4	5	6	7	8

Fig. 1 Schematization of Nimboran verbal system following Inkelas (1993)

obscure the identity of morphemes across examples. The morphological analysis in the examples is drawn from Inkelas (1993), where specific reference to the original source, Anceaux (1965), can be found. Some changes in glossing and transcription conventions have been made for ease of exposition in the present context, involving, in particular, the addition of labels corresponding to the numbered position classes in Fig. 1. Acute marks in (12) indicate the position of an accent whose primary surface realization involves pitch (Anceaux 1965: 36–37).

(12) a. *ŋgedói*$_{\mathbf{0}}$-^{i}$_{\mathbf{1}}$-*d*$_{\mathbf{7}}$-*u*$_{\mathbf{8}}$ ⟶ *ŋgedóidiu*
draw.PL-PL.SBJ-FUT-1s/p
"we (more than two) will draw here" (Inkelas 1993: 568)

b. *ŋgedóu*$_{\mathbf{0}}$-*k*$_{\mathbf{2}}$-*be*$_{\mathbf{5}}$-*k*$_{\mathbf{7}}$-*u*$_{\mathbf{8}}$ ⟶ *ŋgedóukebekú*
draw.DU-DU.SBJ-to.above-PST-1s/p
"we two drew from here to above" (Inkelas 1993: 563)

c. *ŋgedúo*$_{\mathbf{0}}$-*rár*$_{\mathbf{3}}$-*ŋa*$_{\mathbf{5}}$-*k*$_{\mathbf{7}}$-*u*$_{\mathbf{8}}$ ⟶ *ŋgedúoreŋáku*
draw.SG-M.OBJ-below-PST-1s/p
"I drew him below" (Inkelas 1993: 570)

d. *ŋguá*$_{\mathbf{0}}$-*maN*$_{\mathbf{4}}$-*k*$_{\mathbf{7}}$-*ám*$_{\mathbf{8}}$ ⟶ *ŋguámaŋkám*
bite.DU-INCL.DU.SBJ-PRS-INCL
"you (sg.) and I bit (here)" (Inkelas 1993: 567)

e. *ŋgedúo*$_{\mathbf{0}}$-*báN*$_{\mathbf{5}}$-*ŋkát*$_{\mathbf{6}}$-*k*$_{\mathbf{7}}$-*am*$_{\mathbf{8}}$ ⟶ *ŋgedúobekáŋkam*
draw.SG-from.below-ITER-PST-3s.M
"he drew repeatedly from below to here" (Inkelas 1993: 572)

As suggested by the examples in (12), within the template, only Position 7 and Position 8, corresponding to tense-marking and subject-marking, are obligatory. However, Position 7 can only be treated as obligatory if one assumes significative absence is present in the system. This seems reasonable, in this case, due to the fact that significative absence appears to be a central part of the language's paradigmatic system of tense marking (Inkelas 1993: 573), as well as the fact that the language has also been described as exhibiting the unusual phenomenon of having zero roots (see Sect. 3.2.2). The remaining positions are not obligatorily present. As with the Tiene template discussed in Sect. 4.2, we can understand the Nimboran template as a kind of constructional signifier: It constrains the space of possible verbal signifiers, but is not an actual surfacing signifier in its own right.

In constructional terms, however, the nature of the constraints imposed by the Nimboran template on the verb is somewhat distinct from the Tiene case. This is

because they do not operate on the phonological dimension of the construction but, rather, the morphosyntactic one. This is schematized in (13), where the template is described in terms of the position class numbers given in Fig. 1. Double brackets are used to encode the template, rather than the double parentheses seen in (11), to indicate that this constructional signifier constrains a morphosyntactic constituent rather than a prosodic one. The phonological dimension of the construction is schematized as consisting of two prosodic units of the same type, following Inkelas (1993: 563–566), where the first prosodic unit corresponds to the stem and the second to the modifier. The semantic aspect of the construction is not indicated here since that depends on the identity of the specific elements appearing in the stem and modifier positions.

(13)
$$\begin{array}{c} [\![2\ 3\ 4\ 5\ 6\ 7\ 8]\!]_{\text{VMODIFIER}} \\ \downarrow \\ (\text{X})_{\pi_j}\ (\text{X})_{\pi_j} \leftrightarrow [\text{VSTEM}_i \quad [\text{X}]_{\text{VMODIFIER}_j}]_{\text{VERB}_k} \end{array}$$

Obviously, the analyses provided in (11) and (13) cannot be taken as full-fledged treatments of templates in Construction Morphology. Nevertheless, they should make clear that the framework can be readily extended to handle such patterns. Moreover, to the extent that templates can be understood as a kind of construction, this makes Construction Morphology a natural framework in which to analyze them and can be seen as an additional reason for its general adoption for morphological analysis.

4.4 Constraining Signifiers

In the schematic representations in (11) and (13), the representation of the sign has been extended to allow for the expression of abstract constraints that limit the space of possible signifiers in the construction. In the case of (11), these constraints were modeled as being operative directly over the phonological representation, i.e., the part of the sign associated most directly with the signifier. In (13), the constraints were modeled as operative over the morphosyntactic representation, which, by virtue of encoding information about the linearization of morphemes, also affects the possible shapes of signifiers at the constructional level, though more indirectly.

While templatic patterns like these are striking instances of grammatical restrictions on signifier shapes, they should, perhaps, best be seen as occupying extreme ends of a cline of possible constraints. In the phonological domain, general phonotactic constraints on segmental arrangement and syllable structure also impose constraints on signifiers, as briefly mentioned in Sect. 4.2. In the morphosyntactic domain, there is also, for instance, a clear bias towards affixes that are either prefixes or suffixes, as opposed to infixes, circumfixes, or the rarer class of elements labeled “mobile” affixes, which appear as prefixes or suffixes depending on their

phonological environment (see, e.g., Paster 2009: 34–36; Jenks and Rose 2015). A gap in our current understanding of the structure of signs is the full range of restrictions that can be imposed on the shapes of signifiers, which kinds are more common, and which less common.

Overall, the existence of templates points to a complication in the modeling of signs not anticipated in work extending the classic Saussurean model to domains such as morphology and syntax: They suggest that signifiers cannot simply be modeled as "inert" sequences of elements that are strung together to form larger constructions. Rather, they can be embedded in larger systems of signifier relations that may form a kind of signifier grammar in their own right. Modeling such relations would go beyond merely patching up problems for linearization associated with non-canonical signifiers such as umlaut (see (3)) or those discussed in Sect. 3.2 and, instead, seem to require the development of sets of schema and subschema relations describing possible signifier shapes in a given language (see also Good 2016: 90–91).

This conclusion would appear to complement that of Booij and Audring (2017: 291) who propose that an extension to the basic constructional schemas of Construction Morphology, second-order schemas (i.e., schemas of schemas) can be used to account for patterns of morphological truncation in nickname formation. In both cases, non-canonical signifiers would seem to require an extension of the framework's basic tools to model the "intricate network of lexical relationships" that characterize morphological systems (Booij and Audring 2017: 291).

5 Arbitrary But Not Unsystematic? Sign–Signifier Pairings

To this point, the discussion has focused on the shapes of signifiers themselves without detailed consideration of the kinds of meanings that different kinds of signifiers are paired with. While the "arbitrary nature of the sign" (Saussure 1916/1959: 65) is Saussure's first principle, it is clear that there are limits to this arbitrariness when the basic device of the sign is used to model morphological and syntactic generalizations. This is recognized by Saussure (1916/1959: 131) in his distinction between absolute and relative arbitrariness, where the latter notion is used to characterize constructions involving the combination of signs in grammatically prescribed ways to create new words, as is the case for compounds. (Saussure (1916/1959: 131) specifically cites, for instance, compound numbers, such as *nineteen* as instances of relative arbitrariness.)

For non-constructional approaches to morphology and syntax, where the use of signs as a formal device is largely limited to the domain of lexical items which are then concatenated by various grammatical operations (e.g., inserted into a tree structure), the distinction between absolute and relative arbitrariness can, at least partly, be treated as resulting from a distinction between "lexicon" and "grammar". For constructional approaches, which do not view these as discrete domains, the distinction needs to be modeled some other way. While a general framework

for exploring the relationship between absolute and relative arbitrariness of signs has not been developed to the best of my knowledge, there is existing relevant work focusing on specific areas of form-meaning relationship. Haiman (1983), for instance, explores the connection between linguistic "distance" (i.e., how far apart two morphemes are from each other) and their conceptual relationship. Similarly, Mayerthaler (1987: 48–50) develops a number of principles of "morphological markedness theory" which seeks to account for asymmetric patterns in morphological encoding (e.g., the fact that some morphosyntactic categories, such as plural, seem to be more likely to be associated with overt coding than others, such as singular). More generally, Downing and Stiebels (2012) offer a thorough overview of iconicity in language of relevance here.

In the present context, it is perhaps easiest to illustrate the importance of understanding the allowable range of form-meaning pairings in constructional approaches by considering a constructed example of a non-canonical sign pattern that seems unlikely to ever be attested, even though its signifier components are of a type that are otherwise attested. Consider, for example, the extreme version of CV-skeleton morphology schematized in (14). The basic signifier pattern is comparable to the sort exemplified above in Table 2: CV skeletons are treated as distinctive signifiers in their own right which combine with segmental signifiers in the realization of words. However, in this case, the CV skeletons are associated with meanings normally considered to be clausal in nature, and the segmental material that combines with them is divided across meanings normally associated with nouns and verbs. The nominal meanings are represented via consonants and the verbal meanings via vowels. These "lexical items" are represented in (14a). When the consonantal and vocalic signifiers are combined with the CV skeleton signifiers, pronounceable "sentences" can be produced corresponding to standard sentential meanings, as presented in (14b).

(14) a.

tgr	'tiger'
rkn	'raccoon'
ao	'sleep'
uioe	'see'
CVCVC	intransitive sentence template
CVCVC CVCVC	transitive sentence template

b.

Tagor.	'The tiger sleeps.'
Tugir roken.	'The tiger sees the raccoon.'

If we admit the need for CV skeleton morphemes, which seem like an appropriate device to model morphological alternations in languages like Sierra Miwok, there does not appear to be any specific mechanism within Construction Morphology, or constructional approaches more broadly, which would suggest that the particular signifier pattern schematized in (14) should not be attested. One could easily construct other such examples. Based on what is attested in Izon, for instance,

Table 8 Umbundu tonal cases (Schadeberg 1986: 431)

CASE LABEL	AUGMENT	FORM	NO AUGMENT	FORM	LABEL
PREDICATIVE	*óngevé*	A	*Ngévé*	A	Predicative
OBJECT	*óngevé*	A	*Ngèvé*	B	Object
COMMON	*òngevé*	B	*Ngèvé*	B	Common

as described in Sect. 3.2.6, one could imagine a language where tonal melodies connected to nominal meanings associate with segmental melodies connected to verbal meanings, and vice versa. Such a system also would seem highly unlikely to be attested.

Following Dryer (2006: 207–208), I do not assume that linguistic formalisms should be simultaneously explanatory and descriptive, as typically considered important in the Chomskyan tradition. Therefore, I am not concerned here about whether the formal devices of Construction Morphology exclude the description of a language like the one seen in (14). However, it seems clear that any complete theory of Construction Morphology should be able to account not only for the range of attested signifier shapes but also for why certain kinds of signifier shapes are found associated with some meanings but not others.

Returning to actually attested patterns, the domain of tone, which was seen above to be a significant source of different kinds of non-canonical signifiers (see, e.g., Sects. 3.2.5 and 3.2.6) also provides a relevant example in this context. The data in Table 8 provides forms from the Bantu language Umbundu, which has been described by Schadeberg (1986) as exhibiting patterns of tonal case. The forms in the table are for words meaning 'hippopotamus'. Those in the "augment" column are the common noun forms for the word, and those in the "no augment" column are proper noun forms (e.g., used to refer to a character called Hippopotamus in a story).

As can be seen in Table 8, nouns in Umbundu can appear in two case forms, labeled A and B. There are two classes of nouns with respect to the patterning of the case categories. Those appearing with a so-called "augment" prefix and those not appearing with an augment.[16] Each class of nouns shows two case forms. However, the forms with the augment show the same tones in the Predicative and Object cases and a distinct form in the Common case. (These case terms will be discussed further below.) The forms without the augment, by contrast, exhibit syncretism in the Predicative and Object case and a distinct form in the Common case. Thus, there is evidence for three cases even though individual nouns only ever show two distinctions.

[16]The details of the form and function of augment morphemes can be somewhat complicated. See Katamba (2003: 107–108) for overview discussion and de Blois (1970) for a detailed survey. For present purposes, we can treat nouns with and without the augment in a way comparable to the declension classes associated with segmental case systems.

Table 9 Umbundu tonal classes (Schadeberg 1986: 431)

A	B	GLOSS
éyó	*èyo*	'5.tooth'
óvayò	*òvayo*	'6.tooth'
óndukò	*ònduko*	'9.name'
ócipetà	*òcipeta*	'7.bark'
ónjó	*ònjó*	'3.house'
ókulyá	*òkulyá*	'15.eat'
úlúme	*ùlúme*	'1.man'
ócitúngo	*òcitúngo*	'7.sauce'
óciwávì	*òciwávì*	'7.spider'
ókutòlà	*òkutólà*	'15.tear'

The precise tone patterns found on nouns associated with each case differ depending on the noun. Some example patterns are presented in Table 9, where a number of nouns are given along with an indication of their noun class. A general pattern is that the A forms begin with a high tone and the B forms with a low tone.[17]

Case marking via tone appears to be relatively uncommon in languages of the world. The survey of Dryer (2013) revealed only five languages, out of a sample of over a thousand, showing tonal case, all of them in Africa. Within Bantu, tonal case is described for at least several Western Bantu languages (Kavari et al. 2012: 316). What is of interest here are the number of distinctions found in such systems and the categories that these cases encode. While segmentally encoded case systems are described as having as many as twenty cases (see Iggesen 2013), attested tonal case systems appear to make use of only a relatively small number of distinctions, where "the total number of cases distinguished is limited to maximally three", with the only known exception in the study of König (2008: 224) being the Nilotic language Turkana. In addition, languages with tonal case are all of the "marked nominative" type, where the forms associated with "subjects" have a more restricted distribution than forms associated with "objects" (König 2008: 224). For instance, citation forms may be the same as object forms rather than the "nominative" subject forms.

A variant of this case marking pattern can be seen in the Umbundu examples given in (15), (16), (17), and (18). The citation forms of two nouns are given in (15). One of the nouns is coded with the augment and the other is not, but, in both cases, they begin with a high tone, indicating that they are in Schadeberg's (1986) Predicative case. This is the same form found for nominal predicates, seen in (16).

(15) a. *ónjíla*
'AUG.bird.A'

[17] In the transcription system used for Umbundu for the data presented here, a vowel without a tone mark has the same tone as that found in the preceding syllable. Further details on the interpretation of the tone transcription can be found in Schadeberg (1986: 427–428).

b. *Kándímba*
'Hare.A' (Schadeberg 1986: 432)

(16) a. *ómokó*
AUG.9.knife.A
"It is a knife."
b. *òngólo ócinamà*
AUG.9.zebra.B AUG.7.animal.A
"A zebra is an animal."
c. *Sómá*
1.chief.A
"It's the chief." (Schadeberg 1986: 432)

By contrast, subject nouns in Umbundu are associated with an initial low tone, as seen in the data in (17). That is, subject noun forms are distinct from citation forms. (The subject noun in (17b) has two noun class prefixes, and the outer one codes locative semantics.) Umbundu shows a complication to a standard marked nominative pattern in that only objects with an augment prefix show the same tonal pattern as citation forms. This is seen in (18) where, in (18a), the object can be seen with an initial high tone, which is characteristic of citation contexts. In (18b), by contrast, the noun without the augment shows an initial low tone, otherwise associated with subject forms as seen in (17). It is this split in the tone patterns of objects that leads Schadeberg (1986) to propose the three-way case distinction for Umbundu presented in Table 8 (though see König (2008: 210–211) for further discussion).

(17) a. *òlusapo lwápwá*
AUG.11.story.B 11.TAM.finish.FV
"The story is finished."
b. *vòmbénje múĩi óvávo*
18.9.calabash.B 18.TAM.be AUG.6.water.A
"In the calabash is water." (Schadeberg 1986: 434)

(18) a. *ndàlandá ómbísi*
1s.TAM.buy.FV AUG.9.fish.A
"I bought a fish."
b. *ndàsangá Sòma*
1s.TAM.meet.FV 1.chief.B
"I met the Chief." (Schadeberg 1986: 434)

What is interesting about tonal case patterns in the present context is that there appear to be implicational relationships between this specific means of expressing

case and logically independent grammatical properties, such as whether the case system will be relatively small or show a marked nominative pattern. At least for Umbundu, key reasons for the attested patterns appear to be historical in nature. Its tonal case system most likely arose from a system originally based around definiteness marking that developed into a case system (see Schadeberg 1986: 444–445; König 2008: 211–218; Blanchon 1998). Such a grammaticalization scenario would not be expected to yield a large case system since definiteness, and related notions such as referentiality, are not associated with the same degree of semantic oppositions as, for instance, spatial relations, which are found to be grammatically encoded via segmental case. The connection between tonal case and the marked nominative pattern can also be understood as an expected development for a case system grammaticalizing from a definiteness marking system. Subjects tend to be definite and topical while objects tend to be indefinite and in focus. The fact that citation forms would pattern with objects in such a system is not especially surprising given that the function of naming a noun would place it into focus as well.

I am not aware of any systematic study of systematic correspondence between certain kinds of form (e.g., here tonal morphology) and certain kinds of function (e.g., here, marked nominative case systems with limited case oppositions). However, other examples can presumably be found. Perhaps the most well-known general example is the apparent link between reduction of form and the development of "grammatical" meanings (see, e.g., Hopper and Traugott 2003: 100–101). These kinds of form-meaning patterns raise an interesting issue for Construction Morphology: To what extent should they be treated as historical accidents falling outside the scope of synchronic models and to what extent should apparently systematic relations between form and function be treated as significant properties of synchronic grammars? In addition, how should they be formally modeled?

Patterns like these pose a general problem for formal models of grammar, not just Construction Morphology. However, Construction Morphology is especially well suited to deal with them due to its ability to effectively blend the description of idiosyncratic patterns with more general ones. In this case, the general issue is how to describe constraints on form-meaning pairings in broad terms, and the more idiosyncratic issue is the apparent link between tonal case marking and particular kinds of case systems.

6 Conclusion

The bulk of this paper has focused on issues in the modeling of signifiers within Construction Morphology that do not yet seem to have received much attention within the framework. None of the concerns raised here are intended to be arguments against constructional approaches. Rather, by returning to a view of grammar centered around the device of the sign, constructional approaches revealed the existence of a number of analytical problems that have been obscured in other kinds of approaches. In particular, sign-based approaches bring to the forefront the extent

to which high-level grammatical patterns depend on the shapes that signifiers can take on and the ways in which those signifier shapes interact with each other.

Despite this paper's emphasis on non-canonical signifiers, the arguments here are also not intended to be taken to mean that the shapes of signifiers are simply unconstrained. In fact, certain logically constructible patterns do not appear to occur such as the "syntactic" CV-skeleton pattern presented in (14). Rather, the claim is that observed deviations from linear signifiers are sufficiently varied that a systematic exploration of signifier typology appears to be called for. In other words, this does not appear to be a case where there is a broadly coherent system of signifier formation that is subject to the occasional "leak", to borrow the well-known metaphor of Sapir (1921: 39). Instead, there appear to be important generalizations yet to be discovered, such as the ways in which tonal signifiers may systematically differ in their behavior from segmental ones or the categories of morphological elements that can form discontinuous signifiers.

Fortunately, the basic tools are in place to model the patterns described here within Construction Morphology. Schema relations, for instance, provide the foundation for modeling templatic patterns. Moreover, nothing within the architecture of Construction Morphology requires that signifiers must have a linear shape, even if much work within it has focused on morphological patterns where this largely holds true. Gurevich (2006), for example, demonstrates that the framework is flexible enough to accommodate highly complex inflectional morphological patterns. This does not relieve us of the problem of developing a proper kind of "signifier theory", but it does suggest that constructional approaches provide an appropriate means for modeling any such theory.

In this respect, it is worth concluding by specifically contrasting sign-based approaches with what one might call "string-based" approaches. It is often the case that the object typically used to represent a linguistic form, the string, becomes improperly conflated with the form itself (see, e.g., McCawley 1998: 2–3 for relevant discussion). This conflation of "linguistic form" with "string" seems to be a particularly prominent feature of generative approaches to syntax, going back to Chomsky (1957: 26–30). The idea, for instance, that a representation such as /kæt/ is sufficient to represent the form of a word like *cat*, leads to an assumption that the models of morphology and syntax centered around a simple operation of concatenation are more or less sufficient for morphosyntactic analysis. However, even for a relatively simple word like *cat*, there is quite a bit more to its form than a mere sequence of sounds: It has syllabic structure, metrical structure, two boundaries, etc. Moreover, as made clear above, there are many more complexities that can be associated with signifiers (see also Rhodes 1992: 420).

Ultimately, an emphasis on string-based representations leads to an oversimplified view of signifiers and an overreliance on concatenation as the primary device for morphosyntactic combination. This, in turn, simultaneously obscures the complexities of the form-meaning pairings found in grammars and leads to

a proliferation of formal devices (e.g., movement operations) to address data that fails to adhere to canonical linear patterns. In contrast, by focusing attention on the detailed properties of signs themselves, constructional approaches provide the tools to describe non-linear patterns in ways that allow for both their generalities and specificities to be clearly represented, which can help us come to a more precise understanding of the full range grammatical patterns of the world's languages.

Glossing Abbreviations

1–18 (not followed by s/p)	noun class (Bantu)
1, 2, 3 (followed by s/p)	first, second, third person (singular/plural)
CAUS	causative
A	agent (Mohawk) "A" nominal case (Umbundu)
AUG	augment
B	"B" nominal case
DU	dual
DUALIC	dualic
DUR	durative
F	feminine
FV	final vowel
INCH	inchoative
INCL	inclusive
ITER	iterative
M	masculine
NEG	negative
OBJ	object
OPT	optative
PFV	perfective
PFX	prefix
PL	plural
PRS	present
PRT	particle
PST	past
REFL	reflexive
RPT	repetitive
SBJ	subject
SG	singular
TAM	tense-aspect-mood marker

References

Akinlabi, Akinbiyi. 2011. Featural affixes. In *The Blackwell companion to phonology*, vol. II, ed. Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume, and Keren Rice, 1945–1971. Chichester, West Sussex: Wiley-Blackwell.

Anceaux, J. C. 1965. *The Nimboran language: Phonology and morphology*. 's-Gravenhage: M. Nijhoff.

Aronoff, Mark. 1992. Segmentalism in linguistics: The alphabetic basis of phonological theory. In *The linguistics of literacy*, ed. Pamela Downing, Susan D. Lima, and Michael Noonan, 71–82. Amsterdam: Benjamins.

Aronoff, Mark. 1994. *Morphology by itself: Stems and inflectional classes*. Cambridge, MA: MIT Press.

Baerman, Matthew. 2010. Introduction: Defectiveness: Typology and diachrony. In *Defective paradigms: Missing forms and what they tell us*, 1–18. Oxford: Oxford University Press.

Baker, Mark C. 1990. Pronominal inflection and the morphology-syntax interface. In *Papers from the 26th regional meeting of the Chicago Linguistic Society: Volume 1: The main session*, ed. Michael Ziolkowski, Manuela Noske, and Karen Deaton, 25–48. Chicago: Chicago Linguistic Society.

Bearth, Thomas. 1971. *L'énoncé toura (Côte d'Ivoire)*. Norman, OK: Summer Institute of Linguistics.

Blanchon, Jean Alain. 1998. Semantic/pragmatic conditions on the tonology of the Kongo noun-phrase: A diachronic hypothesis. In *Theoretical aspects of Bantu tone*, ed. Larry M. Hyman and Charles Kisseberth, 1–32. Stanford: CSLI.

de Blois, Kees F. 1970. The augment in the Bantu languages. *Africana Linguistica* 4: 85–165.

Booij, Geert. 2010. *Construction morphology*. Oxford: Oxford University Press.

Booij, Geert. 2016. *Construction morphology*, Oxford research encyclopedia of linguistics. http://linguistics.oxfordre.com/.

Booij, Geert, and Jenny Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41(S2): 277–302.

Bresnan, Joan. 2001. *Lexical-functional syntax*. Oxford: Blackwell.

Broadbent, Sylvia M. 1964. *The Southern Sierra Miwok language*. Berkeley: UC Press.

Brown, Dunstan, and Marina Chumakina. 2012. What there might be and what there is: An introduction to Canonical Typology. In *Canonical morphology and syntax*, ed. Dunstan Brown, Marina Chumakina, and Greville G. Corbett, 1–19. Oxford: Oxford University Press.

Browning, Marguerite. 1987. *Null operator constructions*. Ph.D. dissertation. Cambridge, MA: MIT.

Bye, Patrik, and Peter Svenonius. 2012. Non-concatenative morphology as epiphenomenon. In *The morphology and phonology of exponence*, ed. Jochen Trommer, 427–495. Oxford: Oxford University Press.

Caballero, Gabriela, and Alice C. Harris. 2012. A working typology of multiple exponence. In *Current issues in morphological theory: (Ir)regularity, analogy, and frequency*, ed. Ferenc Kiefer, Mária Ladányi, and Péter Siptár, 163–188. Amsterdam: Benjamins.

Caballero, Gabriela, and Sharon Inkelas. this volume. A construction-based approach to multiple exponence.

Chomsky, Noam. 1957. *Syntactic structures*. 's-Gravenhage: Mouton.

Cinque, Guglielmo. 2005. Deriving Greenberg's Universal 20 and its exceptions. *Linguistic Inquiry* 36: 315–332.

Davis, Stuart, and Natsuko Tsujimura. 2014. Non-concatenative derivation: Other processes. In *The Oxford handbook of derivational morphology*, ed. Rochelle Lieber and Pavol Štekauer, 190–218. Oxford: Oxford University Press.

Davis, Stuart, and Natsuko Tsujimura. this volume. Arabic nonconcatenative morphology in construction morphology.

Downing, Laura J., and Barbara Stiebels. 2012. Iconicity. In *The morphology and phonology of exponence*, ed. Jochen Trommer, 379–426. Oxford: Oxford University Press.
Dryer, Matthew S. 2006. Descriptive theories, explanatory theories, and basic linguistic theory. In *Catching language: The standing challenge of grammar writing*, ed. Felix Ameka, Alan Dench, and Nicholas Evans, 207–234. Berlin: Mouton de Gruyter.
Dryer, Matthew S. 2013. Position of case affixes. In *The World Atlas of Language Structures online*, ed. Matthew S. Dryer and Martin Haspelmath. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/chapter/51.
Efere, Emmanuel Efereala. 2001. The pitch system of the Bumo dialect of Izon. In *Current research on African languages and linguistics* (University of British Columbia Working Papers in Linguistics 4), ed. Suzanne Gessner, Sunyoung Oh, and Kayono Shiobara, 115–259. Vancouver: University of British Columbia Department of Linguistics.
Ellington, John. 1977. *Aspects of the Tiene language*. Ph.D. dissertation. Madison, WI: University of Wisconsin.
Fortune, Reo. 1942. *Arapesh*. New York: J.J. Augustin.
Freeland, L. S. 1951. *Language of the Sierra Miwok*. Baltimore: Waverly.
Goldsmith, John A. 1976. An overview of autosegmental phonology. *Linguistic Analysis* 2: 23–68.
Goldsmith, John A. 1990. *Autosegmental and metrical phonology*. Oxford: Basil Blackwell.
Good, Jeff. 2016. *The linguistic typology of templates*. Cambridge: Cambridge University Press.
Good, Jeff, and Jesse Lovegren. 2017. Remarks on the nasal classes in Mungbam and Naki. In *Mechthildian approaches to Afrikanistik: Advances in language based research on Africa—Festschrift für Mechthild Reh*, ed. Raija Kramer and Roland Kießling, 83–99. Köln: Rüdiger Köppe.
Gurevich, Olga I. 2006. *Constructional Morphology: The Georgian version*. Ph.D. dissertation. Berkeley: UC Berkeley.
Gussenhoven, Carlos. 2004. *The phonology of tone and intonation*. Cambridge: Cambridge University Press.
Haiman, John. 1983. Iconic and economic motivation. *Language* 59: 781–819.
Hall, T. Alan. 1999. The phonological word: A review. In *Studies on the phonological word*, ed. T. Alan Hall and Ursula Kleinhenz, 1–22. Amsterdam: Benjamins.
Harris, Alice C. 2000. Where in the word is the Udi clitic? *Language* 76: 593–616.
Harris, Alice C. 2002. *Endoclitics and the origins of Udi morphosyntax*. Oxford: Oxford University Press.
Harris, Alice C. 2017. *Multiple exponence*. Oxford: Oxford University Press.
Harry, Otelamate, and Larry M. Hyman. 2014. Phrasal construction tonology: The case of Kalabari. *Studies in Language* 38: 649–689.
Hockett, Charles F. 1954. Two models of grammatical description. *Word* 10: 210–234.
Hoffmann, Thomas, and Graeme Trousdale. 2013. Construction grammar: Introduction. In *The Oxford handbook of construction grammar*, ed. Thomas Hoffmann and Graeme Trousdale, 1–12. Oxford: Oxford University Press.
Hombert, Jean-Marie. 1980. Noun classes of the Beboid languages. In *Noun classes in the Grassfields Bantu borderland*, ed. Larry M. Hyman, 83–98. Los Angeles: University of Southern California Department of Linguistics.
Hopper, Paul J., and Elizabeth Closs Traugott. 2003. *Grammaticalization*. Cambridge: Cambridge University Press.
Hyman, Larry M. 1981. *Noni grammatical structure: With special reference to verb morphology*. Los Angeles: University of Southern California Department of Linguistics.
Hyman, Larry M. 2009. The natural history of verb-stem reduplication in Bantu. *Morphology* 19: 177–206.
Hyman, Larry M. 2010. Affixation by place of articulation: The case of Tiene. In *Rara and rarissima: Collecting and interpreting unusual characteristics of human languages*, ed. Jan Wohlgemuth and Michael Cysouw, 145–184. Berlin: De Gruyter Mouton.
Hyman, Larry M. 2011. Tone: Is it different? In *The handbook of phonological theory*, ed. John A. Goldsmith, Jason Riggle, and Alan C. L. Yu, 2nd ed., 197–239. Chichester: Wiley-Blackwell.

Hyman, Larry M. 2013. Issues in the phonology-morphology interface in African languages. In *Selected Proceedings of the 43rd Annual Conference on African Linguistics*, ed. Ọlanikẹ Ọla Orie and Karen W. Sanders, 16–25. Somerville, MA: Cascadilla.

Hyman, Larry M. 2016. Morphological tonal assignments in conflict: Who wins? In *Tone and inflection: New facts and perspectives*, ed. Enrique L. Palancar and Jean Léo Léonard, 15–39. Berlin: De Gruyter Mouton.

Hyman, Larry M., and Sharon Inkelas. 1997. Emergent templates: The unusual case of Tiene. In *University of Maryland Working Papers in Linguistics*, vol. 5, ed. Viola Miglio and Bruce Morén, 92–116. College Park, MD: University of Maryland Department of Linguistics.

Hyman, Larry M., Sharon Inkelas, and Galen Sibanda. 2009. Morphosyntactic correspondence in Bantu reduplication. In *The nature of the word: Essays in honor of Paul Kiparsky*, ed. Kristin Hanson and Sharon Inkelas, 273–309. Cambridge, MA: MIT Press.

Hyman, Larry M., and Florian Lionnet. 2018. Phonology. In *The languages and linguistics of Africa: A comprehensive guide*, ed. Tom Güldemann. Berlin: De Gruyter Mouton.

Idiatov, Dmitry. 2005. The exceptional morphology of Tura numerals and restrictors: Endoclitics, infixes and pseudowords. *Journal of African Languages and Linguistics* 26: 31–78.

Iggesen, Oliver A. 2013. Number of cases. In *The World Atlas of Language Structures online*, ed. Matthew S. Dryer and Martin Haspelmath. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/chapter/49.

Inkelas, Sharon. 1993. Nimboran position class morphology. *Natural Language and Linguistic Theory* 11: 559–624.

Inkelas, Sharon. 2014. *The interplay of morphology and phonology*. Oxford: Oxford University Press.

Inkelas, Sharon, and Cemil Orhan Orgun. 1995. Level ordering and economy in the lexical phonology of Turkish. *Language* 71: 763–793.

Jakobson, Roman, and Linda Waugh. 1979. *The sound shape of language*. Bloomington: Indiana University Press.

Jenks, Peter, and Sharon Rose. 2015. Mobile object markers in Moro: The role of tone. *Language* 91: 269–307.

Katamba, Francis X. 2003. Bantu nominal morphology. In *The Bantu languages*, ed. Derek Nurse and Gérard Philippson, 103–120. London: Routledge.

Kavari, Jekura U., Lutz Marten, and Jenneke van der Wal. 2012. Tone cases in Otjiherero: Head-complement relations, linear order, and information structure. *Africana Linguistica* 18: 315–353.

Kießling, Roland. 2010. Infix genesis and incipient initial consonant mutations in some lesser known Benue-Congo languages. In *Form und Struktur in der Sprache: Festschrift für Elmar Ternes*, ed. Armin R. Bachmann, Christliebe El Mogharbel, and Katja Himstedt, 188–220. Tübingen: Narr.

König, Christa. 2008. *Case in Africa*. Oxford: Oxford University Press.

Lemaréchal, Alian. 1997. *Zéro(s)*. Paris: Presses Universitaires de France.

Mayerthaler, Willi. 1987. System-independent morphological naturalness. In *Leitmotifs in natural morphology*, ed. Wolfgang U. Dressler, Willi Mayerthaler, Oswald Panagl, and Wolfgang Ullrich Wurzel, 25–58. Amsterdam: Benjamins.

McCarthy, John. 1979. *Formal problems in Semitic morphology and phonology*. Ph.D. dissertation. Cambridge, MA: MIT.

McCarthy, John. 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12: 373–418.

McCarthy, John, and Alan S. Prince. 1995. Prosodic morphology. In *The handbook of phonological theory*, ed. John A. Goldsmith, 318–366. Oxford: Blackwell.

McCawley, James D. 1998. *The syntactic phenomena of English*, 2nd ed. Chicago: University of Chicago Press.

Mithun, Marianne. 2000. The reordering or morphemes. In *Reconstructing grammar: Comparative linguistics and grammaticalization*, ed. Spike Gildea, 231–255. Amsterdam: Benjamins.

Müller, Stefan. 2002. *Complex predicates: Verbal complexes, resultative constructions, and particle verbs in German*. Stanford: CSLI.
Nichols, Johanna. 2007. What, if anything, is typology? *Linguistic Typology* 11: 231–238.
Paster, Mary. 2009. Explaining phonological conditions on affixation: Evidence from suppletive allomorphy and affix ordering. *Word Structure* 2: 18–37.
Rhodes, Richard A. 1992. What is a morpheme? A view from construction grammar. In *Proceedings of the Eighteenth Meeting of the Berkeley Linguistics Society: General session and parasession on the place of morphology in a grammar*, ed. Laura Buszard-Welcher, Lionel Wee, and William Weigel, 409–423. Berkeley: Berkeley Linguistics Society.
Sadock, Jerrold M. 2012. *The modular architecture of grammar*. Cambridge: Cambridge University Press.
Sag, Ivan A. 2012. Sign-based construction grammar: An informal synopsis. In *Sign-based construction grammar*, ed. Hans C. Boas and Ivan A. Sag, 69–202. Stanford: CSLI.
Sapir, Edward. 1921. *Language: An introduction to the study of speech*. New York: Harcourt, Brace and Company.
Saussure, Ferdinand de. 1916/1959. *Course in general linguistics* (translated by Wade Baskin). New York: McGraw Hill.
Schadeberg, Thilo C. 1986. Tone cases in Umbundu. *Africana Linguistica* 10: 423–447.
Sibanda, Galen. 2004. *Verbal phonology and morphology of Ndebele*. Ph.D. dissertation. Berkeley: UC Berkeley.
Simpson, Jane, and Meg Withgott. 1986. Pronominal clitic clusters and templates. In *Syntax and semantics 19: The syntax of pronominal clitics*, ed. Hagit Borer, 149–174. New York: Academic.
Smith, Jennifer L. 2011. Category-specific effects. In *The Blackwell companion to phonology: Volume IV: Phonological interfaces*, ed. Marc van Oostendorp, Colin J. Ewan, Elizabeth Hume, and Keren Rice, 2439–2463. Malden, MA: Wiley-Blackwell.
Smith, Norval. 1985. Spreading, reduplication and the default option in Miwok nonconcatenative morphology. In *Advances in non-linear phonology*, ed. Harry van der Hulst and Norval Smith, 363–380. Dordrecht: Foris.
Štekauer, Pavol, Salvador Valera, and Lívia Kortvélyessy. 2012. *Word-formation in the world's languages: A typological survey*. Cambridge: Cambridge University Press.
Stump, Gregory T. 1997. Template morphology and inflectional morphology. In *Yearbook of Morphology 1996*, ed. Geert Booij and Jaap van Marle, 217–241. Dordrecht: Kluwer.
Trommer, Jochen. 2012a. Introduction. In *The morphology and phonology of exponence*, ed. Jochen Trommer, 1–7. Oxford: Oxford University Press.
Trommer, Jochen. 2012b. Ø-exponence. In *The morphology and phonology of exponence*, ed. Jochen Trommer, 326–354. Oxford: Oxford University Press.
Tsujimura, Natsuko, and Stuart Davis. 2011. A construction approach to innovative verbs in Japanese. *Cognitive Linguistics* 22: 799–825.
Tsujimura, Natsuko, and Stuart Davis. this volume. Japanese word formation in Construction Morphology.
Ussishkin, Adam. 2000. *The emergence of fixed prosody*. Ph.D. dissertation. Santa Cruz: UC Santa Cruz.
Voll, Rebecca. 2017. *A grammar of Mundabli [boe], a language of the Lower Fungom region of North-West Cameroon*. Ph.D. dissertation. Leiden: University of Leiden.
Welmers, William E. 1962. The phonology of Kpelle. *Journal of African languages* 1: 69–93.
Yu, Alan C. L. 2007. *A natural history of infixation*. Oxford: Oxford University Press.
Zec, Draga, and Sharon Inkelas. 1990. Prosodically constrained syntax. In *The phonology-syntax connection*, ed. Sharon Inkelas and Draga Zec, 365–378. Stanford: CSLI.
Zimmermann, Eva. 2017. *Morphological length and prosodically defective morphemes*. Oxford: Oxford University Press.

Partial Motivation, Multiple Motivation: The Role of Output Schemas in Morphology

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Abstract Output-oriented, constructional schemas should be used for stating regularities that are not productive. These schemas have a motivational function only. We show that words may be partially motivated even when they lack a base word. Moreover, they can be motivated by more than one schema. This applies to the huge set of Dutch verbs in *-elen*. Verbs in *-eren* appear to exhibit similar properties, as do parallel verbs in German and English, and Dutch words ending in *-ig*. Diachronic facts, in particular the construction of nouns ending in *-er*, support the claim that language users make generalizations in the form of output-oriented schemas.

Keywords Diminutive verb · Motivation · Output schema · Phonaestheme · Productivity · Lexical network

1 Introduction

Morphological patterns, whether productive or unproductive, can be characterized by output schemas. If there is a systematic correspondence between form and meaning in a set of complex words, this systematic correspondence can be expressed by a constructional schema, as proposed in the framework of Construction Morphology (Booij 2010). For instance, the set of deadjectival nouns in German of the form $[\text{A-}heit]_{\text{N}}$, words such as *Schönheit* 'beauty' and *Wahrheit* 'truth' can be characterized by the following constructional schema:

(1) $<[\text{A}_i\text{-}heit]_{\text{Nj}} \leftrightarrow [\text{Property of SEM}_i]_{\text{SEMj}}>$

In this schema, the double arrow specifies correlations between the (phonological and morpho-syntactic) form and the meaning (SEM) of deadjectival nouns suffixed with *-heit*. The angled brackets demarcate the schema. Co-indexation specifies correlations between parts of the form and parts of the meaning. This constructional

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schema has two functions: on the one hand it specifies the predictable, systematic properties of existing, lexically stored nouns of this type. Thus, it indicates that the properties of these words are not completely arbitrary, but motivated. On the other hand, this schema specifies how new words of this type can be coined.

This approach to morphology is word-based rather than morpheme-based. The word is the basic unit of morphological analysis, and a complex word is not characterized as a concatenation of morphemes. Instead, morphemes are recurring pieces of words that can be identified on the basis of formal and semantic correspondences between sets of words. They are not always elements with a recurrent stable meaning (Aronoff 2013).

A classic argument for word-based morphology is that languages have lots of words that are formally complex, but lack a base word. For instance, as pointed out in Booij (1977: 29–33). Dutch has many prefixed verbs with a root that does not function as a word by itself, for instance verbs with the prefix *ont-*:

(2) ont-beer ‘to lack’
ont-gin ‘to exploit’

These verbs have to represented as complex because they behave as prefixed verbs morphologically. This can be seen in the way they form participles: Dutch past participles take the prefix *ge-*, unless the stem begins with an unstressed prefix. The past participles of the two verbs in (2) are *ont-beer-d* and *ont-gonn-en*, respectively, hence, they do behave as prefixed verbs. The root, *gin* of *ontginnen* which in itself is meaningless, shares properties with the equally meaningless element *gin* in the verb *beginnen* ‘to begin’: the past tense form and participle form of both verbs exhibit the same ablaut pattern*: ontgin – ontgon – ontgonnen, begin – begon – begonnen*. Hence, we want to say that the element *gin* is a formal component, in fact the same formal component, in both words.

The consequence of this observation is that although such verbs cannot be computed by means of concatenation of morphemes, they have to be stored as complex verbs in the lexicon.

In the Germanic languages we find lots of complex words, both prefixed and suffixed, for which there is no corresponding base word. In many cases this means that the base word has been lost, whereas the corresponding derived word has been preserved. This holds, for instance, for the following Dutch adjectives ending in the suffix *-loos*:

(3) arge-loos ‘guileless’
roeke-loos ‘reckless’
weer-loos ‘defenseless’

In these words, the part *-loos* still contributes the meaning component ‘without’ which is also found for adjectives in *-loos* that do have a lexical base, such as *adem-loos* ‘breath-less’.

Other examples of such root-based morphology are found in geographical names. In English, for example, many toponyms end in a 'town suffix' like *-ton, -ford* or *-by* (as in *Hamilton, Hereford, Grimsby*), while the root is not in itself a word. Still, these endings make a word recognizable as a geographical name.

The phenomenon that individual complex words of a certain morphological type lack a corresponding base word is also found in the non-native stratum of the Dutch lexicon. Consider for instance the following nouns in *-ist*:

(4) social-ist 'socialist'
Stalin-ist 'Stalinist'
aut-ist 'autist'

These three nouns all denote a person with certain properties. The word *aut-ist*, however, has no base word, the root *aut-* is borrowed from Greek as part of the process of borrowing Greek words with that root. The regularity that all nouns in *-ist* denote persons can be expressed by the following schema:

(5) $<[\text{x -ist}]_{\text{Nj}} \leftrightarrow [\text{Person with Property X}]_{\text{SEMj}}>$

These examples illustrate that there are lots of morphemes that do not have a meaning by themselves. Thus, they challenge the classical definition of the morpheme as the minimal meaning-bearing unit, and show the necessity of word-based instead of morpheme-based morphology (Booij 2010; Gundersen 2001). The meaning of complex words can better be defined over the entire word than over their individual morphemes.

In this paper we will focus on the analysis of certain types of root-based morphology. We will argue that constructional schemas should be used for stating regularities that are not productive. That is, some schemas may have a motivational function only. One of the cases we discuss is that of Dutch verbs ending in *-el*. Many of these verbs do not have a base that corresponds to an existing word. They have the form [root + *el*]. These verbs are semantically similar: they express an attenuative meaning (reduced intensity, i.e. diminutive, and often also iterative) that is linked to the appearance of the ending *-el* (phonological form /əl/). Some examples of such root-based verbs are the following, listed here in their infinitival form (stem + *-en*), which is the quotation form:

(6) brabbelen 'to babble'
buitelen 'to tumble'
drentelen 'to stroll'
friemelen 'to fiddle (with)'
giechelen 'to giggle'

The meaning of these verbs is PARTIALLY MOTIVATED: even though the roots have no meaning by themselves, the presence of the suffix *-el* indicates that these verbs can receive an attenuative interpretation. This motivation cannot be expressed in terms of a classic word-based word formation rule of the type proposed in Aronoff (1976). First, the base is not a lexical item that can be used in word formation.

Secondly, the pattern is not or only marginally productive, and hence, one cannot assume a rule, as such a rule would incorrectly generate new words of this type. Output schemas provide the right formalism to express such regularities: they capture the systematic form-meaning correspondence found in sets of established words, without automatically implying that the set can be extended. The output schema for verbs ending in *-el* with an attenuative and iterative interpretation has the following form:

(7) $<[\text{x -el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i>$

In Sect. 2 we discuss the set of Dutch verbs in *-elen* in more detail. We show that such words are partially motivated even when they lack a base word. Moreover, we argue that they can be motivated by more than one schema. Verbs in *-eren* appear to exhibit similar properties (Sect. 3), as do parallel verbs in German and English (Sect. 4). In Sect. 5 we extend the analysis to words ending in *-ig*. Diachronic facts, in particular the construction of nouns ending in *-er*, support our claim that language users make generalizations in the form of output-oriented schemas (Sect. 6). Our theoretical conclusions concerning the importance of output schemas are summarized in Sect. 7.

2 The Motivation of Dutch Verbs in *-elen*

The *Van Dale dictionary of present-day Dutch* lists almost 300 simplex verbs ending in *-elen*. In addition, there is a substantial number of such verbs prefixed with *be-* or *ver-* such as *betuttelen* 'to patronize' or *vertroetelen* 'to pamper'.[1] The *Woordenboek der Nederlandsche Taal*, a historical dictionary of Dutch, also lists a huge number of verbs ending in *-elen*, many obsolete by now, or from dialects, and many occurring in combination with a prefix or a particle. The largest collection, however, is De Jager (1875), a two-volume dictionary of "frequentatives", i.e. verbs in *-elen* and *-eren* (for *-eren*, see Sect. 3 below).

According to *Schönfelds Historische Grammatica van het Nederlands* (Van Loey 1964: 237–238) the historical source of these verbs are nouns ending in the suffix *-el*, which were converted into verbs. This nominal suffix often contributed a diminutive meaning, as in *kruimel* 'small crumb' derived from *kruim* 'crumb'. After conversion, the verb *kruimelen* 'to crumble' retained the diminutive semantics. Once formed, however, verbs in *-elen* could be reinterpreted as being derived from verbs rather than nouns. For instance, given the pair of verbs *druppen* 'to drip' and *druppelen* 'to drip, to trickle', converted from the nouns *drup* 'drop' and *druppel* 'droplet' respectively, the verb *druppelen* could be reinterpreted as being derived from the

[1] As mentioned above, the infinitival form of Dutch verbs is the citation form, and hence, we will often present these verbs in this form. The verbal stem, without the infinitive suffix, ends in *-el*.

verb *druppen* directly. Thus, *-el* was reinterpreted as a deverbal suffix, and hence a verb like *trappelen* 'to stamp' could be derived directly from the verb *trappen* 'to kick' (there is no noun **trappel* that could have served as a nominal base).

According to Van Loey (1964), the verbal suffix *-el* acquired an iterative meaning, because this was a semantic characteristic of many of these verbs, whatever their derivational origin. This iterative suffix then also came to be used for the formation of new verbs of an onomatopoeic nature such as *rammelen* 'to rumble'. This led to the emergence of a set of verbs in *-elen* that lack a lexical root.

A second source of root-based verbs in *-elen* is that for a number of verbs, their base words disappeared from the vocabulary of Dutch. For instance, the verb *wankelen* 'to wobble' was derived from the simplex verb *wanken* 'to waver, to sway', but subsequently *wanken* disappeared (it still exists in the neighbouring language German). Hence, in present-day Dutch, *wankelen* is a root-based verb.

From a synchronic point of view there are three classes of verbs in *-elen*:

(I) Verbs derived from a nominal or verbal base word by means of *-el*: *kant* 'side'- *kantelen* 'to topple over', *nest* 'nest' – *nestelen* 'to nest', *mengen* 'to mix'- *mengelen* 'to mix slightly', *rijmen* 'to rhyme'- *rijmelen* 'to write bad verse';
(II) Root-based verbs in *-elen*; these verbs are root-based either due to the loss of the base word (*wankelen* 'to wobble'), or due to onomatopoetic formation (*foezelen* 'to tamper with', *rammelen* 'to rattle').
(III) Verbs derived by means of conversion from a noun or adjective ending in *-el*: *borstel* 'brush'-*borstelen* 'to brush', *druppel* 'drop'- *druppelen* 'to drop', *eikel* 'acorn'- *eikelen* 'to mess around', *spiegel* 'mirror' – *spiegelen* 'to reflect', *dartel* 'playful'– *dartelen* 'to frolic about'. The sequence *el* is either part of the root (as in *spiegel*), or a suffix (as in *drupp-el*).

The same three types of verbs, with stems in *-el* and infinitive forms in *-el-n*, occur in German (and, indeed, in a similar form in English; see Sect. 4 below).

2.1 Type I and Type II Verbs

Weidhaas and Schmid (2015) present an analysis of German diminutive verbs and argue that their core meaning, in particular in cases that correspond to our type I and type II verbs, may be specified as 'attenuation'. This implies meanings such as diminutive, i.e. less intensive, and iterative. The authors point out that there is a semantic connection between attenuation and iterativity: "rather than encoding a global and conclusive type of action, an ongoing, durative activity is conceptualized as consisting of smaller events that occur successively but have less force and intensity than the action proper" (Weidhaas and Schmid 2015: 201). This semantic characterization is also appropriate for many Dutch verbs in *-elen*, for instance:

(8) *Type I, with word as base (word-based)*

	base = *V*
duikelen ‘to tumble’	duik ‘to dive’
krabbelen ‘to scratch lightly’	krab ‘to scratch’
rijmelen ‘to write weak verse’	rijm ‘to rhyme’
hinkelen ‘to hop repeatedly’	hink ‘to limp’
huppelen ‘to hop repeatedly’	hup ‘to hop’
	base = *N*
brokkelen ‘to crumble’	brok ‘piece’
neuzelen ‘to twang’	neus ‘nose’

Type II without word as base (root-based)

babbelen ‘to chat’
biggelen ‘to trickle’
brabbelen ‘to babble’
drentelen ‘to saunter, to stroll’
dribbelen ‘to dribble’
dwarrelen ‘to swirl’
frommelen ‘to crumple’
gniffelen ‘to snigger’
grabbelen ‘to scramble’
kakelen ‘to cackle’
knuffelen ‘to cuddle’
kwebbelen ‘to chatter’
murmelen ‘to gurgle’
peddelen ‘to paddle’
ritselen ‘to rustle’
sabbelen ‘to suck’
sprenkelen ‘to sprinkle’
trippelen ‘to trip’
wiebelen ‘to wobble’
zwatelen ‘to buzz’

While verbs in *-elen* express attenuation and iterativity, that is, repeated events (they are also referred to as frequentative verbs, e.g. in De Jager’s 1875 dictionary), it is obvious that the meaning of the type II verbs is only partially motivated, due to the lack of a base word. In this respect they differ from type I verbs. Yet, we want to express the fact that both classes of verbs denote a particular type of event. We can account for this partial motivation by schema (7), repeated with extensions in (9). The variable *x* stands for a sequence of phonemes, and *-el* is the suffix. The semantic property specified in the right-hand part of schema (7) is a property of the morphological construction as a whole: the constituent *-el* in itself does not carry that meaning, it only does so in words of the word class Verb.

This general schema dominates three subschemas: *x* can be a Root (in Type II verbs), a V, or an N (in Type I verbs). It is only when the part *x* corresponds to a word that a (sub)schema has the potential to be used for coining a new verb.

(9) $<[x\text{ -el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i >$

$<[\text{root-el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > <[\text{N-el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > <[\text{V-el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i >$

The existence of root-based words with a recurring, systematic meaning component is a strong argument in favour of morphological approaches which make use of output-oriented schemas, and argues against a conception of morphology as the 'syntax of morphemes'. The roots are non-recurring residues after identification of *-el*, and they cannot be considered morphemes in the sense of minimal meaning-bearing units. This type of words reminds us of words with phonaesthemes. For instance, the ending *-owl* in English words may be associated with the meaning 'sinister', as in *owl, prowl, scowl, growl, howl* (Bolinger 1950: 123); however, the residue has no morphemic status. Kwon and Round (2015) discuss the status of phonaesthemes in linguistic theory, and come to the following conclusion: "any viable theory must find a place for lexical stems which are composed of a recurring, sound-meaning pairing plus a non-recurrent residue" (Kwon and Round 2015: 24).

The type of schemas we use here, within the framework of Construction Morphology, can be used for the description of phonaesthemes as well: the schema specifies the phonaestheme, and the variable *x* stands for the non-recurring residue. In short, output schemas for classes of words are also suitable for the description of phonaesthemic patterns. The difference between the verbs ending in *-el* and words with phonaesthemes is that *-el* is a recurrent constituent that also functions as a suffix in words that do have a recognizable base word, the type I verbs. Hence, recognition of the relevant pattern might be easier for verbs ending in *-elen*. The first subschema in (9) substantiates the claim that we may find a systematic form-meaning correspondence in a set of complex words without a base word.[2]

The semantic properties of type I and type II verbs are discussed in detail by Weidhaas and Schmid (2015) for the corresponding German verbs. They argue for the description of these semantics in terms of a semantic network a la Jurafsky (1996), which accounts for systematic polysemy patterns.

The individual verbs may have one or more than one related meanings as specified in this network. Weidhaas and Schmid (2015) point out that German verbs

[2]This does not mean that we can never form new verbs of this type. An example is the formation of the Dutch verb *ibbelen* 'move your fingers through hair of a dog' (Google search, August 4, 2016). This verb does not occur in dictionaries, and is apparently coined by some dog-lover, who has to explain its meaning on the internet site *Hondenforum*, a site for other dog-lovers.

in *-eln* do not always have the full range of specified meanings. This also applies to Dutch. For instance, the following Dutch verbs do not have the attenuative meaning, but do have an iterative meaning:

(10) wentelen ‘to rotate’, wisselen ‘to change’

The following verbs have neither an attenuative or an iterative meaning:

(11) sneuvelen ‘to fall in battle’, spijbelen ‘to skip school’

In other words, verbs in *-elen* may differ in the degree to which they are motivated by schema (9).

This is accommodated by the model, as in CxM both abstract schemas and individual complex words are stored in the lexicon. Properties of an individual complex word that follow from a schema to which this word can be related count as redundant, or motivated. In this view, there is no opposition between a schema-based and an exemplar-based approach to the analysis of complex words, unlike what Weidhaas and Schmid (2015) suggest. They discuss a schema-based approach without the individual words being linked to schemas, and reject it in favour of an exemplar-based approach because individual words may differ from what the schemas predict. However, we feel this is a false opposition, as both individual complex words and the schemas that provide potential motivation for these words can be assumed to be stored in the lexicon.

2.2 Type III Verbs

Verbs in *-elen* can also be created by conversion of nouns ending in *-el* into verbs (Type III verbs). As noted above, this was – historically speaking – the primary source for *-el* verbs. Conversion of N to V is a productive process in Dutch. Here is a list of examples:

(12) conversion of [x *-el*]$_N$ into verbs with iterative meaning

noun	*verb*
borrel ‘drink’	borrelen ‘to have a drink’
borstel ‘brush’	borstelen ‘to brush’
buffel’ ‘buffalo’	buffelen ‘to beaver away’
cirkel ‘circle’	cirkelen ‘to circle’
hagel ‘hail’	hagelen ‘to hail’
lepel ‘spoon’	lepelen ‘to spoon’
pekel ‘salt’	pekelen ‘to put down salt’
ratel ‘rattle’	ratelen ‘to rattle’
schommel ‘swing’	schommelen ‘to swing’
sleutel ‘key’	sleutelen ‘to fiddle’
stempel ‘stamp’	stempelen ‘to stamp’
trommel ‘drum’	trommelen ‘to beat the drum’
winkel ‘shop’	winkelen ‘to shop’

These verbs do not have an attenuative meaning, but most of them have an iterative meaning. This iterative meaning does not follow from the conversion process as such, as there are lots of denominal conversion verbs in Dutch without such a meaning. These verbs denote an action in which the entity denoted by the corresponding noun is involved. For instance, the verb *fietsen* 'to cycle' corresponds with the noun *fiets* 'bicycle', and denotes the action of cycling. There is no specific meaning component of iterativity involved. In other words, it is a specific subclass of conversion verbs, those derived from nouns ending in *-el,* that appear to carry this iterative meaning. This generalization can be expressed by linking these verbs to the schema for type I and type II verbs, which often have an iterative meaning. This is expressed in schema (7), repeated here for convenience.

(7) $<[\text{x -el}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i >$

Verbs can carry both meanings at the same time. Hence the slash means 'and/or'. This implies that the schema represents two subschemas, one for each meaning. The type III verbs that express an iterative meaning can now be linked to the subschema for 'Iterative Event'.

This linkage implies that a complex word may receive its motivation from more than one schema. In this case, the verbs in (12) are motivated by the schema for denominal conversion (schema 13 below) and the schema for iterative verbs ending in *-el*. This is therefore a case of MULTIPLE MOTIVATION. Such cases are easily accounted for in an architecture that views the lexicon as a multidimensional network of relations between words and morphological schemas of various degrees of abstractness. Let us look again at a specific example. The verbs in (12) all express an action that is normally repeated. For instance, the verb *lepelen* denotes a repeated use of a spoon in order to bring a liquid into a container or food into one's mouth. The verb is an instantiation of N-to-V conversion, and hence derives its motivation partially from the general meaning and structure of this schema. Conversion of N to V is a systematic paradigmatic relationship between nouns and verbs. This paradigmatic relation is specified by co-indexation of components of two different schemas, as specified in (13):

(13) $<[x_i]_N \leftrightarrow SEM_i >$
$<[x_i]_V \leftrightarrow [\text{Perform Action with } SEM_i \text{ being involved}]_{SEMj} >$

In Construction Morphology, we therefore assume that the lexical representation of the verb *lepelen* is linked to schema (13). At the same time, the verb *lepelen* can also be linked to schema (7), and be interpreted as an instantiation of that schema, since the phonological form of the stem of *lepelen* can be decomposed into /x-el/ and the word as a whole carries the word class label V. This illustrates that a word may be motivated by more than one morphological schema.

Interestingly, this does not exhaust the motivational connections of *lepelen*. The noun *lepel* itself contains an old proto-Germanic instrumental suffix *-el*, and there are a number of other instrument nouns in Dutch with this suffix, such as *beit-el*

'chisel', *schomm-el* 'swing', *stemp-el* 'stamp', *sleut-el* 'key' and *tromm-el* 'drum'. Thus, the verb *lepelen* receives a third, indirect motivation through the following schema:

(14) $<[\text{x -el}]_{\text{Ni}} \leftrightarrow [\text{Instrument}]_{\text{SEMi}}>$

A similar situation arises with verbs whose nominal base is not an instrument noun, but a diminutive. Such nouns are formed with a variant of the nominal *-el* suffix in (14), which, however, has a diminutive meaning (schema 14′):

(14)′ $<[\text{x -el}]_{\text{Ni}} \leftrightarrow [\text{Small Entity}]_{\text{SEMi}}>$

Instantiations of this schema are, for example, the nouns *kruim-el* 'crumb' and *eik-el* 'acorn'. If converted, the resulting verbs have links to both the nominal and the verbal diminutive schema, as well as to the conversion schema. Multiple motivation of this type can lead to structural ambiguities, as will be discussed below.

Note again that motivation does not necessarily encompass all formal and semantic aspects of the verb. For example, the verb *cirkelen* 'to move in a circle, to circle around' is derived by conversion from the noun *cirkel* 'circle'. The meaning of this verb is partially motivated by the meaning of the noun. Also, *cirkelen* is formally and semantically motivated by the N > V conversion schema specified in (13). At the same time, it has an iterative meaning and can thereby be related semantically to the [*x -el*] verbs schematized in (7). However, the noun *cirkel* cannot be linked to schema (14) as it does not denote an instrument; nor is it a diminutive noun. Hence, we see multiple motivation and partial motivation in the same word.

Consider also the verbs *sleutelen*, *stempelen*, and *trommelen*, all denoting activities in which the instrument is denoted by the base noun. Clearly, these verbs denote a repeated action, but not one of less intensity. Hence, it can be linked to subpart 'Iterative Event' of (7) only. Note that the iterativity of these verbs does not stem from a diminutive meaning of the nominal base, which would otherwise be a natural source.[3]

2.3 Structural Ambiguity

Patterns of multiple motivation can lead to variation among language users as to the structural connection among lexical items. The lexicons of individual language users differ, and hence also the range of possible links among complex words and between complex words and schemas. In the case of potential multiple motivation, language users may therefore differ as to which links they perceive between words.

[3]This does not mean that all type III verbs in *-elen* are iterative in nature. For instance, the verb *dieselen* 'to use diesel oil' has no obvious iterative meaning, although its meaning is related straightforwardly to that of the corresponding noun *diesel*.

In fact, words might be linked in ways that result in structural ambiguity. Consider the following set of words presented by De Haas and Trommelen (1993: 345):

(15)	*simplex noun* >	*verb*	*derived noun* >	*verb*	*derived verb*
	drup	drupp-en	drupp-el	drupp-el-en	drupp-el-en
	kreuk	kreuk-en	kreuk-el	kreuk-el-en	kreuk-el-en

As De Haas and Trommelen (1993) point out, the derived verbs may be morphologically related in various ways. The verb *druppelen*, for instance, may be a conversion of the noun *drupp-el* (a diminutive noun of the type discussed as (14′) above), or a derivation by means of verbal *-el* from the verb *drupp-en*. In other words, this verb may be motivated by various constructional schemas, and neither the language user nor the morphologist has to decide which schema has to be selected. Instead of considering this an analytical problem for the morphologist, it is more appropriate to see these verbs as cases of multiple motivation. The verb *druppelen* shares the constituent *drup* with other words, and this constituent can be co-indexed with more than one other word in the lexicon:

(16)[4]	$[drupp_{j,k}\text{-}el]_{Vi}$	$[drup]_j$	Noun
		$[drup]_k$	Verb
		$[drupp_j el]_i$	Noun

Moreover, [*drupp-el*] as a whole can be coindexed both with the verbal diminutive schema in (7) and the nominal diminutive schema in (14′), plus the conversion schema in (13). While these patterns are contradictory in derivational terms, they can easily coexist synchronically in a network of lexical links. This possibility of multiple co-indexation means that the semantic interpretation of the verb *druppelen* is strongly entrenched in the network of semantic relations between words in the lexicon. What we expect is that the more potential links a word has to morphologically related words and schemas, the easier it will be to retrieve the meaning and structure of that word.

A similar example is the verb *prikkelen* ‘to prick, to stimulate’ which may be either related to the noun *prik* ‘prick’, the verb stem *prik* ‘to prick’, or the noun *prikkel* ‘prick, incentive’. Again, all options are available, and there is no need to single out one specific relationship as the correct or the only one.

A different flavour of ambiguity arises with a particularly interesting group of word pairs listed under (17).

[4]The double p is a spelling convention, there is only one /p/.

(17)

klungel-en ‘to bungle’	< >	klungel ‘awkward person’
bikkel-en ‘to be tough’	< >	bikkel ‘tough person’
sukkel-en ‘to ail, to plod’	< >	sukkel ‘wimp, plodder’
stuntel-en ‘to be clumsy’	< >	stuntel ‘clumsy person’
dreutel-en ‘to dawdle’	< >	dreutel ‘dawdler’
griezel-en ‘to be creeped out’	< >	griezel ‘creepy person’

Here, the direction of conversion is indeterminable: the verbs could have been derived along the usual denominal conversion route, but the opposite direction is a true alternative. The relation between *-el* nouns and *-el* verbs is so well-established that it might allow for paradigmatic extensions, especially in clearly recognizable semantic niches (the word pairs (17) all denote persons and their behaviour). Again, we see multiple motivation at work (nominal *-el*, verbal *-el* and conversion), creating a tight network of related words.

Conceptually, the idea of multiple motivation fits in very well with the basic idea of Construction Morphology that morphological schemas are based on systematic relationships between sets of words in the lexicon. Sets of complex words that exhibit a certain systematic form-meaning correspondence give rise to morphological schemas. An individual listed complex word may fit into more than one schema, and hence its properties may be motivated in multiple ways. In other words, multiple motivation is to be expected in this view of the relationship between lexicon and morphology.

2.4 Complex Verbs

The verbs discussed so far are all simplex verbs. In Dutch dictionaries we also find a lot of these verbs with a prefix or a particle, for instance:

(18)

a with particle *af*
af-troggelen ‘to wheedle sth. out of sbd.’
af-wimpelen ‘to get rid of sbd.’

b. with prefix *be-*
be-disselen ‘arrange’
be-duimelen ‘to thumb’
be-potelen ‘to paw, to muddle’

c with prefix *ver-*
ver-haspelen ‘to mangle’
ver-nachelen ‘to cheat, to ruin’
ver-schrompelen ‘to shrivel’

These verbs have no corresponding independently existing base word. They do have the familiar iterative meaning component, and can be linked to schema (7). Moreover, each word is linked to the respective particle or prefix schema that

matches its structure. In the case of the prefixed verbs, these linkages account for the typical behaviour in past participle formation that we saw for the verbs in (2) above: the verbs under (18b, c) form their participles without *ge-*.

In sum, we have seen that there are recurrent meaning components in the large set of verbs in *-elen*. This makes these verbs partially motivated, which can be expressed by a schema that has a purely motivational function. In addition, we saw that the meaning of some of these verbs is also partially motivated by the N > V conversion schema and, in some cases, a schema with nominal *-el*. Thus, these verbs illustrate the idea of multiple motivation. In the next section we will see that Dutch verbs in *-eren* also exhibit both partial and multiple motivation.

3 Verbs in *-eren*

The classification of verbs ending in *-elen* also applies to verbs in *-eren*. From a synchronic point of view there are three types, parallel to the three types of verbs in *-elen* discussed in Sect. 2:

(I) Verbs derived from a base word by means of *-er*: from a verb: *kiepen* 'to tumble'- *kieperen* 'to tumble (attenuative)', *klappen* 'to clap'- *klapperen* 'to flapper', *knippen* 'to cut' – *knipperen* 'to blink, to flash', *redden* 'to save'- *redderen* 'to tidy up', or a noun: *klont* 'lump'- *klonteren* 'to clot', *snot* 'mucus'- *snotteren* 'to snivel', *bad* 'bath'- *badderen* 'to splash around in bath, to go splashy-splashy';

(II) Root-based verbs in *-eren*; these verbs are root-based either due to the loss of the base word (**wappen* – *wapperen* 'to blow'), or due to onomatopoetic formation of the root (*klateren* 'to splash', *kletteren* 'to rattle', *knetteren* 'to crackle').

(III) Verbs derived by means of conversion from a noun or adjective ending in *-er*: *hamer* 'hammer' – *hameren* 'to hammer', *honger* 'hunger'- *hongeren* 'to starve', *kaffer* 'blockhead'- *kafferen* 'to shout at', *offer* 'sacrifice' – *offeren* 'to sacrifice', or adjective: *minder* 'less'- *minderen* 'to reduce', *somber* 'sombre, gloomy' – *somberen* 'to be in a sombre mood'.

The meaning contribution of the suffix *-er* in type I and type II verbs is often iterative, similar to that of *-el*, and sometimes the aspect of attenuation is also present, as in *badderen, redderen, flikkeren* 'to flicker', *dobberen* 'to float, to bob' and *fladderen* 'to flutter'. This means we can posit schema (19), parallel to schema (7).

(19) $<[x\text{ -er}]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i>$

The set of root-based verbs (type II) in Dutch ending in *-er* is quite large. Here are some examples:

(20) banjeren ‘to pace up and down’, bibberen ‘to shiver’, daveren ‘to thunder’, denderen ‘to
rumble’, flakkeren ‘to flicker’, flodderen ‘to flap’, flonkeren ‘to twinkle’, flubberen ‘to
wobble’, fluisteren ‘to whisper’, gakkeren ‘to cackle’, glibberen ‘to slither’, glinsteren ‘to
glitter’, glitteren ‘to glitter’, glunderen ‘to beam’, kletteren ‘to rattle’, kliederen ‘to make a
mess’, knetteren ‘to crackle’, knisperen ‘to rustle’

The following verbs are type III verbs, that is, verbal conversions of nouns in *-er*. Their meaning is therefore related to the meaning of the corresponding nouns, as specified in (13), though idiosyncrasies occur. Yet, they can also be linked to a general schema for *-er* verbs because many of these verbs have an iterative and/or attenuative meaning, which may follow from the nature of the action in which the object denoted by the corresponding noun is involved:

(21)

noun	*verb*
etter ‘pus’	etteren ‘to fester’
hamer ‘hammer’	hameren ‘to hammer’
hamster ‘hamster’	hamsteren ‘stock up, hoard’
honger ‘hunger’	hongeren ‘to starve’
huiver ‘shiver’	huiveren ‘to shiver’
jammer ‘misery’	jammeren ‘to moan’
kanker ‘cancer’	kankeren ‘to moan’
kikker ‘frog’	kikkeren ‘hop around’
klodder ‘clot’	klodderen ‘to mess around’
liefhebber ‘lover, amateur’	liefhebberen ‘to dabble in sth.’
moker ‘sledge-hammer’	mokeren ‘to hammer heavily’
modder ‘mud’	modderen ‘to mess around’
nummer ‘number’	nummeren ‘to number’
slinger ‘swing’	slingeren ‘to swing’
snot ‘mucus’	snotteren ‘to snivel’
spijker ‘nail’	spijkeren ‘to nail’
toeter ‘horn’	toeteren ‘to hoot’
voeder ‘fodder’	voederen ‘to feed animals’

These verbs denote repetitive actions inspired by the meaning of the base noun. This iterative meaning is confirmed, and hence strengthened by the meaning of the constructional schema (19). Therefore, we may consider these verbs as having multiple motivation.

4 Parallels Between Dutch, German and English

Cognates of the verbal affixes *-el* and *-er* occur throughout the Germanic languages, and German and English also have substantial numbers of verbs with these affixes. A few examples were noted in passing above, others are:

(22) *German*
flattern 'to flutter', lispeln 'to lisp', meckern 'to nag', menscheln 'to show human weakness',
nörgeln 'to nag', quengeln 'to whine', rieseln 'to trickle (down)', stottern 'to stammer', zittern
'to shiver'

English
to dangle, to flatter, to hover, to mumble, to puzzle, to simmer, to sparkle, to slither

There are many parallels between the Dutch, German, and English verbs, both semantic and formal. First, we see the attenuative and iterative meanings typical of verbal diminutives. German has *köch-el-n* 'to simmer' as a less intensive and more repetitive variant of *koch-en* 'to cook'; similarly, verbs such as *schnief-el-n* 'to sniffle' and *stich-el-n* 'to tease' have a diminutive and an iterative character. The same holds for English *spark-le*, which might be seen as an attenuated variant of *spark* or *flash* and which also denotes a repetitive action. In addition, both English and German have onomatopoetic forms, witness *to babble, to stutter*, *murmeln* 'to mumble' or *gackern* 'to cackle'.

Second, we find the same three types introduced above:

(I) Verbs derived from a base word by means of *-el/-er*:
German: *zünd-el-n* 'to play with fire < *zünden* (V) 'to ignite, *schleck-er-n* 'to eat sweets' < *schleck-en* (V) 'to lick, esp. ice cream', *gift-el-n* 'to spew (verbal) venom' > *Gift* (N) 'venom', *wild-er-n* 'to poach' < *Wild* (N) 'game', *blöd-el-n* 'to fool around' < *blöd* (A) 'dumb'[5], *achteln* 'to divide into eight parts' < *acht* (Num) 'eight';
English: *suck-le* < *suck* (V), *waddle* < *wade* (V), *nestle* < *nest* (N), *speck-le* < *speck* (N); *patter* < *pat* (V)

(II) Root-based verbs in *-el/-er*:
German: *bimmeln* 'to ring, *bibbern* 'to shiver', *hecheln* 'to pant';
English: *puzzle, fondle, gargle, clutter*, *glower*, *mutter*

(III) Verbs derived by means of conversion from a noun or adjective ending in *-el/-er*:

[5]To our knowledge, there are no deadjectival *–er* formations.

German: *klingeln* ‘to ring’ < *klingel* (N) ‘bell’, *fächern* ‘to fan’ < *Fächer* (N) ‘fan, *dunkeln* ‘to darken’ < *dunkel* (A) ‘dark’;
English: *to saddle* < *saddle* (N), *to hammer* < *hammer* (N), *to lower* < *lower* (A)

Individual examples worth mentioning are the German prefixed verb *ver-scheiß-er-n* ‘to make a fool of sbd.’, based on the noun *Scheiß(e)* ‘shit’ and the particularly poetic *irrlicht-er-n* ‘to move like a ghost light’, from *Irrlicht* ‘ghost light, fen fire’. English has incidental prefixed forms such as *be-dragg-le-d* and *dis-grunt-le-d*, mainly restricted to the participle form. A orthographic oddity is *swivel*, which has <el> rather than <le> (the same spelling is found in nouns such as *shovel* and *satchel*).

Notable differences between Dutch, English, and German are that the percentage of lexical bases is notably larger in German and dramatically smaller in English. This is probably due to the general conservativeness of German, which has retained a greater number of the words that served as a base for the diminutive, whereas English has lost most of them. That said, Weidhaas and Schmid (2015) overreport the lexical bases for German; the list in the appendix includes historical forms no longer known in present-day German (e.g. **risen*, **smeichen* and **strampen*, to mention just a few). The preponderance of non-lexical bases again reminds us that output schemas are better suited to account for the formal and semantic regularities of the diminutive verbs, as there is often no input form to derive a complex word from.

German has a small number of *-el* verbs with adjectival bases, such as *blöd-el-n* ‘fool around’, from *blöd* ‘silly’, *schwäch-el-n* ‘to be weak’ from *schwach* ‘weak’ or *kränk-el-n* ‘to be sick’ from *krank* ‘sick’ (though the archaic verb *kranken* ‘be sick’ is an alternative source).[5] Another ambiguous case is *eifersücht-el-n*, which is either denominal (< *Eifersucht* ‘jealousy’) or deadjectival (< *eifersüchtig* ‘jealous’, under suffix deletion). Interestingly, German has a productive niche of *-el* verbs with numerals as base; an example is *vierteln* ‘to quarter, to divide into four parts’. Of course, the actual number of novel formations is limited by practical considerations: there is little call for a verb like *neunzehnteln* ‘to divide into nineteen parts’. Another subgroup of interest are *-el* verbs meaning ‘talk like a speaker of dialect x’: *sächseln* ‘talk in the Saxon dialect’, *schwäbeln* ‘talk in the Swabian dialect, *Berlinern* ‘talk in the Berlin dialect’. This class is also mentioned in Weidhaas and Schmid (2015: 187).

German diminutive verbs sometimes show umlaut, as in the pairs in (23).

(23) kochen ‘to cook’ köcheln ‘to simmer’
lachen ‘to laugh’ lächeln ‘to smile’
husten ‘to cough’ hüsteln ‘to cough slightly, to clear one’s throat’

Such pairs are rare in Dutch (an example would be *spatten* ‘to splash’ > *spetteren* ‘to splash’) and – to our knowledge – absent in English.

While the proposed classification generally works well for the three languages, the distinction between class I and class III words is sometimes difficult in English.

Consider the verb *to saddle*. Its semantics ('put a saddle on sth.') reveals that it is a conversion of the noun *saddle*, which makes it a class III verb. The suffix is the nominal *-le*, a cognate of the instrument suffix described in Sect. 2.2 for Dutch. However, the direction of conversion is much less clear for words such as *bundle*, *handle, drizzle, chatter, shiver* or *shudder*, which also have homophonous nominal forms, but provide no synchronic indication of whether the noun is derived from the verb or vice versa. As English is particularly free in applying conversion, there are a number of ambiguous cases of this type. The structural ambiguity is often matched by semantic ambiguity: *drizzle* has a diminutive meaning that could be paraphrased both as "rain lightly' or 'light precipitation", which would match the verbal *-el* or the nominal (diminutive) *-el*, respectively.

As we argued for Dutch, such cases represent instances of multiple motivation. A particularly illustrative case is *handle*. Historically, the noun *handle* contains the instrument suffix also described for *saddle*, while the verb is a cognate of German and Dutch *handeln/handelen* 'to trade' and contains a frequentative suffix (etymology by Oxford English Dictionary, consulted online on 12/2/2017). Currently, we see a verb with an iterative meaning, which links it to the verbal diminutives, and a homophonous noun in a connection of ambiguous directionality. Hence, the relation invokes both the schema for V-to-N conversion and the schema for N-to-V-conversion. For those speakers that have acquired a generalization for the nominal *-el* suffix, here in its instrument meaning, the noun is additionally motivated. Finally, both noun and verb are connected to the simplex nominal *hand*, and perhaps weakly to the homophonous verb. Hence, we see the multiple interrelations in the lexicon, involving both words and schemas. Similar examples can be found both in German and in Dutch.

With this note, we leave the diminutives for a moment to point out interesting parallels in other patterns of word formation.

5 Adjectives and Verb Stems in *-ig*

Dutch adjectives ending in *-ig* are similar to the verbs discussed in Sects. 2 and 3 in that some of them have a base word, usually a noun, whereas a number of these adjectives are root-based:

(24) *adjectives with base noun*

hand-ig 'handy'	< hand 'hand'
jeugd-ig 'youthful'	< jeugd 'youth'
kruid-ig 'spicy'	< kruid 'spice'
nijd-ig 'angry'	< nijd 'anger'
tijd-ig 'timely'	< tijd 'time'
strijd-ig 'contrary'	< strijd 'fight'

root-based adjectives
behendig ‘skilful’, bondig ‘succinct’, huidig ‘present’, koddig ‘droll’, kribbig ‘grumpy’,
schunnig ‘filthy’, slordig ‘sloppy’, snibbig ‘snappy’, veilig ‘safe’, welig ‘opulent’,
vaardig ‘able’, zalig ‘heavenly’

The root-based adjectives receive a partial motivation from the fact that they all end in *-ig*. Hence, they are adjectives, and denote a property. This is expressed by the following schema:

(25) $<[x\text{ -ig}]_{Ai} \leftrightarrow [\text{Property}]_{SEMi}>$

These adjectives in *-ig* also play a role in the following sets of related words, where adjectives in *-ig* correspond with a verbal stem of the same shape. The issue here is whether the verb stems in *-ig* are derived from the nouns by means of suffixation with a verbal suffix *-ig*, or from the adjectives in *-ig*, either by conversion or by prefixation. There are three subsets of verbs in *-ig*: denominal verbs (26), deadjectival verbs (27) and a set of verbs where both types of relation are possible (28):

	Noun	*Adjective in -ig*	*Verb stem in -ig*
(26)	eed ‘oath’		be-ed-ig ‘to swear in’
	hulde ‘homage’		huld-ig ‘to honor’
	schade ‘damage’		be-schad-ig ‘to damage’
(27)		veil-ig ‘safe’	be-veil-ig ‘to secure’
		zal-ig ‘heavenly’	zal-ig ‘to beatify’
(28)	eerbied ‘respect’	eerbied-ig ‘respectful’	eerbied-ig ‘to respect’
	genade ‘mercy’	genad-ig ‘merciful’	be-genad-ig ‘to pardon’
	heil ‘salvation’	heil-ig ‘holy’	ont-heil-ig ‘to desacrify’
	jeugd ‘youth’	jeugd-ig ‘youthful’	ver-jeugdig ‘to rejuvenate’
	moed ‘courage’	moed-ig ‘courageous’	be-moed-ig ‘to encourage’
			ont-moed-ig ‘to discourage’
	ootmoed ‘humility’	ootmoed-ig ‘humble’	ver-ootmoed-ig ‘to humble’
	vocht ‘moisture’	vocht-ig ‘damp’	be-vocht-ig ‘to make wet’
	wet ‘law’	wett-ig ‘legal’	wett-ig ‘to justify’
	schuld ‘guilt’	schuld-ig ‘guilty’	be-schuld-ig ‘to accuse’
			ver-ont-schuld-ig ‘to apologize’
	zonde ‘sin’	zond-ig ‘sinful’	zond-ig ‘to sin’

As we saw above, words may receive a partial motivation by being linked to a schema. In this case, the verbs in (28) can be linked to two schemas:

(29) a $<[[x]_{Ni}\text{-ig}]_{Vj} \leftrightarrow [\text{Action in which SEM}_i \text{ is involved}]_{SEMj}>$
b $<[[x]_{Ak}]_{Vj} \leftrightarrow [\text{Cause to be SEM}_k]_{SEMj}>$

As in the case of verbs in *-elen* and *-eren*, it is not necessary to make a choice: the verbs in (28) can receive multiple motivation, from both schemas (29).

6 Nouns in *-er*

Germanic languages feature an enormous number of deverbal and denominal nouns in *-er* denoting persons or instruments, or both, and with a number of other meanings as well. In other words, there is a lot of polysemy involved. In addition, we find numerous root-based nouns of this type, which lack an independent base word. They exhibit a similar range of meanings as the *-er*-nouns with a base. As Köpcke and Panther (2016) point out for German, this suggests that there is a general output-oriented schema for such nouns. In our notation, such a general schema for nouns with an "-er-Gestalt" would have the following form:

(30) $<[\text{x -er}]_{\text{Ni}} \leftrightarrow [\text{Person/Instrument}]_{\text{i}}>$

This general schema will motivate both deverbal and denominal nouns in *-er*. In addition, other nouns in *-er*, without a base word and denoting a person, could be linked to this schema as well. To be sure, there are lots of nouns in *-er* that do not denote a person, but the number of person-denoting nouns of this type is quite large. Hence, it makes sense to assume that person-denoting root-based nouns receive partial motivation from this schema, which is strengthened by the high number of deverbal and denominal personal nouns ending in *-er*.

Examples of root-based nouns of this type in Dutch are words like the following:

(31) kabouter 'gnome', priester 'priest', ridder 'knight', schilder 'painter', slager 'butcher', zigeuner 'gipsy'

The noun *ridder* derived from Middle Dutch *riddere* 'horse rider', but acquired a more general meaning. Historically, the noun *schilder* is a denominal noun with *schild* 'coat of arms' as its base; it acquired the general meaning 'painter' and has thus lost its semantic transparency, but the suffix *-er* is still recognizable. *Slager* is derived from an allomorph *slaag* of the verb *slaan* 'hit', but is also opaque in present-day Dutch.

There are diachronic indications that language users relate these nouns to schema (30). One is etymology: the form of some of these nouns has changed in the course of time. This may be seen as an effect of the structure [x-er] being imposed on these words. Consider the etymological source of the following nouns:

(32)

word	*etymological source*
dokter	Latin doctor
kabouter	Proto-Germanic kobolt
kaffer	Arabic kāfir ‘non-believer’
nikker	English nigger < negro
priester	Greek presbyter
zigeuner	Italian zingaro

These cases illustrate how a borrowed word is adapted in the borrowing language by means of a schema, in this case for person-denoting nouns. Another example of the imposition of this structure on person-denoting words is that the following Middle Dutch words that ended in *-e* changed into words ending in *-er*:

(33) herde ‘shepherd’ > herder (compare German *Hirt(e)*)
schenke ‘giver’ > schenker (compare German *Schenk*)
schutte ‘shooter’ > schutter (compare German *Schütze*)

This latter change can be qualified as systematization, since it leads to a situation in which all person-denoting nouns have the same ending *-er*.

Imposition of this schema on words can also be observed in the addition of *-er* to acronyms that by themselves already denote persons. In this case, the meaning ‘person’ is evoked twice, by the last letter of the acronym, and by *-er*.

(34) BN (Bekende Nederlander) ‘famous Dutchman’ > BN-er
UD (Universitair Docent) ‘assistant professor’ > UD-er

This type of change is referred to as overcharacterization (Van Marle 1978), because the meaning component ‘person’ is expressed twice. We find this overcharacterization not only for acronyms, but also for nouns denoting inhabitants of certain geographical areas or members of religious orders:

(35)

Afrik-aan ‘African’	> Afrik-an-er
Dominic-aan ‘Dominican’	> Dominic-an-er
Francisc-aan ‘Franciscan’	> Francisc-an-er
Karmel-iet ‘Carmelite	> Karmel-iet-er
Sodom-iet ‘Sodomite’	> Sodom-iet-er

The endings *-aan* and *-iet* already indicate the meaning ‘person’. Yet, the [x-er]$_N$ schema for personal nouns is imposed on these words, with the effect of overcharacterization. Again, this shows the influence of schemas, which can attract new member words as they serve to increase the degree of motivation and coherence in the mental lexicon.

7 Conclusions

The data and analysis above provide confirmation of Bybee's (1995) network model of lexical organization, in which frequent patterns of phonological and/or semantic links among lexical representations reveal morphological structure. This model is not concerned about minimizing redundancy in the lexicon, and the metaphor of 'building up words from pieces' is not the business of grammatical machinery. The models of Construction Morphology, as developed in Booij (2010) and of Relational Morphology (Jackendoff and Audring 2016) provide a further articulation of these ideas concerning the structure of lexical knowledge.

Schemas are essential for expressing relations between output forms. These schemas cannot only be used for the description of form-meaning correspondences in productive morphological processes, but may also be used for the description of non-productive patterns of form-meaning correspondence. That is, there is regularity without productivity.

Since the starting point of language users in making morphological generalizations is a set of output forms, we expect that complex words may be motivated by links to more than one schema. Such motivation may be full, partial, or multiple. Since motivation is a declarative, not a procedural relation, it represents a natural situation in the Construction Morphology theory of lexical knowledge.

References

Aronoff, M. 1976. *Word formation in generative grammar*. Cambridge MA: MIT Press.

———. 2013. The roots of language. In *The boundaries of pure morphology*, ed. S. Cruschina, M. Maiden, and J.C. Smith, 161–180. Oxford: Oxford University Press.

Bolinger, D.L. 1950. Rime, assonance, and morpheme analysis. *Word* 6: 117–136.

Booij, G. 1977. *Dutch morphology. A study of word formation in generative grammar*. Lisse/Dordrecht: The Peter de Ridder Press/Foris Publications.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

Bybee, J. 1995. Regular morphology and the lexicon. *Language and Cognitive Processes* 10: 425–455.

De Haas, W., and M. Trommelen. 1993. *Morfologisch handboek van het Nederlands. Een overzicht van de woordvorming*. 's Gravenhage: SDU Uitgeverij.

De Jager, A. 1875. *Woordenboek der frequentatieven in het Nederlands*. Gouda: G.B. van Goor.

Gundersen, H. 2001. Building blocks or network relations: Problems of segmentation. In *A cognitive approach to the verb. Morphological and constructional perspectives*, ed. H. Gram Simonsen and R. Theil Endresen, 95–128. Berlin/New York: Mouton de Guyter.

Jackendoff, R., and J. Audring. 2016. Morphological schemas. *The Mental Lexicon* 11: 467–493.

Jurafsky, D. 1996. Universal tendencies in the semantics of the diminutive. *Language* 72: 533–578.

Köpcke, K.-M., and K.U. Panther. 2016. Analytische und gestalthafte Nomina auf *-er* im Deutschen vor dem Hintergrund konstruktionsgrammatischer Überlegungen. In *Formen und Funktionen. Morphosemantik und grammatische Konstruktion*, ed. A. Bittner and C. Spieß, 85–101. Berlin: De Gruyter.

Kwon, N., and E.R. Round. 2015. Phonaesthemes in morphological theory. *Morphology* 25: 1–28.
Van Loey, A. 1964. *Schönfelds historische grammatica van het Nederlands*. Zutphen: Thieme.
Van Marle, J. 1978. Veranderingen in woordstructuur. In *Aspecten van taalverandering*, ed. G. Koefoed and J. Van Marle, 127–176. Groningen: Wolters-Noordhoff.
Weidhaas, Th., and H.-J. Schmid. 2015. Diminutive verbs in German: Semantic analysis and theoretical implications. *Morphology* 25: 183–228.

Schemas and Discontinuity in Italian: The View from Construction Morphology

Francesca Masini and Claudio Iacobini

Abstract In this paper we use the tools of Construction Morphology to explore Italian morphological and lexical constructions characterized by some kind of structural *discontinuity*. Our goal is to show how a constructionist view of language can account for non-contiguous structures in the lexicon. In particular, the paper deals with four (well-known and lesser-known) case-studies: (i) particle verbs and discontinuous idioms; (ii) bracketing paradoxes, where the suffix splits the phrase in two; (iii) parasynthetic verbs, where discontinuity is represented by the simultaneous addition of prefixation and conversion to a noun or adjective to create a verb; and, finally, (iv) discontinuous reduplication with numerals, a (so far undescribed) construction where a numeral is reduplicated "around" the head noun. In order to account for these different types of discontinuities, we use a variety of theoretical tools and notions developed within Construction Morphology and Construction Grammar.

Keywords Bracketing paradoxes · Discontinuity · Discontinuous idioms · Numerals · Parasynthesis · Particle shift · Particle verbs · Reduplication

1 Introduction[1]

Construction Morphology (Booij 2010; henceforth CxM) is a sign/word/usage-based theory of morphology that relies on the notion of *construction*, or *schema*, and the arrangement of such constructions in a hierarchical lexicon. Constructions

[1]The present paper is the result of close collaboration between the two authors, who are listed in random order. For academic purposes only, Claudio Iacobini takes responsibilty for Sects. 1 and 4, and Francesca Masini for Sects. 2, 3, 5 and 6.

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are linked to one another via inheritance links of various kinds (especially instance links; cf. Goldberg 1995) plus some other mechanisms such as unification and second order schemas (Booij and Masini 2015). The view of morphology that stems from this picture is basically output-oriented and declarative: a schema is not a rule, but a "declarative statement" (Booij 2015: 189) about form-meaning pairings that may contain both lexical material and variables. This suggests that CxM is better suited to handle all those phenomena that are not strictly concatenative or binary, from prosodic morphology to root-and-pattern morphology, from subtractive mechanisms to paradigmatic word formation.

Italian word formation can hardly be defined "non-concatenative" in the traditional sense: there is no transfixation, no regular alternation of suppletive stems. Rather, we have a vast array of prefixes and suffixes (cf. Grossmann and Rainer 2004 for an overview), as well as compounding (Masini and Scalise 2012) and phrasal lexemes (Masini 2009, 2012). However, Italian displays some not strictly concatenative patterns, such as for instance truncation and shortening (e.g. *bici-cletta* > *bici*, *Federica* > *Fede*; cf. Thornton 1996, 2004a), affix substitution (e.g. *marx**ismo*** > *marx**ista***, *economi**a*** > *economi**sta***; cf. Lo Duca 2004: 208, Seidl 2004: 415), conversion (e.g. *francese* ADJ 'French' > (*il*) *francese* N 'French language'; cf. Thornton 2004b), blending (e.g. *mapo* < ***ma**ndarino* 'mandarin' + ***po**mpelmo* 'grapefruit', cf. Thornton 2004c), reduplication (e.g. *adagio adagio* lit. slowly slowly 'very slowly'; cf. Wierzbicka 1986 and Sect. 5).

In this paper we use the tools of CxM to explore this area of the Italian lexicon, by focusing on those morphological or lexical constructions that display some kind of structural *discontinuity*. Our goal is to show how a constructionist view of language can account for these non-contiguous cases in the lexicon. The paper is organized into four case-studies, which deal with both well-know and lesser-known phenomena in the Italian lexicon.

The first case-study (Sect. 2) deals with particle verbs and particle shift, as well as "discontinuous idioms" in general (Jackendoff 1997: 159). Whereas this topic is widely investigated for the English language (e.g. *give* OBJ *away, take* OBJ *for granted*), little is known on Italian (cf. Masini 2008). Section 3 deals with a time-honored issue in morphological theory, namely bracketing paradoxes (Spencer 1988). As we will see, Italian adds one complication to the picture derived from the English language, since in Italian the suffix splits the phrase in two (e.g. *flauto barocco* 'baroque flute' > *flaut**ista** barocco* 'baroque flutist'). The third case-study (Sect. 4) deals with a well-known issue in Italian morphology, namely parasynthesis (Iacobini 2004), where a prefix and a conversion mechanism (hence, a "discontinuous morpheme") apply simultaneously to a nominal or adjectival base (e.g. *giallo* 'yellow' > ***in**giall**ire*** 'to yellow'). Finally, in Sect. 5, we present a peculiar type of – so far undescribed – reduplication in Italian which involves cardinal numerals. Its discontinuity lies in the fact that the numeral is repeated right after the noun it applies to, rather than contiguously (e.g. ***due**-pagine-**due*** lit. two-pages-two 'precisely/only two pages' vs. **due-due-pagine*). In Sect. 6 we draw some conclusions from this overview of split structures.

2 Case-Study 1: Particle Verbs and Discontinuous Idioms

The choice of this first case-study, when dealing with a topic like "discontinuity", is quite predictable. The reason lies in the fact that CxM is notoriously a theory that aims at accounting for phenomena that are not strictly morphological, but straddle the boundary between morphology and syntax, like multiword lexical units with word-like properties. In fact, CxM has originated from work on separable complex verbs in Dutch (1), which were analyzed by Booij (2002) as "constructional idioms" (see also Jackendoff 1990: 221, 1997: 171), i.e. as phrasal structures (with one or more variables) that are conventionally associated with a (more or less idiomatic) meaning (see the formalization in (1b) for examples in (1a)).[2]

(1) a. *dóoreten* 'to go on eating', *dóorfietsen* 'to go on cycling'
b. < [[*door*]$_{Pi}$ [x]$_{Vj}$]$_{V'k}$ ↔ [CONTINUE SEM$_j$]$_k$ >

Separable verbs in Dutch are known for their peculiar syntactic behavior: they appear as one word (particle + verb) in subordinate clauses (2a), but in main clauses the particle separates from the verb and appears at the end of the clause (2b) (examples (2) are from Blom 2005: 6).

(2) a. *dat* *Jan* *de* *informatie* ***op-zoekt***
that John the information up-searches
'that John looks up the information'
b. *Jan* ***zoekt*** *de* *informatie* ***op***
John searches the information up
'John looks up the information'
c. **Jan* ***opzoekt*** *de* *informatie*

The separability of particle verbs is a widely investigated issue also in other Germanic languages, especially English, where the phenomenon goes under the name of "particle shift". As is well-known, particle verbs in English can be realized with either a continuous or a discontinuous order:[3]

(3) a. *He* ***looked up*** *the information* [**V**+**PRT**+OBJ]: CONTINUOUS ORDER
b. *He* ***looked*** *the information* ***up*** [**V**+OBJ+**PRT**]: DISCONTINUOUS ORDER

This double realization is also typical of other idioms containing a full PP, such as *bring to mind* (4),[4] although some idioms, such as *take* OBJ *to the cleaners* (Emonds 1970), apparently occur in the discontinuous form only.

[2] As regards the representation of schemas, we follow the notation conventions introduced by Masini and Audring (forthcoming).

[3] Examples in (3) are taken from Fraser (1976: 16).

[4] Examples in (4) are from the BNC, accessed via the SketchEngine platform (https://www.sketchengine.co.uk)

(4) a. *She wasn't booked with us, she was a few weeks early, and that's why I couldn't* ***bring*** *her* ***to mind*** *straight away.*
b. *The whole thing* ***brings to mind*** *the art troubadour that was in vogue around 1830.*

A number of factors have been claimed to be involved in the selection of the continuous vs. discontinuous order in English particle verbs. For instance, Fraser (1976: 19) claims that complex, heavy objects are normally found after the particle (5), whereas pronouns are regularly found between verb and particle (6) (Fraser 1976: 17). Diessel and Tomasello (2005: 91) propose that particle verbs with spatial meaning are more easily found in the discontinuous order than particle verbs with aspectual or idiomatic meaning (cf. (7a) vs. (7b–c)).

(5) a. *I* ***called*** *up the man who left*
b. **I* ***called*** *the man who left* ***up***

(6) a. *She* ***stirred*** *it* ***up***
b. **She* ***stirred up*** *it*

(7) a. *He* ***pushed*** *the chair* ***away***
b. *He* ***ate up*** *his lunch*
c. *He* ***turned on*** *the TV*

Pragmatic, information-structure factors have also been invoked (Dehé 2002; Gries 1999, 2003): if the object represents new information (or, following Gries, information which is less familiar and accessible to the hearer), then the continuous order is more likely to occur, whereas if it represents known information (or, as Gries says, familiar and accessible information) that can be easily retrieved in discourse (including vague nouns such as *matters, things,* etc.), the discontinuous order is preferred. See the examples in (8), taken from Diessel and Tomasello (2005: 91).

(8) a. *What did she do with the ball?*
She ***picked*** *the ball* ***up***
Discontinuous order → old information
b. *What did she pick up?*
She ***picked up*** *the ball*
Continuous order → new information

In the constructionist literature, this order alternation has been handled in a non-derivational way: there is no basic order from which the other is somehow derived, but two independent constructions with different pragmatic-discourse properties. In order to account for the undeniable link between the continuous and the discontinuous construction, Cappelle (2006) proposes to treat them as

allostructions, i.e. as two variants of a more abstract construction where word order is underspecified. The selection of the right allostruction depends on pragmatic-discourse factors like those discussed above.

As is well-known by now, Italian, despite being a Romance language, also has particle verbs (e.g. Masini 2005; Iacobini and Masini 2007; Iacobini 2009, 2015), although the phenomenon is not pervasive like in English. See the following examples:

(9)	a.	*andare su*	lit. go up	'to go up(wards)/to ascend/to climb'
	b.	*mettere sotto*	lit. put under	'to bump into (with a vehicle)'
	c.	*guardare avanti*	lit. look ahead/forward	'to look forward, to look to the future'
	d.	*buttare via*	lit. throw away	'to throw away/to waste'

In the literature on Italian particle verbs (see e.g. Iacobini and Masini 2007: 160), these objects are normally claimed to be separable only by clitics (10a) and light constituents (10b), such as sentence adverbs, but not by "heavy" material, such as a direct object (11):

(10) a. *Hai* *rischiato* *di* ***metter****-lo* ***sotto.***
have.2SG risked of putting-him under
'You risked bumping into him'

b. *Devi* ***guardare*** *sempre* ***avanti.***
must.2SG look always ahead
'You must always look to the future'

(11) a. *Irene* *ha* ***buttato*** ***via*** *la* *bambola.*
Irene has thrown away the doll
'Irene threw the doll away'

b. ??*Irene* *ha* ***buttato*** *la* *bambola* ***via.***
Irene has thrown away the doll

However, Masini (2008) observed that the discontinuous order is, actually, occasionally found, especially in spoken language. This observation led the author to carry out a corpus-based search for discontinuous particle verbs, using three corpora of spoken Italian (for a total of approx. 850.000 tokens)[5] and the newspaper corpus *la Repubblica* (laR, approx. 380M tokens, cf. Baroni et al. 2004) for written Italian. The results confirmed that the discontinuous order is found in naturally

[5]The spoken Italian corpora used were: LIP (De Mauro et al. 1993, approx. 500.000 tokens), ARCODIP (Roma Tre University, approx. 37.000 tokens) and C-ORAL-ROM (Cresti and Moneglia 2005, approx. 300.000 tokens).

occurring language: 13 cases were spotted in the spoken corpora, and 411 in laR.[6] The qualitative analysis of the results revealed that most factors called into play for English seem to be valid for Italian, too. For instance, particle verbs with a spatial meaning are more frequently split (12a). Also, discontinuous cases with concrete nouns as direct object are more frequent than abstract nouns (but see (12b)), as predicted by Gries (2003), who claims that abstract nouns are less familiar and accessible than concrete nouns. Gries (2003) also mentions that nouns denoting body parts are highly familiar and entrenched, and are therefore more likely to be found in the discontinuous configuration. This is confirmed by Italian data, too: *mettere giù* 'to put down', for instance, occurs very few times with discontinuous order, but in all cases the direct object corresponds to a body part noun (e.g. *testa* 'head', *piede* 'foot', etc.).

(12) a. *Qui bisogna pensare a* ***buttare*** *la palla* ***dentro***. [laR]
here need think to throw the ball in(side)
'Here you need to think about getting the ball in the net.'

b. [. . .] ***mette*** *una stranissima sensazione* ***addosso***. [laR]
puts a very.strange feeling on
'[. . .] (he) gives you a very strange feeling.'

More in general, the Italian data confirm that information structure, and especially the accessibility of the referent denoted by the direct object, plays a role in facilitating the discontinuous configuration: see for instance (13), where a ladder is introduced in the discourse (as an indefinite noun phrase: *una scala* 'a ladder'), and then it occurs again as the direct object of the particle verb *tirare su* 'to pull up(wards)' (with a definite article, this time: *la scala* 'the ladder'), separating verb and particle.

(13) *Lassù dimorava col tempo buono e caldo Ci saliva con* ***una scala*** *a pioli* [. . .]. *Più spesso accadeva che tirasse* ***la scala*** *su* [. . .] *e agli amici che bussavano di sotto* [. . .] *non rispondesse*. [laR]
'He used to live up there when the weather was good and warm. He would climb there with a ladder. More often, he would pull the ladder up and not answer to the friends who were knocking downstairs.'

[6]Given the size difference between the spoken and written corpora, the discontinuous order is actually more frequent in the spoken variety. Note that the search was conducted for a limited number of patterns, i.e. for sequences where the interrupting object was either a bare noun (N), or a noun preceded by a determiner (Det + N), or a noun preceded by a determiner and an adjective (Det + A + N).

Let us have a look at the following (self-constructed) situations and dialogues:

(14) a. Situation A: Sara and Luca are fighting. Mario is in the other room and understands that Luca threw away something that belongs to poor Sara. So he enters the room and asks:

b. Mario: *Sara, cosa ha buttato via Luca?*
'Sara, what did Luca throw away?'

c. Sara: *Ha **buttato via** il mio libro!*
'He threw away my book!'

d. Sara: *#Ha **buttato** il mio libro **via**!*
'He threw my book away!'

(15) a. Situation B: Sara and Luca have been fighting about Luca throwing away Sara's book for the last few minutes. Mario, who's been listening, steps in and says:

b. Mario: *Dai, Sara, non è così grave.*
'Come on, Sara, it's not so bad'

c. Sara: *Come sarebbe a dire non è grave . . . ha **buttato** il mio libro **via**!*
'What do you mean it's not bad . . . he threw my book away!'

In Situation A, Sara's book is new information, so the interposition between verb and particle is definitely inappropriate. In Situation B, Sara's book is already familiar in the discourse: here the discontinuous order is more acceptable. Obviously, the continuous order is always the default and preferred one in Italian. However, the contrast between these two situations shows the pragmatic conditions in which the marked, discontinuous order is more acceptable.

Although in the majority of cases the discontinuous order is still marginal, few specific particle-verb + object combinations occur equally in both orders, such as *mettere dentro la palla* and *mettere la palla dentro* 'kick the ball in the net (lit. put in the ball / put the ball in)' (clearly referring to football jargon). Hence, the alternation between continuous and discontinuous order seems fully available and operative, if not for the Italian particle verb construction per se, at least for some specific exemplars of that construction. This leads us to hypothesize the gradual emergence of a V+OBJ+PRT *allostruction* with distinct discourse-pragmatic properties (along the lines of the English situation) starting from very specific exemplars, quite in line with usage-based and exemplar-based constructionist approaches (Tomasello 2003; Bybee 2006, 2013; Goldberg 2006), to which CxM is explicitly linked. This process might also be strengthened by the presence of some (semi-)fixed expressions where a nominal occurs between verb and particle:

(16)	a.	*mettere le mani avanti*	lit. put the hands forward	'to prevent an unpleasant situation'
	a'.	?*mettere avanti le mani*		
	b.	*fare un passo avanti*	lit. make a step forward	'to make progress'
	b'.	**fare avanti un passo*		
	c.	*mettere piede fuori*	lit. put foot outside	'to go out'
	c'.	**mettere fuori piede*		

Whereas the example in (16a) may occasionally be found in the continuous order (*mettere avanti le mani*) – although the latter expression is more readily associated with the literal meaning of putting the hands forward, rather than with the metaphorical meaning carried by *mettere le mani avanti* –, examples (16b) and (16c) are definitely unacceptable with changed order.

Finally, as food for future thought, we may add that the hypothesis of an emergent discontinuous particle verb construction might be correlated with the presence of other discontinuous idioms in Italian – quite similar to the English ones of the type in (4) – that happen to have a double order, as exemplified below.

(17) *prendere sul serio* (+OBJ) lit. take on.the serious 'to take seriously'

a. [. . .] *la gente comincerebbe a* ***prendere sul serio*** *gli avvertimenti dei sismologi* [laR]
'[. . .] people would start taking seismologists' alerts seriously'

b. *Sembra incapace di* ***prendere*** *qualcosa* ***sul serio****, neanche se stesso.* [laR]
'(He) seems unable to take something seriously, not even himself.'

(18) *mettere da parte* (+OBJ) lit. put on side 'to save'

a. *Riuscite a* ***mettere*** *dei soldi* ***da parte****?* [laR]
'Do you manage to save some money?'

b. *Devi* [. . .] ***mettere da parte*** *un bel gruzzolo*. [laR]
'One should [. . .] save a pretty sum.'

In sum, discontinuity in particle verbs and idioms is a property that constructionist approaches have no hard time in accounting for: multiword expressions in general are perfectly accepted within the theory and word order is just one of the aspects that can be encoded with the construction, thus allowing the emergence of allostructions with different orders. What the Italian case discussed in these pages shows is that we need a usage-based, exemplar-based version of CxM to accommodate the (still embryonic) emergence of particle shift in Italian.

3 Case-Study 2: Bracketing Paradoxes

As mentioned in Sect. 1, bracketing paradoxes, as types of form-meaning mismatches, are a time-honored issue in morphological theory. Here follows the well-know English example from Spencer (1988):

(19) *transformational grammar* > *transformational grammarian*

a. form: [[*transformational*]$_{A}$ [*grammar-ian*]$_{N}$]$_{NP}$

b. meaning: [[*transformational grammar*]$_{NP}$ *-ian*]$_{N}$

Here the suffix *-ian* attaches to *grammar*, but semantically it has scope on the whole phrase *transformational grammar*: a *transformational grammarian* is a grammarian that works within the framework of transformational grammar, not a grammarian who is transformational. The traditional problem about these cases is that if we want to follow the semantics-driven analysis (where *-ian* takes the whole phrase as input), we must violate the Lexical Integrity Hypothesis and the No-Phrase Constraint (Botha 1984).

Now, if we turn to Italian, one more complication emerges, since – as noticed by Bisetto and Moschin (2010) and Booij and Masini (2015) – the suffix in Italian attaches to the left constituent (i.e., the head), thus splitting the original phrasal expression (example from Bisetto and Scalise 1991: 36, footnote 3):

(20) *flauto barocco* → *flaut-**ista** barocco*
flute baroque flute-ist baroque
'baroque flute' 'baroque flutist'

A *flautista barocco* is not a flutist that is baroque (although it could be forced into this interpretation), but a flutist who plays the baroque flute.[7] This pattern is recurrent with similar NA phrases with naming function – namely instances of what CxM calls "phrasal lexemes", or more precisely "phrasal nouns" (Booij 2009; Masini 2009) – as illustrated in (21) (see Virgillito 2010; Booij and Masini 2015 for more examples).

[7]Rainer (1993a: 116–117; 1993b: 102) considers similar examples from Spanish (within a more general discussion on "head-operations") and argues in favor of a phrasal account of these formations, whose peculiar semantics is dealt with by an "*ad hoc* rule of semantic interpretation" (Rainer 1993a: 117) referring to the corresponding expression. According to this view, there is no split structure here. Our account differs from the latter because we treat these phrasal expressions as constructions, hence as multiword units. As we will see in a few lines, a constructionist treatment also accounts for the semantic interpretation of these formations in a systematic way.

(21) a. *chitarra* *acustica* → *chitarr-**ista*** *acustico*
guitar acoustic guitar-ist acoustic
'acoustic guitar' 'acoustic guitarist'
b. *economia* *politica* → *econom-**ista*** *politico*
economy political econom-ist political
'political economy' 'political economist'

NA phrasal nouns are not the only phrasal lexemes to generate bracketing paradoxes of this kind. Phrasal nouns of the NPN type (very common in Italian and other Romance languages, cf. Masini 2009) act similarly:[8]

(22) a. *pizza* *al* *taglio* → *pizz-**eria*** *al* *taglio*
pizza at.the slice pizza-ery at.the slice
'pizza sold by the slice' 'pizzeria where pizza is served by the slice'
b. *strumento* *a* *corde* → *strument-**ista*** *a* *corde*
instrument at strings instrument-ist at strings
'stringed instrument' 'strings player'

A *pizzeria al taglio* is not a *pizzeria* sold by the slice, but a place where pizza is sold by the slice; and if I am a *strumentista a corde* I am not "stringed" in any way, but I play stringed instruments.

With respect to discontinuous idioms discussed in Sect. 2, this type of discontinuity manifests itself as another type of multiword expression (a phrasal noun) that is split by a derivational suffix. How can we account for such cases within CxM? Booij and Masini (2015) do so with the aid of a theoretical tool developed in CxM and called "second order schema" (SOS). A SOS "is a set of two or more paradigmatically related schemas" (Booij and Masini 2015: 49) that is used to express paradigmatic relations and generalizations in the lexicon. SOSs, which have proven very handy in representing a range of form-meaning mismatches in a variety of languages (Booij and Masini 2015), are formally expressed as follows:

(23) $< \text{FORM1} \leftrightarrow \text{FUNCTION1} >_{\text{SCHEMA1}} \approx < \text{FORM2} \leftrightarrow \text{FUNCTION2} >_{\text{SCHEMA2}}$

Therefore, a SOS explicitly states a paradigmatic relationship (formalized by coindexation of constituents, and marked by ≈) between two (or more) constructions (here SCHEMA 1 and SCHEMA 2). As regards the Italian bracketing paradoxes just mentioned, it is possible to represent them as follows:

[8]Rainer (1993a: 116) shows that in Spanish we get the diminutive *libr-ito de texto* (lit. book-DIM of text) 'little textbook' from *libro de texto* (lit. book of text) 'textbook', but not **libr-ero de texto* (lit. book-NMLZ of text) 'seller of textbooks (intended reading)'. Evaluative suffixation is therefore allowed, but category-changing suffixation is not, contrary to what happens in Italian, which allows both (see e.g. *strument-ino a corde* lit. instrument-DIM at strings 'little stringed instrument').

(24) $< [[x]_{\mathbf{N}k}\ [y]_{\mathbf{A}i}]_{N'j} \leftrightarrow [SEM_k \text{ with the property } SEM_i]_{\mathbf{j}} > \approx$
$< [[[x]_{\mathbf{N}k} + \textit{ista}]_{Nw}\ [y]_{\mathbf{A}i}]_{Nz} \leftrightarrow [SEM_w \text{ that has to do with } \mathbf{SEM_j}]_z >$

(25) $< [[x]_{\mathbf{N}k}\ [[z]_{\mathbf{P}}\ [y]_{\mathbf{N}i}]]_{\mathbf{N}'j} \leftrightarrow [SEM_k \text{ with relation R to } SEM_i]_{\mathbf{j}} > \approx$
$< [[[x]_{\mathbf{N}k}\text{SUFF}]_{Nw}\ [[z]_{\mathbf{P}}\ [y]_{\mathbf{N}i}]]_{N'z} \leftrightarrow [SEM_w \text{ that has to do with } \mathbf{SEM_j}]_z >$

The SOS in (24) generalizes over examples (20) and (21), whereas the formula in (25) generalizes over examples such as those illustrated in (22) (SUFF stands for either *-ista* or *-eria*). The second schemas in (24) and (25) are formally motivated by the presence of independently existing schemas such as $[[[x]_{\mathbf{N}k} + \textit{ista}]_{Nw}$ and, more generally, $[[x]_{\mathbf{N}k}\ \text{SUFF}]_{Nw}$. Although the affix formally attaches to the $[x]_{\mathbf{N}k}$, the cross-reference between the two schemas obtained via co-indexation – which allows the semantics of the second schema to refer to the meaning of the first schema (SEM_j) – guarantees that the correct semantics is computed out of the phrasal nouns, despite the form-meaning mismatch.

4 Case-Study 3: Parasynthesis

Starting from Darmesteter (1875), parasynthesis is the standard term used to designate Romance denominal and deadjectival prefixed verbs (*annodare* 'to knot' from *nodo* 'knot', *indebolire* to weaken' from *debole* 'weak') for which neither the non-prefixed V (*nodare*, *debolire*) nor the prefixed N or A (*annodo*, *indebole*) are actual words. This meaning of the term "parasynthesis" is used almost exclusively in the description of Romance languages. In other linguistic traditions, similar constructions are treated under headings such as "circumfixation" or "prefixal-suffixal formations". Although parasynthesis was already in use in Latin and is productive in all Romance languages, its specificity led to much debate in theoretical morphology, mostly because of the difficulty of (i) analyzing the phenomenon in a concatenative perspective (relative order of prefixation and suffixation) and (ii) accounting for the non-occurrence of the non-prefixed verb.

In this section we will claim that CxM shows clear advantages in the treatment of parasynthesis, as it can accommodate the instantiation of parasynthetic verbs from Ns/As without intermediate stages. The non-occurrence of the non-prefixed corradical verb finds an explanation, too, and at the same time its centrality is demoted with respect to the other features characterising parasynthesis. As we will see, CxM allows to view parasynthetic verbs as a non-exceptional phenomenon in Italian (and Romance) word formation, and to give a unified account of both the diachronic emergence of parasynthetic verbs and their synchronic vitality.

4.1 Theoretical Debate and Core Properties

Parasynthetic verbs are difficult to handle in a concatenative approach to word formation. Their peculiarities seem to collide with three general conditions postulated by generative morphology: *Binary Branching Hypothesis*, *Word Based Hypothesis, Right-Hand Head Rule*. Several solutions (which ultimately consist in some violation of one or more of these conditions) have been devised within concatenative-driven morphology to explain the apparent uniqueness of parasynthetic verbs. For example, Scalise (1984: 204), in order to save the *Binary Branching Hypothesis* (according to which only one affix may be attached to a word at each step of the derivation), allows a derogation of the *Word Based Hypothesis* (which holds that "[a] new word is formed by applying a regular rule to a single already existing word", Aronoff 1976: 21) arguing that parasynthetic verbs are derived from potential but non-attested bases (°*nodare* > *annodare* 'to knot'). The proposal envisages a two-step affixation for all prefixed verbs of which the corradical verb is non-attested, but this does not take into account either the specific semantic characteristics of parasynthetic prefixes or the reasons that may explain the non-attestation of the verbal bases.[9]

The solutions proposed in a concatenative perspective either deny the specificity of parasynthetic verbs, granting a prominent role to the notion of "potential word", or argue for *ad hoc* mechanisms that are not plausible from a formal and a semantic point of view (cf. Corbin 1980, who argues for the prefixation of nominal/adjectival bases before the verbal derivation).

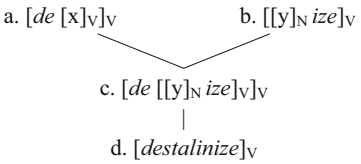
Of the three above-mentioned conditions, the *Right-Hand Head Rule* has been subject to severe criticism due to its empirical inadequacy. The *Binary Branching Hypothesis* may be accepted if reinterpreted not as a mandatory principle but rather as the most common relation between the constituents of a complex word. The difficulty of graphically representing the simultaneous addition of two affixes by a binary tree diagram cannot be the reason for not recognizing the existence of a simultaneous prefix + conversion process.

The distinction between actual and potential words is an important issue in morphology, due to its role in the discussion about what constitutes a possible base for productive word formation. Potential words can be defined as well-formed entities (i.e. resulting from productive word formation processes) but non-actual in the language. Already in his 1977 dissertation, Booij criticised the *Word Based Hypothesis* as too restrictive, and proposed to regard not only actual words but also potential words as valid bases for word formation processes. This position was further developed in CxM: Booij (2007: 39) for instance shows how a verb such as *destalinize* can be instantiated from a schema which is formed through unification of two independent schemas (see (26)); in this way, the verb *stalinize* is not required to be an actual word. As Booij (2007: 39) observes, "[t]he actual rise of such unified

[9]Cf. Iacobini (2004) and Serrano Dolader (2015) for a critical review of the different accounts of parasynthetic verbs.

templates is based on the possibility that the native speaker posits a direct connection between complex words and words that are two degrees less complex".

(26)



In a recent publication, Rainer (2012) traces the history of the notion of potential word and convincingly argues in favour of a trichotomy of "actual", "potential" and "virtual" words: "[t]he necessity of distinguishing two "modes of existence" among non-actual words stems from their different behaviour with respect to "blocking by word": while potential words (in my terminology) are possible bases of word-formation rules, it is shown that this is not the case for what I call virtual words (that is, blocked words)" (Rainer 2012: 165). Potential words (e.g. *to stalinize*) can readily be used given an appropriate context and can serve as intermediate stages in word formation (e.g. *stalinization*). On the contrary, virtual words cannot participate in further derivation:[10] "[t]hey surface only under very special circumstances such as slips of the tongue, fatigue, etc., and when they do, they are generally felt to be mistakes, even though speakers may agree that there is nothing wrong about them from a strictly morphological point of view" (Rainer 2012: 179).

Given the solution proposed by Booij (2007) for complex words such as *destalinize* (see (26)), we might be tempted to think that CxM can simply do without a notion of possible word, since it is no longer needed as an intermediate stage in derivation (*destalinize* is directly instantiated from the unified schema). As a matter of fact, we can still talk about possible words in CxM, both "potential" and "virtual" (in Rainer's sense): potential complex words would be words that are not instantiated from a schema (despite meeting all requirements for unification) due to a lack of communicative need; virtual complex words would be words that are not instantiated (despite meeting all requirements) because of the "no-synonymy principle" (Goldberg 1995), i.e. word blocking. Hence, the notion of possible word (potential and virtual) still has a place in CxM.

Following Iacobini (2004), we claim that the distinguishing features of Italian parasynthetic verbs can be summarized as follows:

1. the three prefixes productively employed in parasynthetic verbs (*ad-, in-, s-*) are devoid of a spatio-relational meaning; rather, parasynthetic verbs express the same semantic values that are expressed by verbs derived by conversion (cf. *imburrare* 'to butter' and *zuccherare* 'to sugar', respectively). The main function of these prefixes is therefore to mark a change of state: indeed, they form

[10] As an example of virtual word Rainer (2012: 174) mentions Germ. *Stehler,* equivalent to *stealer*, which is a non-actual word – blocked by the established synonym *Dieb* 'thief' – that cannot be derived, e.g.: **stehlerhaft* '(lit.) stealerish'.

verbs that encode ingressivity[11] (*addolcire* 'to sweeten', *ingrandire* 'to enlarge', *scaldare* 'to heat'), or, with nominal bases only, change of place (*intrappolare* 'to entrap') or, more marginally, the accomplishment of an action by means of a tool (*accoltellare* 'to stab, to knife');
2. the prefixes *ad-*, *in-* and *s-* with an ingressive value are used exclusively in parasynthetic verbs: they do not attach productively to verbal roots or denominal verbs derived by conversion or suffixation[12] (which basically invalidates Scalise's hypothesis of a possible but non-actual denominal verb to which the prefix would be added). It is important to stress that parasynthetic verbs are not formed by means of a phonologically realized suffix (i.e. *-izzare*, *-eggiare, -ificare*), but through conversion;
3. parasynthesis is the only productive way through which new verbs of the inflectional class *-ire* can be derived (*appiattire* 'to flatten', *innervosire* 'to annoy'). Conversion and suffixation can only derive *-are* verbs.

Summing up, the role of the prefix in parasynthetic verbs is to signal (more clearly than conversion) the change of state expressed in the categorial shift from N/A to V.[13] Moreover, the non-occurrence of the denominal verb does not represent a foundational feature for parasynthesis: we rather claim that the non-attestation of corradical verbs derived by conversion/suffixation is actually a by-product of the productivity of parasynthetic verbs, which themselves preempt and block possible equivalent verbs derived with other derivational means. The criteria that drive the choice between parasynthesis and other means can be explained in terms of analogical processes, such as the insertion into paradigmatic micro-series. For example, verbs like *accomunare* (1310–12) 'to join, to pool' and *associare* (1532) 'to associate' may have represented models for the coinage of *affratellare* (1600) 'to unite in brotherhood' (cf. Crocco Galèas and Iacobini 1993a). Borrowings may also play a role in the choice among different derivational patterns: borrowings from English show a preference for conversion or suffixation (e.g. *chattare*, cf. *to chat*, *liberalizzare*, cf. *to liberalize*), whereas those from other Romance languages may prefer parasynthesis (e.g. *allineare* 'to align' from Fr. *aligner*; *appesantire* 'to make heavier' from Fr. *appesantir*).

[11] We follow Grossmann (1994: 3–16) in the use of the term ingressive (and its antonym egressive) to name a phase of the event that refers to the transition from a state (which remains unspecified in parasynthesis) to another state (which is lexicalized by the base N/A), and that may also refer to the resulting new state of affairs.

[12] Prefixed verbal roots such as *aggiungere* 'to add', *iscrivere* 'to inscribe', *scorrere* 'to flow' trace back to Latin.

[13] As is known, in Italian verbs formed by conversion can express a wider range of meanings and actional features than those formed by parasynthesis. Moreover, the morphological structure of the bases is subject to less restrictions (cf. Grossmann 2004).

4.2 The Emergence of Parasynthetic Verbs within Verbal Derivation

In this section we show that parasynthesis is not an exceptional phenomenon in the context of Romance verb formation, but rather displays deep connections with other schemas of verbal derivation. A brief diachronic digression is in place here.

Parasynthesis, now productive in all Romance languages, established itself in Late Latin. Massive evidence can be found especially in those texts that are more influenced by spoken language or use a technical register (cf. Allen 1981; Crocco Galèas and Iacobini 1993b; Brachet 1999; Iacobini 2010). Parasynthesis emerges as a quantitatively significant, independent process starting from the third century AD, due to the progressive desemantization of some spatial prefixes (*ad-*, *in-*, *ex-* in particular). This desemantization and the increase in number of parasynthetic verbs is a progressive tendency during Latinity, but in Late Latin parasynthetic prefixes could still be used with their original spatial value with verbal stems (Lat. *adcurro* 'to run to' vs. *curro* 'to run', *includo* 'to enclose' vs. *claudo*/*cludo* 'to close, to shut'), as it used to happen in Classical Latin. The number and frequency of use of prefixed denominal and deadjectival verbs – where the prefix does no longer contribute a specific spatial meaning to the semantics of the derived verb (Lat. *accumulo* 'to gather into a heap, to pile up', *incurvo* 'to make curved or bent', *intitulo* 'to engrave an inscription on'), which cannot be distinguished from the corresponding denominal and deadjectival verbs (Lat. *cumulo*, *curvo*, *titulo*) – has favored the formation by analogy of prefixed verbs (whose base is a N/A) that lack a corresponding corradical denominal/deadjectival verb. In other words, we claim that the parasynthetic construction is the result of a process of reinterpretation of prefixed denominal and deadjectival verbs: by ignoring the intermediate stage represented by the denominal/deadjectival verb, a new derivational schema is gradually established, thus allowing the creation of verbs such as Lat. *adunco* 'to make hooked', *emanco* 'to maim, to mutilate', *inesco* 'to entice (animals) with bait' directly from a noun or an adjective (viz. Lat. *uncus* 'hook', *mancus, -a, -um* 'having a useless hand, maimed, crippled', *esca* 'bait'). The progressive reduction of the spatial/temporal system of verbal prefixation from Classical Latin to Romance languages had a clear role in favoring the emergence of parasynthetic verbs. Also, the emerging of parasynthetic construction spreads in a period of progressive disgregation of the Latin norms: the language is in search of a new balance that will lead to the creation of the morphological systems of Romance languages. In this context, parasynthesis might establish itself by virtue of its "iconicity": it signals in a clearer way than conversion the categorial change of the nominal/adjectival bases (suffixation in denominal and deadjectival verb formation is marginal in Latin).

Parasynthetic verbs are also connected to the semantic change of prefixes from a spatial to an aspectual meaning. The prefixes used in parasynthetic verbs have progressively lost their productivity as spatial modifiers and acquired the function of marking ingressivity: motion can indeed be reinterpreted metaphorically as a change of state.

In parasynthetic verbs the prefix *s-* expresses an opposite value as compared to the etymological meaning of Latin *ex-* 'out of, away from'. The point of transition between the original egressive value of the Latin prefix and the more recent ingressive one can be found in Latin causative verbs derived from As/Ns such as *effemino* 'to deprive of male characteristics, to emasculate', *essicco* 'to make dry, to dry up; to drain', *evaporo* 'to emit vapour', which refer to the process of dropping out of a state. This state (being male, being damp, being liquid) is not expressed in the verb, because it is considered intrinsic to the referent to which they refer (on the origin of these verbs cf. Brachet 1999). These verbs are easily reanalyzed as ingressive, since they express the transition to the state denoted by the nominal base: 'to become female or similar to a female', 'to become dry or drier', 'to become vapour'. These meanings are basically equivalent to those of parasynthetic verbs with *ad-* and *in-*: see synonymic pairs like Italian *allargare* and *slargare* 'to broaden, to widen' (from *largo* 'broad, wide').

4.3 Properties of Parasynthetic Constructions

Italian deadjectival parasynthetic verbs can be paraphrased as 'to make (more) A': *abbassare* 'to lower', *ammorbidire* 'to soften', *insudiciare* 'to soil', *smagrire* 'to make thin'. In general they are transitive causative verbs in which the subject causes a change of state in the object, and in which A represents the semantic core of the predication (e.g. *i pannelli solari scaldano l'acqua* 'solar panels warm the water'). They can also be used in unaccusative constructions (where the unvolitional subject undergoes a change of state), which often appears in the pronominal form (*l'acqua si scalda* lit. the water (SI) heats 'the water heats', *Gianni (si) ingrassa* lit. John (SI) fattens 'John fattens').

Adjectival bases are generally morphologically simple. The few existing exceptions are mainly due to denominal adjectives (e.g. *impietosire* 'to move to pity': *pietà* 'compassion' > *pietoso* 'compassionate').

The most numerous deadjectival parasynthetic verbs are those prefixed with *in-*, followed by those prefixed with *ad-*, whereas *s-* parasynthetic verbs are not many.[14] Single prefixes are not systematically associated with a dedicated meaning; also, no systematic relation can be envisaged between the meaning of the base and the inflectional class of the parasynthetic verb.[15]

Verbs ending in *-ire* are slightly more numerous than those ending in *-are*. Deadjectival parasynthetic verbs have a strong competitor in the suffix *-izzare* that, differently from parasynthesis, can freely attach to suffixed adjectives (e.g. *contesto* 'context' > *contestuale* 'contextual'' > *contestualizzare* 'to contextualize').

[14]Quantitative data on parasynthetic verbs are taken from Iacobini (2004).

[15]The choice of the inflectional class for new formations can be explained in terms of insertion in analogical series, see Sect. 4.4.

Overall, in CxM terms, we can propose the following schema for Italian deadjectival parasynthetic verbs:

(27) a. $< [\text{PREF}\ [[x]_{A\alpha k}]_{V\beta i}]_{V\gamma j} \leftrightarrow [\text{CAUSE to BECOME (more) SEM}_k]_j >$
where: α = simple A (mostly); γ = *-are/-ire* inflectional class, transitive

The meanings expressed by denominal parasynthetic verbs are more varied compared to deadjectival parasynthetic verbs: very often, they involve semantic features related to the activities normally associated with the referent denoted by N. The two main meanings are causative and spatial, to which two other meanings are associated: instrumental and ornative.

Verbs with causative meaning represent about 50% of denominal parasynthetic verbs. Like deadjectival verbs, they are generally transitive (e.g. *inscheletrire* 'to make slimmer', from *scheletro* 'skeleton') and can be used in the anticausative alternation (e.g. *inscheletrirsi* 'to slim down').[16] Three main subtypes can be identified:

1. 'to cause, produce, (make) acquire N': these verbs have abstract Ns as bases, mostly referring to psychological states, and are the most similar to the ones derived from adjectival bases:

(28) a. $< [\text{PREF}\ [[x]_{N\alpha k}]_{V\beta i}]_{V\gamma j} \leftrightarrow [\text{CAUSE to have SEM}_k]_j >$
where: α = abstract N (mostly); γ = *-are/-ire* inflectional class, transitive
b. *affascinare* 'to fascinate' (N = *fascino* 'charm'), *impaurire* 'to frighten' (N = *paura* 'fear')

2. 'to (make) become (a) N', where bases are mostly concrete Ns:

(29) a. $< [\text{PREF}\ [[x]_{N\alpha k}]_{V\beta i}]_{V\gamma j} \leftrightarrow [\text{CAUSE to BECOME (a) SEM}_k]_j >$
where: α = concrete N (mostly); γ = *-are/-ire* inflectional class, transitive
b. *impastare* 'to knead' (N = *pasta* 'dough'), *sbriciolare* 'to crumble' (N = *briciola* 'crumb')

3. 'to (make) become like (a) N':

(30) a. $< [\text{PREF}\ [[x]_{N\alpha k}]_{V\beta i}]_{V\gamma j} \leftrightarrow [\text{CAUSE to BECOME like (a) SEM}_k]_j >$
where: α = animate N (mostly); where: γ = *-are/-ire* inflectional class, transitive
b. *scamosciare* 'to chamois, to suede' (N = *camoscio* 'chamois')

[16] Some of these verbs are only attested in the pronominal intransitive form (e.g. *accapponarsi* 'to get gooseflesh', from *cappone* 'capon'), although the corresponding transitive verb would be a possible word.

Approximately 40% of denominal verbs express spatial meaning. Among these, a distinction into two main subtypes can be made, depending on whether the referent of the base noun represents the Ground (31), i.e. the place where something or someone is to be placed (e.g. *infornare* 'to put in the oven'), or the Figure (32), i.e. a localized object (e.g. *ammobiliare* 'to furnish, i.e. to put the furniture in a house'). The two spatial interpretations (localized object/space of localization) of parasynthetic verbs may depend on the semantics of the noun (cf. *impollinare* 'to pollinate': localized object vs. *imbottigliare* 'to bottle': space of localization).[17]

(31) a. $< [\text{PREF}\ [[x]_{\mathbf{N}\alpha k}]_{\mathbf{V}\beta i}]_{\mathbf{V}\boldsymbol{\gamma} j} \leftrightarrow [\text{move to SEM}_k]_j >$
where: N = Ground; $\boldsymbol{\gamma}$ = *-are*/*-ire* inflectional class, transitive

(32) a. $< [\text{PREF}\ [[x]_{\mathbf{N}\alpha k}]_{\mathbf{V}\beta i}]_{\mathbf{V}\boldsymbol{\gamma} j} \leftrightarrow [\text{provide with SEM}_k]_j >$
where: N = Figure; $\boldsymbol{\gamma}$ = *-are*/*-ire* inflectional class, transitive

Verbs of both types are usually transitive. Some of the Figure-parasynthetic verbs may acquire an ornative meaning, since the approaching of a Figure can be ultimately reinterpreted as the addition of something (e.g. *incoronare* 'to crown, i.e. to put the crown on someone's head').

Verbs with spatial meaning can take on an instrumental reading, which we analyze as a sense extension resulting from a change of perspective: rather than on the change of position of the localized object (the base N), the verb focuses on the use of that object to perform some action and on the result of that action. The identification of this autonomous semantic type (which is therefore analyzed as a subschema of the Figure construction in (32), cf. (33)) is justified by verbs like *addentare* 'to bite' (N = *dente* 'tooth'), *impallinare* 'to riddle with bullets' (N = *pallino* 'pellet'), where no spatial value can be detected. Instrumental parasynthetic verbs are transitive, activity verbs that appear as unergatives when used intransitively; instead, change-of-state and spatial parasynthetic verbs are accomplishment and achievement verbs, respectively, that may be used as unaccusatives when entering the anticausative alternation.

(33) a. $< [\text{PREF}\ [[x]_{\mathbf{N}\alpha k}]_{\mathbf{V}\beta i}]_{\mathbf{V}\boldsymbol{\gamma} j} \leftrightarrow [\text{use SEM}_k \text{ to do something}]_j >$
where N = Figure / where $\boldsymbol{\gamma}$ = *-are*/*-ire* inflectional class, transitive

In denominal parasynthetic verbs the prefixes *in-* and *s-* prevail over *ad-*, and the inflectional class *-are* prevails over *-ire*. The formation of intransitive (non-pronominal) parasynthetic verbs does not seem to be productive, except for analogic formations such as *allunare* 'to land on the moon', *ammartare* 'to land on Mars', built on the model of *atterrare* 'to land', *ammarare* 'to land on water'.

Parasynthetic verbs convey meanings that can also be expressed through conversion (cf. *immagazzinare* 'to store' vs. *stivare* 'to stow in a ship's or plane's

[17]However, it is not always possible to classify a verb in one of these two types. For example, in *incorniciare un quadro* 'to frame a picture', *cornice* 'frame' may be the Figure (put the frame around the picture) but also the Ground (put the picture in the frame), depending on the perspective.

hold') or suffixation (cf. *irrobustire* 'to stenghten' vs. *fortificare* 'to fortify'). On the other hand, they convey opposite meanings compared to verbs with egressive prefixes such as *de-*, *dis-*, and *s-*. The latter prefixes differ from parasynthetic prefixes because they can be productively employed with verb roots (*disfare* 'to undo', *slegare* 'to untie'), denominal/deadjectival verbs formed by suffixation (*disindustrializzare* 'to deindustrialize', *decalcificare* 'to decalcify') or conversion (*decolorare* 'to discolour', *smascherare* 'to unmask'), and already prefixed verbs (*decongelare* 'to thaw', *scomporre* 'to break into pieces').[18] Egressive prefixes and prefixes forming parasynthetic verbs have often been confused since the former, too, derive from a spatial-to-actional semantic change, namely from values of exit/departure/separation (*sbarcare* 'to disembark') to reversative (*decontaminare* 'to decontaminate', *snodare* 'to unknot') and privative values (*diserbare* 'to weed'). Confusion may also stem from the fact that egressive prefixes also appear in verbs where the non-prefixed corradical verb is not attested (e.g. *derattizzare* 'to get rid of rats' but °*rattizzare* 'to provide with rats'). However, the non-attestation of (a small proportion of) verbal bases with egressive prefixes is due to pragmatic reasons, viz. the lack of need for such a word. For example, items such as *disossare* 'to debone' or *sbudellare* 'to gut' describe an event that cancels an inherent state or a normal condition of the affected entity: bones and guts are inalienable to human beings. Thus, it is not necessary to posit an event resulting in a given state to create the corresponding privative/reversative with egressive prefixes: you can desalinate a fish which has been previously salted, but you can also desalinate sea water. This also means that, if needed, for whatever reason, the non-prefixed denominal verbs might come into use: right now the forms °*caffeinare* (cf. *decaffeinare* 'to decaffeinate') and °*forestare* (cf. *deforestare* 'to deforest') are potential words in Italian, but they might become actual, given the proper conditions, like what happened with *nuclearizzare* 'to nuclearize' and *umidificare* 'to humidify', which were coined after their corresponding prefixed verbs (*denuclearizzare* 'to denuclearize', *deumidificare* 'to dehumidify').

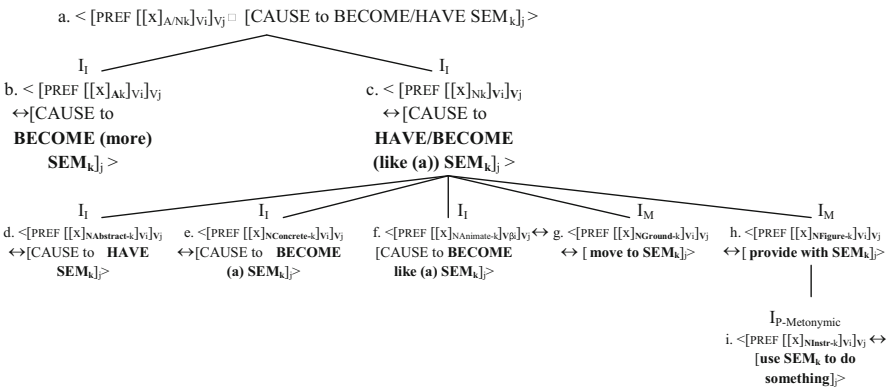
Verbs with egressive prefixes with non-attested, non-prefixed bases are described as verbs with a double derivational stage by Crocco Galèas and Iacobini (1993b). Such a labelling hints at the plausibility of reconstructing an intermediate stage featuring a denominal/deadjectival verb formed by conversion/suffixation that is semantically distinct from the prefixed verb. Non-attested non-prefixed verbs corresponding to verbs with egressive prefixation are therefore 'potential' words (in Rainer's sense) that can become actual if needed, whereas those corresponding to parasynthetic verbs are "virtual", since they are blocked by the parasynthetic verb itself.

[18]Egressive prefixes are normally attached to telic verbs since the reversative action presupposes the achievement of a state.

4.4 A Network of Parasynthetic Constructions

From previous sections we have learned that a parasynthetic construction gradually emerges diachronically as an independent construction due to the combination of a number of factors: entrenchment of denominal/deadjectival verbs, desemantization of prefixes and consequent reinterpretation i) of prefixed verbs as derived directly from base nouns/adjectives, and ii) of prefixes as markers of change of state (ingressivity). New parasynthetic verbs in contemporary Italian are derived directly from this schematic parasynthetic construction, which governs a number of subschemas with partially different properties (Sect. 4.3), as illustrated in the hierarchy below[19]:

(34) Inheritance hierarchy for (transitive) Italian parasynthetic verbs



As we can see, the maximally schematic parasynthetic construction (34a) with ingressive meaning develops a rich hierarchy. First of all, it is instantiated by two equally schematic subconstructions: the one in (34b) represents deadjectival parasynthetic verbs, the one in (34c) denominal parasynthetic verbs. The latter governs a range of subschemas: (34d), (34e) and (34f) refer to subtypes described in (28)–(30) above (different types of nouns occur in these subschemas) and are linked to the mother construction by means of an instance inheritance link (I_I) (Goldberg 1995), whereas (34g) and (34h) refer to parasynthetic verbs with spatial meaning (Ground-parasynthetic verbs and Figure-parasynthetic verbs, respectively) and are linked to (34c) via a metaphorical inheritance link (I_M). Finally, the schema for parasynthetic verbs with instrumental reading (34i) is linked to (34h) with a polysemic inheritance link of a metonymic kind ($I_{P\text{-}Metonymic}$).

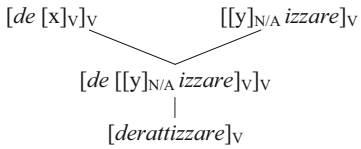
Ingressive parasynthetic verbs are instantiated directly from these schemas, via unification with a noun or adjective. The non-prefixed corradical verb is a virtual (in Rainer's sense), hence non-attested, word which is blocked by the

[19]Notation is simplified for the sake of readability, we refer to schemas in Sect. 4.3 for details.

parasynthetic verb itself, since it would carry the same semantics.[20] Since parasynthetic verbs are largely equivalent semantically independently of the prefix used (*ad-*/*in-*/*s-*), and the combinations of their properties (prefix, base, inflectional class) show differences in frequency (*ad-* combines preferably with *-are*) but no systematic correlation, new verbs are formed by analogy with actual verbs, thus clustering in "paradigmatic families" (cf. Crocco Galèas and Iacobini 1993a). The quite recent coinage of *imberlusconirsi* 'to become like Silvio Berlusconi, imitating his manner and behavior', for instance, is probably related to other similar verbs, such as *inasinirsi* (from *asino* 'donkey'), whose semantics can be paraphrased 'to become, behave like a donkey, showing stupidity and ignorance'.

As for egressive verbs, most of the times they are the result of verbal prefixation (e.g. *ospedalizzare* 'to hospitalize' vs. *deospedalizzare* 'to dismiss from the hospital'). In the very few cases in which the corradical verb of egressive prefixed verbs is non-attested (e.g. *derattizzare* 'to get rid of rats' vs. °*rattizzare*), the latter can be regarded as a potential word (expressing the resulting state that is removed by the egressive prefix) that may become an actual word given the right pragmatic and communicative conditions. The CxM solution for these cases is "schema unification" (like in (26)), as illustrated in (35), where the *de-* schema and the *-izzare* schema are unified into a *de*-N/A-*izzare* schema (endowed with its own productivity) from which complex words like *derattizzare* are derived, via unification with a N/A.

(35)



One last case that needs to be discussed is exemplified by antonymic pairs like the following:

(36)

a.	b.
inchiodare 'to nail'	*schiodare* 'to unnail'
avvitare 'to screw'	*svitare* 'to unscrew'
abbottonare 'to fasten with buttons'	*sbottonare* 'to unfasten the buttons'

Examples in 'a' are parasynthetic verbs, whereas in 'b' we have egressive verbs with prefix *s-* (other possible prefixes are *de-* and *dis-*) that are coined via affix

[20]The actual use of the botanical term *bottonare* 'to bud' cannot be considered a violation of the blocking of corradical denominal verbs of parasynthetic verbs (see *abbottonare* 'to fasten with buttons'), but rather a confirmation of it, given the different semantics and its use in specialized terminology. According to Bauer (1983: 88), "blocking prevents not so much the coining of nonce complex forms as their institutionalization: stealer might be said by an individual on a single occasion, but would not become established unless the lexeme were used to denote some specific new subgroup of thieves or robbers".

replacement from parasynthetic verbs (concatenation of prefixes is also attested but much less frequent: *incrostare* 'to encrust' vs. ***dis****incrostare* 'to descale' */s/crostare* 'to strip'): clearly, we are dealing with a paradigmatic relationship, since *sbottonare* does not mean 'to deprive of buttons', but 'to unfasten the buttons that were previously fastened', hence the reversative *s-* has scope over *abbottonare*, not *bottone* 'button' (its base). These cases can be represented, in CxM, by means of the already mentioned second order schemas (SOS; cf. Section 3):

(37) $<$ [{*a-*|*in-*} [[x]$_{N/Ak}$]$_{Vi}$]$_{Vj}$ $\leftrightarrow$ [CAUSE to BECOME/HAVE SEM$_k$]$_j$ $> \approx$
$<$ [{*s-*|*de-*|*dis-*} [[x]$_{N/Ak}$]$_{Vi}$]$_{Vw}$ $\leftrightarrow$ [REVERSE **SEM$_j$**]$_w$ $>$

Thanks to the paradigmatic relation represented by this SOS, the meaning of the *s-* verb can be defined with relation to SEM$_j$, i.e. the meaning of the corresponding *a−/in-* parasynthetic verb. This SOS also accounts for pairs such as *accelerare* 'to speed up' vs. *decelerare* 'to decelerate', where the second one is a borrowing from English.

5 Case-Study 4: Discontinuous Reduplication with Numerals

Although less grammaticalized than in other languages, total reduplication is well attested in Italian, where it conveys different functions, also depending on the lexical category involved (cf. Rainer 1983 for a useful overview). Wierzbicka (1986) identifies various types of "syntactic reduplication" in Italian, the most typical being adjectival or adverbial reduplication with an intensifying function:

(38) a. *bella bella* lit. beautiful beautiful 'very beautiful'
b. *adagio adagio* lit. slowly slowly 'very slowly'

However, some cases of adjectival reduplication are not strictly speaking intensifying. Take for instance (39): here the repetition of *nero* 'black' doesn't mean 'very black', but rather stresses the accuracy of the utterance (really/literally/exactly black). As D'Achille and Grossmann (2010: 407) put it, the reduplication of a color term, when used literally, has the effect of referring to the focal point of the color itself.

(39) *nero nero* lit. black black 'really/literally/exactly black'

A similar effect is obtained when a "contrastive focus reduplication" (Gomeshi et al. 2004) is used: in this case a noun is reduplicated with the intention of referring to the prototypical member of the corresponding category, as exemplified by the following examples mentioned by Wierzbicka (1986: 297 and ft. 6) (cf. also Lepschy and Lepschy 1984: 103; Medici 1959: 84).

(40) a. *caffè caffè* lit. coffee coffee 'real/true coffee, not a surrogate'
b. *lana lana* lit. wool wool 'genuine wool'

Finally, in the realm of verbs, we might have still other semantic effects at play. As noted by Bertinetto (2001: 50), when we repeat a verb form, that verb – if durative – may acquire continuous aspect (cf. (41a)); if the verb is not durative it may acquire iterative aspect, as in (41b).

(41) a. *La guardava e rideva, rideva, rideva*
'He looked at her and kept on laughing'
b. *Bussò, bussò, bussò, ma non c'era nessuno*
'He knocked many times / repeatedly, but nobody was there'

Italian reduplication therefore seems to conform to the variety of meanings that are typically associated with reduplication in the languages of the world (cf. Moravcsik 1978). A constructionist analysis of Italian reduplication would be interesting in its own right, since non-concatenative patterns can be handled by means of schemas in CxM (see Booij 2010: 40 for a treatment of total reduplication in Afrikaans compatible with the analysis in Botha 1988). However, this paper is about discontinuity, which leads us to narrow down our focus to a very specific kind of total reduplication which involves cardinal numerals and which has been barely noticed so far.[21] Take the following examples:[22]

(42) a. [. . .] *un uxoricida se l'è cavata con* ***due-giorni-due*** *di galera*
'[. . .] a man who killed his wife got away with it with two (two! can you imagine?!) days in jail' (lit. two-days-two)
b. *Una spolverata di pepe, e se ne avete,* ***tre-gocce-tre*** *di vino bianco*
'A sprinkle of pepper and, if available, three (and no more) drops of white wine' (lit. three-drops-three)
c. [. . .] *quel Brasile che ha dichiarato* ***sette-giorni-sette*** *di lutto per commemorare la morte di Giovanni Paolo Secondo*
'[. . .] that Brasil that declared seven days (seven! can you imagine?!) of mourning to commemorate the death of John Paul II' (lit. seven-days-seven)

As you can see, the numeral (here *due* 'two', *tre* 'three' and *sette* 'seven') is repeated not immediately (as we would expect in 'traditional' reduplication) but right after the noun it modifies. No pause is taken between the noun and the repeated numeral; quite to the contrary, the sequence NUM_i-N-NUM_i is pronounced all together, within a single intonational contour, as one complex word. This is also reflected ortographically by the two dashes that are found in these expressions most of the time (*due-giorni-due* vs. *due giorni due*). The intonational properties of the construction might be in part responsible for the fact that the construction basically

[21] A brief mention to this construction is found in Bazzanella (2011a: 16).

[22] All examples from this section are taken from the *itTenTen10* web corpus (almost 2.6 billion words), available on the SketchEngine (https://www.sketchengine.co.uk).

admits only single bare nouns (either singular or plural), except very rare cases like the following:

(43) a. *Tutto* [. . .] *risolto con* ***due-battute-di-dialogo-due*** [. . .]
'All [. . .] solved with just two lines of dialogue'
b. [. . .] *quelli che* [. . .] *non hanno più prodotto neppure* ***una-paginetta-dattiloscritta-una*** [. . .]
'[. . .] those who [. . .] have no longer produced a single typewritten page, not even one'

The basic meaning conveyed by this construction is one of precision: *tre-gocce-tre* in (42b) means exactly three drops, no less, no more. This contrasts with the approximating reading that numbers often have in Romance and other languages (e.g. *mettere quattro cose in valigia* lit. to put four things in suitcase, 'to put a couple of / few things in one's suitcase'; *ti ho chiamato mille volte* lit. (I) called you thousand times, 'I called you many many times'; cf. Bazzanella 2011b; Voghera 2017): thus, reduplication here seem to have a function that is similar to contrastive focus reduplication (see (40)), since it stresses that the numeral should be interpreted literally, in its core, prototypical use.[23]

Often, the reading is "scalar": in (43a), for instance, *due-battute-di-dialogo-due* means 'just/only/merely two', whereas in (43b) the scalar meaning is patent due to the presence of *neppure* 'not even'. In addition, a more subjective, evaluative meaning emerges in some cases, whose manifestation depends on the context. In (42a), for instance, the 'two-days-two' in jail are clearly judged as far too few for the crime in question; by stressing that the days in jail where *only* two, the speaker also expresses his/her disbelief or distress towards the situation. In (42c), instead, the 'seven-days-seven' are judged as far too many for the commemoration in question; again, the judgement of the speaker emerges between the lines. The reduplicated number can therefore be judged as too low (*paucity reading*) or too high (*excess reading*): in both cases, it deviates from an ideal expected value that corresponds to the speaker's beliefs, and this deviation may affect the speaker to a certain extent.[24]

A cursory look at data from the itTenTen10 corpus shows that many numbers and many nouns can appear in this construction. Numbers *due* 'two' and *tre* 'three' are the most frequently used, followed by *un(o|a)* 'one'; (token) frequency diminishes as we proceed towards higher numerals (*quattro* 'four', *cinque* 'five', etc.). However, higher numerals are not banned from occurring in the construction, as (44) exemplifies:

[23] We would like to thank Miriam Voghera for this observation.

[24] The precise semantic profile of this construction deserves further investigation: this is meant as a first attempt at grasping its semantic and pragmatic content. Its representation in schema (45) is therefore tentative.

(44) a. [. . .] *fu trasferito dalla sua bella casa in una prigione, dove trascorse* ***tredici-mesi-tredici***.
'[. . .] (he) was transferred from his beautiful house to a prison, where he stayed for thirteen months (!)' (lit. thirteen-months-thirteen)

b. [. . .] *seppe rapire l'audience nel 2004 con* ***trenta-secondi-trenta*** *di apparizione*
'[. . .] (he) was able to fascinate the audience in 2004 with just thirty seconds of appearance' (lit. thirty-seconds-thirty)

This means that the pattern is available for the instantiation of new expressions. In terms of CxM, we may therefore posit a schema like the following:

(45) $< [[x_j]_{NUM\alpha k}\ [y]_{N\beta i}\ [x_j]_{NUM\alpha k}]_{N\beta i} \leftrightarrow [\text{exactly}_{([+EVAL])}\ SEM_k \text{ with reference to } SEM_i]_i >$

where we have (i) a form with three slots occupied by variables, two of which are identical ($[x_j]_{NUM\alpha k}$) and surround the central one (the head noun), and (ii) a semantics that conveys precision and (optionally) evaluation/judgement on the part of the speaker (here tentatively and sketchily represented with feature [+EVAL]; cf. footnote 22). The prosodic properties of the whole construction (single intonational contour) will have to be specified within the β features of the output form.

Finally, it is worth noting that the function expressed by this construction couldn't possibly be conveyed by a contiguous reduplication of the numeral under the same prosodic conditions, i.e., we cannot say *tre-tre-gocce* 'three three drops' (vs. (42b)) or *trenta-trenta-secondi* 'thirty thirty seconds' (vs. (44b)) without pauses. We may obtain a similar effect only by repeating the numeral after a long pause, possibly with further material expressing surprise or unexpectedness in between (e.g. *trenta – capito? – trenta secondi* lit. thirty – understand? – thirty seconds; *trenta – dico trenta – secondi* lit. thirty – (I)say thirty – seconds). In the latter case, both occurrences of the numeral would be prosodically stressed, whereas this does not happen in the discontinuous reduplication with numerals, which therefore qualifies as a full-fledged independent construction.

6 Conclusion

In this paper, we put together a set of linguistic phenomena from the Italian language that share the property of being characterized by structural discontinuity of some sort. Most are well-known phenomena (particle shift, parasynthesis, bracketing paradoxes), although not always typically associated with Italian (particle verbs and particle shift are much more widespread and salient in Germanic languages). However, one specific construction – discontinuous reduplication with numerals – has received its first systematic treatment in the present paper, which therefore contributes new data beside new analyses. Some of the discussed phenomena are not specific to Italian: parasynthesis is also found in other Romance languages (e.g.

Table 1 Discontinuous structures in Italian and their constructional treatment

Discontinuous structures	Type of discontinuity	Technical solution
Particle shift (and discontinuous idioms)	Split multiword expression (by argument)	(Emerging) allostructions
Bracketing paradoxes	Split multiword expression (by affix)	Second order schemas (SOS)
Parasynthesis	Split affix (circumfix)	*Ad hoc* template
		Unified schemas
		Second order schemas (SOS)
Discontinuous reduplication with numerals	Split reduplicated form	*Ad hoc* template

French *enrichir* 'to enrich'), together with braketing paradoxes with a 'splitting suffix' (e.g. Spanish *guitarra clásica* > *guitarr**ista** clásico*; but see Rainer's 1993a,b different account, cf. footnote 6). Therefore, the analyses proposed for Italian data might be tested and extended to similar data in other languages.

We applied the tools of CxM (and Construction Grammar) to account for the phenomena under discussion, including their emergence (for particle shift and parasynthetic verbs). Although all of them share some form of non-contiguity, its exact nature proved to be different in each case. This resulted in the use of a variety of theoretical tools, depending on the type of discontinuity displayed by each case-study. Therefore, different technical solutions were proposed, as summarized in Table 1, although some tools are in fact recurring, such as *ad hoc* templates (as one would expect) and second order schemas.

In conclusion, CxM proves to be a flexible theoretical framework that can accommodate morphological and lexical structures that would be more problematic in more "concatenative" models: discontinuity, therefore, has its place in a constructionist framework.

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References

Allen, A.S. 1981. The development of prefixal and parasynthetic verbs in Latin and Romance. *Romance Philology* 35: 79–87.

Aronoff, M. 1976. *Word formation in generative grammar*. Cambridge, MA: MIT Press.

Baroni, M., S. Bernardini, F. Comastri, L. Piccioni, A. Volpi, G. Aston, and M. Mazzoleni. 2004. Introducing the 'la Repubblica' corpus: A large, annotated, TEI(XML)-compliant corpus of newspaper Italian. In *Proceedings of the 4th international conference on Language Resources and Evaluation (LREC 2004)*, 1771–1774. Parigi: ELRA.

Bauer, L. 1983. *English word-formation*. Cambridge: Cambridge University Press.

Bazzanella, C. 2011a. Numeri per contare e per parlare. In *Numeri per parlare. Da 'quattro chiacchiere' a 'grazie mille'*, ed. Carla Bazzanella, Rosa Pugliese, and Erling Strudsholm, 3–20. Roma/Bari: Laterza.

———. 2011b. Approssimare con i numeri nelle lingue. In *Numeri per parlare. Da 'quattro chiacchiere' a 'grazie mille'*, ed. Carla Bazzanella, Rosa Pugliese, and Erling Strudsholm, 21–58. Roma/Bari: Laterza.

Bertinetto, P.M. 2001. Il verbo. In *Grande grammatica italiana di consultazione*, ed. L. Renzi and G. Salvi, vol. II, 13–162. Il Mulino: Bologna.

Bisetto, A., and F. Moschin. 2010. *Bracketing paradoxes as constructions*. Paper presented at the 14th International Morphology Meeting (IMM14), Budapest, May 13–16, 2010. http://www.nytud.hu/imm14/abs/bisetto_moschin.pdf. Accessed 19 Feb 2017.

Bisetto, A., and S. Scalise. 1991. Compounding: Morphology and/or syntax? In *The boundaries of morphology and syntax*, ed. L. Mereu, 31–48. Amsterdam/Philadelphia: John Benjamins.

Blom, C. 2005. *Complex predicates in Dutch: Synchrony and diachrony*. Utrecht: LOT.

Booij, G. 1977. *Dutch morphology. A study of word formation in generative grammar*. Lisse/Dordrecht: The Peter de Ridder Press/Foris Publications.

———. 2002. Constructional idioms, morphology and the Dutch lexicon. *Journal of Germanic Linguistics* 14: 301–329.

———. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th Décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 34–44. Cascadilla Proceedings Project: Somerville.

———. 2009. Phrasal names: A constructionist analysis. *Word Structure* 2: 219–240.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2015. Word formation in construction grammar. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, vol. 1, 188–202. Berlin/New York: Walter de Gruyter.

Booij, G., and F. Masini. 2015. The role of second order schemas in the construction of complex words. In *Semantics of complex words*, ed. L. Bauer, L. Kőrtvélyessy, and P. Štekauer, 47–66. Cham: Springer.

Botha, R. 1984. *Morphological mechanisms: Lexicalist analyses of synthetic compounding*. Oxford: Pergamon Press.

———. 1988. *Form and meaning in word formation: A study of Afrikaans reduplication*. Cambridge: Cambridge University Press.

Brachet, J.-P. 1999. *Les préverbes ab-, de-, ex- du latin: étude linguistique*. Villeneuve d'Ascq: Presses du Septentrion.

Bybee, J. 2006. From usage to grammar: The mind's response to repetition. *Language* 82: 529–551.

———. 2013. Usage-based theory and exemplar representations of constructions. In *The Oxford handbook of construction grammar*, ed. Th. Hoffmann and G. Trousdale, 49–69. Oxford: Oxford University Press.

Cappelle, B. 2006. Particle placement and the case for 'allostructions'. *Constructions* SV1–7/2006. www.constructions-online.de.

Corbin, D. 1980. Contradictions et inadéquations de l'analyse parasynthétique en morphologie dérivationnelle. In *Théories linguistiques et traditions gramaticales*, ed. A.-M. Dessaux-Berthouneau, 181–224. Lille: Presses Universitaires de Lille.

Cresti, E., and M. Moneglia, eds. 2005. *C-ORAL-ROM integrated reference corpora for spoken romance languages*. Amsterdam/Philadelphia: John Benjamins.

Crocco Galèas, G., and C. Iacobini. 1993a. The Italian parasynthetic verbs: A particular kind of circumfix. In *Natural morphology. Perspectives for the nineties*, ed. L. Tonelli and W.U. Dressler, 127–142. Padova: Unipress.

Crocco Galèas, G., and C. Iacobini. 1993b. Parasintesi e doppio stadio derivativo nella formazione verbale del latino. *Archivio Glottologico Italiano* 78: 167–199.

D'Achille, P., and M. Grossmann. 2010. I composti aggettivo + aggettivo in italiano. In *Actes du XXVe Congrès International de Linguistique et de Philologie Romanes (3–8 sept. 2007, Innsbruck), VII*, ed. M. Iliescu, H.M. Siller-Runggaldier, and P. Danler, 405–414. Berlin: Mouton de Gruyter.

Darmesteter, A. 1875. *Traité de la formation des mots composés dans la langue française comparée aux autres langues romanes et au latin*. Paris: Bouillon Franck.
De Mauro, T., F. Mancini, M. Vedovelli, and M. Voghera, eds. 1993. *Lessico di frequenza dell'italiano parlato*. Milan: ETAS libri.
Dehé, N. 2002. *Particle verbs in English: Syntax, information structure, and intonation*. Amsterdam/Philadelphia: John Benjamins.
Diessel, H., and M. Tomasello. 2005. Particle placement in early child language: A multifactorial analysis. *Corpus Linguistics and Linguistic Theory* 1: 89–111.
Emonds, J. E. 1970. *Root and structure-preserving transformations*. Doctoral dissertation, MIT.
Fraser, B. 1976. *The verb-particle combination in English*. New York/San Francisco/London: Academic.
Ghomeshi, J., R. Jackendoff, N. Rosen, and K. Russell. 2004. Contrastive focus reduplication in English (the salad-salad paper). *Natural Language & Linguistic Theory* 22: 307–357.
Goldberg, A. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: University of Chicago Press.
———. 2006. *Constructions at work*. Oxford: Oxford University Press.
Gries, S. 1999. Particle movement: A cognitive and functional approach. *Cognitive Linguistics* 10: 105–145.
———. 2003. *Multifactorial analysis in corpus linguistics: The case of particle placement*. London: Continuum.
Grossmann, M. 1994. *Opposizioni direzionali e prefissazione analisi morfologica e semantica dei verbi egressivi prefissati con des- e es- in catalano*. Padova: Unipress.
———. 2004. *Conversione in verbi*. In Grossmann & Rainer (eds.), 534–549.
Grossmann, M., and F. Rainer, eds. 2004. *La formazione delle parole in italiano*. Tübingen: Niemeyer.
Iacobini, C. 2004. *Parasintesi*. In Grossmann & Rainer (eds.), 165–188.
———. 2009. The role of dialects in the emergence of Italian phrasal verbs. *Morphology* 19: 15–44.
———. 2010. Les verbes parasynthétiques: de l'expression de l'espace à l'expression de l'action. *De lingua Latina* 3. http://www.paris-sorbonne.fr/IMG/pdf/Iacobini_parasynthetiques.pdf.
———. 2015. Particle-verbs in romance. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, 627–659. Berlin/New York: Walter de Gruyter.
Iacobini, C., and F. Masini. 2007. The emergence of verb-particle constructions in Italian. *Morphology* 16: 155–188.
Jackendoff, R. 1990. *Semantic structures*. Cambridge, MA: MIT Press.
———. 1997. *The architecture of the language faculty*. Cambridge, MA: MIT Press.
Lepschy, A.L., and G.C. Lepschy. 1984. *La lingua italiana: storia, varietà dell'uso, grammatica*. Milano: Bompiani.
Lo Duca, M. G. 2004. *Nomi di agente*. In Grossmann & Rainer (eds.), 191–217.
Masini, F. 2005. Multi-word expressions between syntax and the lexicon: The case of Italian verb-particle constructions. *SKY Journal of Linguistics* 18: 145–173.
———. 2008. Verbi sintagmatici e ordine delle parole. In *I verbi sintagmatici in italiano e nelle varietà dialettali. Stato dell'arte e prospettive di ricerca*, ed. M. Cini, 83–102. Frankfurt am Main: Peter Lang.
———. 2009. Phrasal lexemes, compounds and phrases: A constructionist perspective. *Word Structure* 2: 254–271.
———. 2012. *Parole sintagmatiche in italiano*. Roma: Caissa Italia.
Masini, F., and J. Audring. Forthcoming. Construction morphology. In *The Oxford handbook of morphological theory*, ed. J. Audring and F. Masini. Oxford: Oxford University Press.
Masini, F., and S. Scalise. 2012. Italian compounds. *Probus* 24: 61–91.
Medici, M. 1959. Il tipo 'caffè-caffè'. *Lingua nostra* 20: 84.
Moravcsik, E. 1978. Reduplicative constructions. In *Universals of human language, vol. 3: Word structure*, ed. J.H. Greenberg, 297–334. Stanford: Stanford University Press.

Rainer, F. 1983. *Intensivierung im Italienischen*. Salzburg: Institut für Romanistik der Universität Salzburg.
———. 1993a. Head-operations in Spanish morphology. In *Yearbook of morphology 1992*, ed. G. Booij and J. van Marle, 113–128. Dordrecht: Kluwer.
———. 1993b. *Spanische Wortbildungslehre*. Tubingen: Niemeyer.
———. 2012. Morphological metaphysics: Virtual, potential, and actual words. *Word Structure* 5: 165–182.
Scalise, S. 1984. *Morfologia Lessicale*. Padua: CLESP.
Seidl, C.H. 2004. *Deantroponimici*. In Grossmann & Rainer (eds.), 409–418.
Serrano-Dolader, D. 2015. Parasynthesis in Romance. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, 524–536. Berlin/New York: Walter de Gruyter.
Spencer, A. 1988. Bracketing paradoxes and the English lexicon. *Language* 64: 663–682.
Thornton, A.M. 1996. On some phenomena of prosodic morphology in Italian: Accorciamenti, hypocoristics and prosodic delimitation. *Probus* 8: 81–112.
Thornton, A. M. 2004a. *Riduzione*. In Grossmann & Rainer (eds.), 555–566.
———. 2004b. *Conversione in sostantivi/Conversione in aggettivi*. In Grossmann & Rainer (eds.), 505–533.
———. 2004c. *Parole macedonia*. In Grossmann & Rainer (eds.), 567–571.
Tomasello, M. 2003. *Constructing a language. A usage-based theory of language acquisition*. Cambridge: Harvard University Press.
Virgillito, D. 2010. *Bracketing paradoxes in Italian*. Bologna: University of Bologna MA Thesis.
Voghera, M. Forthcoming. Costruzioni di piccoli numeri: la vaghezza intenzionale in funzione. In *L'expression de l'imprécision dans les langues romanes*, ed. O.-D. Balaş et al., 162–175. București: Ars docendi, Universitatea din București.
Wierzbicka, A. 1986. Italian reduplication: Cross-cultural pragmatics and illocutionary semantics. *Linguistics* 24: 287–315.

A Construction-Based Approach to Multiple Exponence

Gabriela Caballero and Sharon Inkelas

Abstract This study brings to bear Optimal Construction Morphology (Caballero and Inkelas 2013) on the phenomenon of multiple exponence (ME), in which the same morphological property is exponed by more than one morphological component of a complex word. ME is a prevalent phenomenon that should receive central coverage in any morphological theory. OCM is well suited to capture ME through its intrinsic architecture of local optimization choices driven by the goal of achieving a target meaning for each word that the morphological grammar is tasked with producing. Each type of ME elucidated in Harris (Multiple exponence. Oxford University Press, Oxford, 2017) is discussed and shown to be emergent from existing principles of OCM; the article pays special attention to compounding-style ME, which is argued to draw upon the same basic construction type utilized by Inkelas and Zoll (Reduplication: doubling in morphology. Cambridge University Press, Cambridge, 2005) in a construction grammar approach to reduplication.

Keywords Phonology-morphology interface · Typology · Multiple exponence · Compounding · Stem-identity

1 Introduction

Multiple (extended) exponence, the one-to-many mapping between meaning and form in morphological expression, has been the topic of much recent debate in the morphological theoretical literature (Anderson 1992; Halle and Marantz 1993; Noyer 1997; Stump 2001; Harris 2009, inter alia), though it is only until recently that its cross-linguistic distribution and typological properties have been addressed

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(Caballero and Harris 2012; Harris 2017). In this paper we show that multiple exponence, in its various forms, can arise organically from basic principles of Optimal Construction Morphology (OCM), a construction-based theory of morphology. In a previous paper (Caballero and Inkelas 2013) we proposed a basic typology of multiple exponence patterns and offered OCM analyses of some types of multiple exponence. In this paper we review a fuller typology, based on Harris (2017), and incorporate a principle independently needed for analyzing reduplication to handle a type of multiple exponence not discussed in the previous paper, which involves constructions that are synchronically and/or diachronically related to compounding requiring stem-identity.

We also draw attention, with Harris (2017), to the fact that while multiple exponence is often discussed in the context of inflection, it also occurs with derivational morphology. This is predicted in OCM, a theory which is designed around the step-by-step construction of words in reference to a meaning target. The meaning target includes information that both inflectional and derivational morphology can provide, and therefore multiple exponence can be found in both domains. We illustrate the role of inflectional and derivational multiple exponence though examination of Lusoga (Bantu; Hyman and Inkelas to appear), a language exhibiting redundant expression of both inflection and derivation in its verbal paradigms.

2 What Is Multiple Exponence?

Harris (2017: 9) defines multiple exponence as follows:

> Multiple (or extended) exponence is the occurrence of multiple realizations of a single morphosemantic feature, bundle of features, or derivational category within a word.[1]

Multiple exponence (henceforth ME) is illustrated in (1) in the following example from Meskwaki (Fox), an Algonquian language:[2]

(1) Meskwaki (Fox) (Algonquian; Dahlstrom 2000:74)

a.	ne-nowi:	'1-go.out'
b.	ke-nowi:	'2-go.out'
c.	**ne**-nowi:-**pena**	**'1**-go.out-**1.**PL'
d.	**ke**-nowi:-**pwa**	'**2**-go.out-**2**.PL'

[1] A broader definition is given in Caballero and Harris (2012), where multiple realizations of meaning are realized in more than a position within a *domain*, both single words but also syntactic constructions. We limit ourselves here, like Harris, to examining multiple exponence within a single word.

[2] Abbreviations used in this paper are: *A* agent, *AN* animate, *AOR* aorist, *APPL* applicative, *CAUS* causative, *CM* class marker, *COMP* competive, *DIM* diminutive, E exclusive, *ERG* ergative, *EXT* extensions, *FUT* future, *FV* final vowel, *IRR* irrealis, *NOM* nominative, *NS* non-singular, *NUM* number, *OBJ* object, P patient, *PART* partitive, *PERS* person, *PL* plural, *PRES* present, *PST* past, *REC* reciprocal, *SBJV* subjunctive, *S, SG* singular, *SUBJ* subject, *TNS* tense, *TR* transitive.

ME is highly relevant to competing morphological theories because of observations that it is typologically unexpected. Various universal (if violable) principles banning it have been proposed in Anderson (1992), Kiparsky (2005), Noyer (1997), Siddiqi (2006), Menn and McWhinney (1984), among others. The nature of the principle, and even its functional underpinnings, vary according to the model of morphology being assumed. Kiparsky (2005) and Siddiqi (2006), operating in a general item-based approach to morphology, express the prohibition against ME as a preference for structural simplicity, or economy, summarized in (2):

(2) a. ECONOMY: "Among equally expressive expressions, the simplest is optimal" (Kiparsky 2005:114)
b. MINIMIZE EXPONENCE: "The most economical derivation will be the one that maximally realizes all the formal features of the derivation with the fewest morphemes" (Siddiqi 2006: 14, 162)

Anderson (1992), adopting a realizational approach in which features in the inflectional descriptions of words trigger phonological rules spelling out those features, proposes a universal principle whereby a spell-out rule is blocked if the feature in question is already lexically present on the word or has been spelled out by a previous rule. Menn and McWhinney (1984), in a discussion of the Repeated Morph Constraint (a phenomenon related, though not identical, to ME), adopt a related stance: inflectional rules are blocked if the stem they would apply to already bears the formative that the spell out rule would supply. Menn and McWhinney suggest that parsing, or an 'affix-checking' consideration, motivates this principle. If a word is already sufficiently marked for a given morphological property, there is no need to mark it again. Redundancy is thus avoided.

Given these assumptions and mechanisms, some cases of ME receive alternative analyses that exclude redundancy. This is, for instance, the case of German plural marking in nouns, exemplified in (3):

(3) German plural noun marking

Singular	*Plural*	*Gloss*
a. Arm	Arm-**e**	'arm'
b. Bild	Bild-**er**	'picture'
c. Vater	V**ä**ter	'father'
d. Boden	B**ö**den	'earth'
e. Wurm	W**ü**rm-**er**	'worm'
f. Hals	H**ä**ls-**e**	'neck'

Matthews (1974: 149) adduces the forms in (3e-f) as examples of ME, since two markers that independently mark plurality (an *-e* suffix and umlaut) co-occur in these nominal forms. In an alternative analysis, umlaut is not a separate exponent of plurality, but instead emerges in plural marking as an abstract ('floating') feature; cf., e.g., Wiese (1996). But while the status of patterns like the one exemplified in (3) may be treated as ME or not depending on analytical choice, other cases are harder to reanalyze away in this fashion.

Stump (2001), who departs from the sources cited so far and explicitly recognizes the prevalence of ME cross-linguistically, builds an affordance for ME

directly into his theory of Paradigm Function Morphology. For Stump, ME occurs whenever there is duplication of inflectional spell out rules across the different blocks/functions of the inflectional module of the grammar. The prediction is, contra Anderson and others cited above, that ME is expected, though ME is only expected in inflection.

Harris's (2017) cross-linguistic survey of ME reveals that this phenomenon is in fact not uncommon. Many cases of ME identified by Harris involve inflectional morphology, as expected in Paradigm Function Morphology, including agreement, negation, number, etc. However, Harris also presents cases documented in the literature of ME involving derivational morphology (e.g., reciprocals in Chichewa, applicatives in Choguita Rarámuri, among other cases) (see also Caballero and Harris 2012). An example of derivational ME is found in Svan, a Kartvelian language of Georgia, where medio-passives, pluractionals and causatives exhibit ME (Harris 2017:63). Svan causative ME is exemplified in (4) (doubled causative exponents are bolded):

(4) Svan causative ME (Topuria 1967 [1931]; cited in Harris 2017: 63)[3]

a.	xägem-**n-un**-e	'causes to build'	[Lent'ex dialect]
b.	xamar-**n-un**-e	'causes to prepare'	[Bečo dialect]
c.	xašx-**un**-āl-**wn**-e	'causes to invite'	[Lašx dialect]
d.	xak'r-**un**-a-**wn-e**	'causes to open the door'	[Lower Bal dialect]

It is clear that any theory of morphology needs to be able to generate ME, not just rule it out. Moreover, ME needs to be generated both for inflection and for derivation. In this paper we illustrate the capacity of OCM to generate the diversity of ME patterns documented to date.

In section 3 we present a finer-grained descriptive typology of ME, based on Harris (2017). In section 4, we review from Caballero and Inkelas (2013) how OCM generates several of these subtypes. In section 5, we discuss a subtype that Caballero and Inkelas (2013) did not address, and propose an analysis within OCM. In section 6 we relate this analysis to the construction-based analysis of reduplication offered in Inkelas and Zoll (2005), showing that although neither phenomenon reduces to the other, the same basic apparatus can be invoked for both.

3 A Descriptive Typology of ME

Based on a survey of 270 patterns of ME in 200 languages, Harris (2017) provides a classification ofME into several subtypes based on historical origin, which show

[3]The Svan examples are represented as given in Harris 2017 (with morpheme breaks and free translations of the complex words, but no morpheme-by-morpheme glosses).

Table 1 Multiple exponence types in Harris (2017)

Harris' ME types	Characteristics
Type 1 "periodic"	The presence of a certain "carrier" morpheme (C) is always accompanied by a "dependent" exponent E; when the base of affixation already contains E, ME results (e.g. B[ase]-E-C-E)
	The E morphs involved in periodic ME are often featurally and formally identical and are typically non-adjacent
	Found in Nakh-Daghestanian languages, Archi, Breton, Camling, Noon, Sentani, Laz
Type 2 "alternating"	Similar to type 1, but carrier morpheme C requires E to be added along with it only if E is already present in the base.
	Suggested to be only inflectional (2017: 54)
	The morphs involved in ME are generally featurally and formally identical and always non-adjacent
	Found in Icelandic, Latin, Georgian, dialects of Mexican Spanish
Type 3 "reinforcement"	ME not dependent on a carrier morpheme C
	ME morphs are formally distinct in surface form and typically adjacent
	The morphs involved in ME are generally featurally identical
	Found in Svan, Rarámuri, Udi, Oromo, Kinshasa Lingala
Type 4 "accidental"	No dependency on a carrier morpheme
	ME morphs are never formally identical, and may be adjacent or not
	The morphs involved expone distinct features (in addition to the shared feature they both expone); thus ME is never superfluous
	Found in Tsakhur, Munsee, Jijeli Arabic, Vogul and Batsbi

recurrent properties in their current, synchronic states. This typology is summarized in Table 1 (where each type is provided with the label used in Harris' survey).

Type 4 is the only case we will not develop an OCM analysis of here going forward, since this type of ME always involves exponents that make unique contributions to meaning in addition to the categories that are multiply expressed. Referred to as 'overlapping' in Caballero and Inkelas (2013), Type 4 ME is exemplified in Munsee (Eastern Algonquian). As shown in (5), animacy (abbreviated as AN' in the glosses) is realized in the stem (*–ne·w-* 'see') as well as, redundantly, in every subsequent morpheme, all of which also uniquely express other inflectional features (Harris 2017: 66):

(5) ME of animacy features in Munsee (Harris 2017: 66)
kə-**ne·w-á·-w-ak**
1-see(**AN**.OBJ)-LOWER.**ANIMATE**.OBJECT[4]-3**AN**.OBJ/SUBJ-**AN**.PL
'You (sg) see/saw them (animate)'

OCM (as well as most other morphological frameworks) can handle this phenomenon with ease, as discussed in Caballero and Inkelas (2013).[5] In this paper we focus instead on the more difficult problem of layers of morphology which seem to be entirely redundant at the point at which they are added – what Caballero and Inkelas (2013) term 'superfluous exponence'. These can be found in Harris's first three types. Examples are provided in (6)–(8).

Type 1, illustrated in (6) for Batsbi with E-B-E-C affix order, occurs when addition of the "carrier" transitivizer *-i* suffix (C, in the E-B-E-C schema) combines with a stem which contains an exponent (E) of gender (*y*, glossed as "CM," for class marker). The transitivizer is obligatorily accompanied by addition of another gender exponent, so that adding it to a gender-marked stem E-B entails the duplication of -E, yielding E-B-E-C (Harris 2017: 56):

(6) Type 1: E-B-E-C, illustrated here for Batsbi; "B" is the root, "E" marks gender, and "C" is a transitivizer:
i. **y**-eʔ-e^{n}
CM$_{E}$-come.SG$_{B}$-AOR 'she came'
ii. **y**-oʔ-**y**-i-e^{n}
CM$_{E}$-bring$_{B}$-**CM**$_{E}$-TR$_{C}$-AOR 's/he brought her'

Type 2, illustrated in (7) for Czech (Harris 2017: 60) with B-E-C-E affix order, occurs when a "carrier" element that does not itself independently require "E" triggers a second addition of "E" when combining with a base that is already marked for "E". In Czech, "E" is case, and "C" is an optional particle, not glossed by Harris. The pattern holds for all six cases; only nominative is illustrated here:

(7) Type 2: B-E-C-E, illustrated here for Czech; "B" is the root, "E" marks case, "C" is an optional particle:
i. te-**n**
this-**NOM** 'this, that'
ii. te-**n**-hle-**n**
this-**NOM**-PART-**NOM** 'this, that'

[4]This suffix is glossed as 'LAO' in the original description; Harris describes its function as indicating that the object is animate and lower on the person hierarchy than the subject (Harris 2017:67).

[5]This is because in 'overlapping' multiple exponence, as attested in Munsee and many other languages, no single exponent is truly redundant. Given that each exponent in this kind of pattern makes a unique semantic contribution to a complex word, it can be modeled in a variety of frameworks as the requirement to realize each non-redundant inflectional feature, bundle of features or derivational information in a complex word (e.g., primary vs. secondary exponence in Distributed Morphology (Noyer 1997)).

As discussed in Harris, this pattern of ME in Czech is Type 2 rather than Type 1 because the particle *hle* does not occur independently with cases (e.g., there is no **hlen, *hlenho*, etc.) (2017:60).

Type 3, illustrated here in (8) for Maay (Paster 2007, 2008), with B-E-E(-E) affix order, is the type in which one exponent is optionally followed by another with the same meaning. Harris terms this "reinforcement", citing examples from Oromo, Svan, Khinaliq, and other languages (Harris 2017: Chapter 3).

(8) Type 3: B-E-E, illustrated for Maay; "B" is the noun root, and "E," of which there are two suppletive but equivalent allomorphs, encodes plural:

a.	gaʔam-o ∼ gaʔañ-yal ∼ gaʔam-o-yal	'hand-PL(-PL)'
b.	ees-o ∼ ees-yal ∼ ees-o-yal	'grass-PL(-PL)'
c.	basal-o ∼ basal-yal ∼ basal-o-yal	'onion-PL(–PL)'

Harris's Types 2 and 3 are the ME types analyzed in Caballero and Inkelas (2013). We will recapitulate those analyses in section 4, in which we introduce OCM. The new focus of this paper, in section 5, is on Harris's Type 1.

4 Optimal Construction Morphology

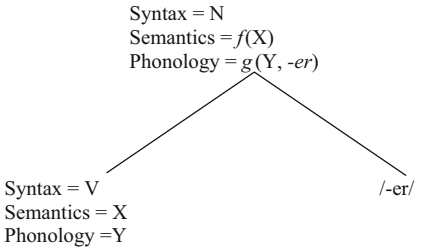
Optimal Construction Morphology (OCM; Caballero and Inkelas 2013) is a construction-based theory of morphology in which word structure emerges from the bottom-up, optimizing one-by-one combination of morphological structures, driven by constant pressures of well-formedness and faithfulness to a target meaning M.

In OCM, exponence in general, and ME in particular, emerge from the interaction of different constraints with the available constructions in the lexicon, or constructicon. ME is neither directly required nor directly banned.

4.1 The Constructicon

In OCM, morphological structures are derived through constructional schemas (e.g., Booij 2010) that encode relationships between the form of morphological elements (phonological form as well as any syntactic specification) and meanings (semantic operators). Morphologically complex words are built from two-level constructions involving lexical bases plus morphological operations. This is exemplified in (9), using two different notations for a morphologically complex word in which a daughter 'base' node (here, a verb) combines with an affix (here, the agentive *-er* suffix in English). (9a) uses the graphical notation of Sign Based Morphology (Orgun 1996), in which the base and affix are daughters of a branching mother node. A more compact schema, following the notation of Booij (2010), is given in (9b) (e.g. Booij 2010: 32). We will use this latter, more compact notation in the paper.

(9) a. Mother and daughter nodes in a binary-branching schema



b. $[V_i\text{-}er]_{Nj} \leftrightarrow [\text{CAUSER OF ACTION}_i]_j$

4.2 Exponence Strength

In OCM, an important component of the constructicon involves exponence strength. Some constructions, as in the example above, expone morphological properties at full strength. That is, the probability that the construction above creates a noun is 1. However, Caballero and Inkelas (2013) propose that some constructions expone properties only weakly, at partial strength. In such a case, the probability that the construction expones a given feature would be less than 1. Weak exponence can be the result of massive homophony (the more homophonous affixes there are, the less strongly each encodes its associated morphological property); it can also be an effect of the receding productivity of an affix, or any other factor that reduces the decomposability or parsability of such an affix as treated in the literature that addresses processing aspects of morphological complexity (Hay 2002; Hay and Baayen 2002, 2005; Hay and Plag 2004, inter alia). 'Weak exponence' in this sense is the synchronic equivalent of what in the diachronic literature is known as 'hypercharacterization', a change in stem or word form when an inner marker is not marking a category transparently enough, triggering a second layer of morphological exponence to 'support' or 'supplement' the loss of contrast in a morphologically complex word (Donohue 2003; Dressler 2004; Lehmann 2005; see also the discussion in Harris 2017). Weak exponence plays a role in ME, as we will see below.

4.3 Constraints

The constraints that optimize the collection of constructions combining in any given word consist of faithfulness and markedness, or well-formedness constraints. These are described in detail below.

4.3.1 Faithfulness

Faithfulness constraints compare candidates, on each cycle of competition, to the meaning target that exists for every word throughout its derivation. The meaning target ('M') includes semantic content, inflectional features (e.g., person, polarity, number, tense, aspect, mood, etc.), part of speech information, verbal argument structure (including number of arguments and the thematic roles to which they link), as well as lexical meanings. Candidates formed via constructions that achieve greater target faithfulness are better, all else equal, than candidates which are less faithful to the target meaning M.

(10) Example M target: [CAT = NOUN, NUM = PLURAL, SEM = MOTHER]

(11) FAITH-M: Assess violations proportional to the mismatch between the M components of the target and the candidate.
(A component of a candidate not present in M will incur 1 violation;
a component of M not expressed in a candidate will incur 1 violation;
a component of M expressed only weakly in a candidate will incur a violation greater than zero but less than 1; etc.)

As described above, M is a broad category. OCM is neutral on the formal details of how syntactic and semantic information should be represented. Certainly the more precise a model, the finer-grained the assessment of M-faithfulness will be. In this paper we are relatively informal about the content of M, sticking to simple dimensions like those in (10).

Because of the rich content of M, it would make sense to treat Faith-M as a family of different types of faithfulness. It would also make sense to assign the highest weight to faithfulness to properties with the richest information content, or content that is in some way valued as most important to express in any given word (perhaps along the lines of Bybee's (1985) Relevance Principle). (See Inkelas 2016 for one attempt in this vein.)

For simplicity in interpreting tableaus here, however, we show only one Faith-M constraint per tableau and list all of the violations in each cell.[6] An example of how Faith-M selects among candidates is shown below, in which various constructions that could combine with the stem *mother* are comparatively assessed by Faith-M:

[6]Violations here are calculated in terms of conflicting or missing information that candidate forms have in relation to the meaning target M.

(12)

	Input: [mother] MOTHER NOUN		Target M: MOTHER NOUN PL	FAITH-M
a.	(ID)	[mother]	MOTHER NOUN	*! (NUM=PL)
☞ b.	*-s* PL	[mothers]	MOTHER NOUN PL	
c.	*-ly* ADJ	[motherly]	MOTHERLY ADJ	*!** (SEM, CAT, NUM)
d.	*-Ø* VERB	[mother]	ACT AS MOTHER VERB	*!** (SEM, CAT, NUM)

The winning candidate in each tableau, or round of construction competition, is the input to another round, unless the identity candidate wins. In this respect, OCM resembles Harmonic Serialism (e.g., McCarthy 2000, 2010; Wolf 2008).

4.3.2 Well-Formedness

Well-formedness constraints come in several varieties (Caballero and Inkelas 2013). Three salient types of constraints figure in this paper: the pressure to be as close to "Word" as possible on the wordhood scale, phonological stem shape considerations such as minimal or maximal size, and paradigmatic uniformity (or non-homophony) constraints. Here, we mention only BE-WORD, as it is specific to OCM.

To be well-formed, the output of the morphological component must be of category "Word." Building on concepts in the literature of X-bar categories (Selkirk 1982), types (Riehemann 1998; Orgun 1996), strata (Kiparsky 1982, 2000) and ordered rule blocks (Anderson 1992; Stump 1991, 2001), Caballero and Inkelas (2013) posit a wordhood scale whose endpoints are Root and Word and which can contain any number of (potentially unordered) intermediate Stem types. The layers of every morphological construction in the constructicon are specified for points on this scale. Some constructions apply to Roots and produce Roots; others apply to Roots and produce Stems, etc. Because the "goal" of the morphological grammar is to produce words, Caballero and Inkelas posit a markedness constraint assessing candidates' penalties in proportion to their scalar distance from Word, along whatever scale is appropriate for the language in question (on scalar markedness constraints, see Mortensen 2006). A candidate labelled "Root" in a language with a three-point Root-Stem-Word scale would violate BE-WORD twice.

(13) BE-WORD: For a candidate at point *i* on the *n*-point Wordhood scale (where Root is at point *1* and Word is at point *n*), assess *n-i* violations

BE-WORD has the effect of motivating affixation that will bring a Root or Stem closer to Wordhood.

4.4 Multiple Exponence in OCM

In OCM, multiple exponence (ME) can result from the interaction of any of the faithfulness and markedness constraints of OCM. Below we describe how the ME types in Harris' typology emerge from this model.

4.4.1 Harris' Type 3 ("Reinforcement")

In ME type 3, 'reinforcement' ME, an outer exponent is added to an inner exponent that is less productive or less phonologically segmentable. 'Reinforcement' ME is characterized as generally involving adjacent exponents, though Harris clarifies this is not a definitional characteristic of reinforcement ME (Harris 2017: 62). OCM offers two different (compatible) sources for this kind of pattern: differential exponence strength, and the advancement of words-under-construction along the wordhood scale. A second exponence of the same property can accomplish one or both of the goals of strengthening degree of exponence and advancing the word-under-construction towards the goal of wordhood.

In Choguita Rarámuri (Uto-Aztecan, Mexico; Caballero 2008), classified in Harris' typology as Type 3, both of these factors contribute to the double exponence of applicative marking. An inner, Root-level applicative suffix (-APPL_R) weakly expones the information that the verb has acquired a new argument; this suffix produces a Stem, advancing the Root one degree along the wordhood scale (Root-Stem-Word). However, applicative is too weakly exponed to fully satisfy M-Faith. The weakness of these applicative suffixes is due to the fact they are lexically conditioned, relatively unproductive and phonologically reduced (Caballero 2008). A second, Stem-level exponent of applicative (-APPL_S), which is stronger (fully productive and phonologically unreduced), fulfills this need. The resulting word has full-strength exponence of applicative:

(14) Choguita Rarámuri applicative ME

a.	sú-**n**-**ki**-ma	'sew-**APPL**$_\text{R}$-**APPL**$_\text{S}$-FUT.SG'
	boto-bú-**n**-**ki**-ma	'sink-TR-**APPL**$_\text{R}$-**APPL**$_\text{S}$-FUT.SG'
b.	pá-**s**-**ki**-ma	'throw-**APPL**$_\text{R}$-**APPL**$_\text{S}$-FUT.SG'
	sú-**n**-ti-**ki**-ma	'sew-**APPL**$_\text{R}$-CAUS-**APPL**$_\text{S}$-FUT.SG'
	rarí-**w**-ti-**ki**-ma	'buy-**APPL**$_\text{R}$-CAUS-**APPL**$_\text{S}$-FUT.SG'

The inner (APPL_R) and outer (APPL_S) applicative suffixes exemplified in (14) are identical in terms of their meaning (increasing the valence of the verb by adding a benefactive argument), but differ in terms of their relative placement

within a strength scale and their structural properties.[7] The relative placement of applicative suffixes in this language within a strength-of-exponence scale is schematized in (15):

(15)

Weakest		Strongest
0	0.5	1
No exponence	*weak exponence*	*strong*

The local, incremental OCM analysis of this pattern is as follows: the inner suffixes, with restricted lexical distributions and reduced forms (*-n, -s, -w*), are weak exponents of the applicative that combine with roots to produce an inner Stem constituent ('Stem 1').[8] This is exemplified in (16) in the derivation from a root input to a Stem level 1 output.

(16)

	Input = [su]$_{ROOT}$ SEW		M: SEW FUT SUBJ = SG APPLICATIVE	M-FAITH	BE-WORD
☞ a.	[[ ]$_{ROOT}$ -n]$_{STEM1}$ APPLICATIVE (.5)	[sun]$_{STEM1}$	SEW APPLICATIVE (.5)	.5	**
b.	[[ ]$_{ROOT}$ -Ø]$_{STEM1}$ Ø	[su]$_{STEM1}$	SEW	1	**
c.	IDENTITY FUNCTION	[su]$_{ROOT}$	SEW	1	***

While unproductive and phonologically reduced, the inner applicative suffixes are the only constructions available at this stage of the derivation for words under construction that have applicative within their M target.[9] That is, the inner applicatives attach to Roots to form Stem 1 constituents.

[7] In OCM, individual constructions in a given language may specify the input they may combine with (e.g., Root vs. Stem) or the type of output they produce (i.e., advancing, preserving or lowering stem type), or they may be unspecified for these properties. Constructions that specify input and/or output type are limited by that specification as to what they can combine with and what type of constituent they can produce. Constructions that are not specified for input type can combine with any type of input (see more discussion in Caballero and Inkelas 2013).

[8] These suffixes are always unstressed (vs. suffixes that may be stressed in the language) and may be the target of general phonological processes (e.g., round vowel harmony) or may undergo post-tonic vowel reduction (to schwa) or deletion (Caballero 2008). These phonological properties render these suffixes homophonous with other constructions in the language. This greater degree of homonymy in morphological exponence renders these affixes as weak exponents of the applicative construction in the sense described above.

[9] In this tableau we only consider candidates that include the affixes that are lexically selected by the input stems (i.e., there is no evaluation of candidate [suw] or [sus]). The lexically incompatible stem-applicative combinations can be modeled within OT through constraint indexation (Pater 2000), cophonologies (Inkelas et al. 1997) or another framework that models lexically and morphologically conditioned variation. We leave discussion of these alternatives outside of the scope of this paper.

The outer *-ki* suffix, fully productive and always aligned with a syllable boundary, is a strong exponent of the applicative that combines with 'Stem 1' constituents and produces 'Stem 2' outputs. The candidate output with ME is optimal given the imperative to have strong exponence of the applicative in this language.

(17)

	Input = [sun]$_{STEM1}$ SEW, APPLICATIVE (.5)		M: SEW FUT SUBJ = SG APPLICATIVE	M-FAITH	BE-WORD
a.	[[ ]$_{STEM1}$ -Ø]$_{WORD}$ Ø	[sun]$_{WORD}$	SEW APPLICATIVE (.5)	.5	
☞ b.	[[ ]$_{STEM1}$ -ki]$_{STEM2}$ APPLICATIVE (1)	[sunki]$_{STEM2}$	SEW APPLICATIVE (1)	1	*
c.	IDENTITY FUNCTION	[sun]$_{STEM1}$	SEW APPLICATIVE (.5)	.5	

This analysis parallels the proposed diachronic source of this pattern, where an outer exponence 'reinforces' an inner exponent that has lost productivity and is phonologically opaque or difficult to parse within the complex word, a process described in the literature as 'hypercharacterization' (Dressler 2004; Lehman 2005, inter alia).

In a different type of pattern, a morphological construction realizes a given feature F and moves the input from Root to Stem, and an outer morphological layer which expones a new feature, G, while also redundantly exponing feature F, promotes the construct from Stem to Word. This pattern is exemplified in Archi (North Caucasian) ME of number (data from Müller 2006; citing Kibrik 1991). In Archi, the inner plural suffix in (18c-d), exponing number, appears superfluous, given that the outer suffix encodes both case and number:

(18) Archi

Singular		Plural	
a.	gel-li	c.	gel-**um**-čaj
	cup.SG-ERG.SG		cup-**PL**-ERG.PL
b.	qIonn-i	d.	qIinn-**or**-čaj
	bridge.SG-ERG.SG		bridge-**PL**-ERG.PL

However, from a bottom-up perspective, neither suffix is redundant. Both do work in advancing the construct from root to word.

In Caballero and Inkelas's (2013) OCM analysis of Archi, the schemas for the relevant Archi constructions are provided in (19):

(19)

Pl suffixes: take Root to Stem	[[ ]$_{ROOT}$	-um]$_{STEM}$
Zero construction: takes Root to Stem	[[ ]$_{ROOT}$	]$_{STEM}$
Case suffixes: take Stem to Word	[[ ]$_{STEM}$	-čaj]$_{WORD}$
	[[ ] $_{STEM}$	-li]$_{WORD}$

Each construction specifies either content (syntactic or semantic properties), stem type information, or both. Thus each has something to contribute. The incremental analysis of Archi is illustrated in the following tableaux. In (20a), which starts with a "Root" as input and has an ergative, plural word as its target output, the only viable candidates are ones formed by constructions that take "Root" as their base. Of these, the construction with the Stem-forming plural suffix (20aii) best matches the meaning target M. The resulting Stem is then input to (20b), in which Stem-attaching constructions compete; of these, the construction which produces an ergative plural Word (20bii) is judged as optimal.

(20) Derivation of gel-**um**-čaj ('cup-**PL**-ERG.PL')

a. Initial round of affixation: Root → Stem

	Input = [gel]$_{ROOT}$ CUP		M: CUP ERG PL	M-FAITH	BE-WORD
i.	[[ ]$_{ROOT}$ Ø]$_{STEM}$	[gel]$_{STEM}$	CUP	**! (ERG,PL)	*
☞ ii.	[[ ]$_{ROOT}$ um]$_{STEM}$ PL	[gelum]$_{STEM}$	CUP PL	* (ERG)	*
c.	ID FUNCTION	[gel]$_{ROOT}$	CUP	**! (ERG,PL)	**

b. Next round of affixation: Stem → Word

	Input = [gelum]$_{STEM}$ CUP PL		M: CUP ERG PL	M-FAITH	BE-WORD
i.	[[ ]$_{STEM}$ li]$_{WORD}$ ERG, SG	[gelumli]$_{WORD}$	CUP ERG SG	*!* (SG,PL)	
☞ ii.	[[ ]$_{ROOT}$ čaj]$_{WORD}$ ERG, PL	[gelumčaj]$_{WORD}$	CUP ERG PL		
iii.	ID FUNCTION	[gelum]$_{STEM}$	CUP PL	*! (ERG)	*

A subsequent round of evaluation, in which (20bii) is input, would result in the ID candidate being the winner; this step, not shown here, ends the derivation and results in [gelumčaj] as the output of the morphological grammar, given target [CUP, ERG, PL]. In this case, ME is an emergent effect, resulting from coincidental duplication of the feature [plural] across affixes of different types in the lexicon. It is neither forced, nor, prohibited, by any explicit principles referring to ME.

4.4.2 Harris' Type 2 ("Alternating")

In ME type 2 'alternating,' the addition of an outer 'carrier' affix causes an inner exponent E to be added again, outside the 'carrier' affix, even though the carrier affix itself does not generally have to co-occur with that exponent.

In OCM, this pattern can result when the outer affix demotes the stem on the wordhood scale in a manner that adding another instance of E can repair. It can also result when the outer affix negates the contribution made by the inner affix to M-faithfulness, which is repaired by a subsequent addition of E. An account combining M-faithfulness and the wordhood scale is developed by Caballero and Inkelas (2013) for Type 2 ME in Breton diminutives, which exhibit surprising repetition of the plural suffix, both inside and outside of the diminutive.

(21) Breton diminutive plurals: root-PL-DIM-PL

	root	root- PL	root-DIM (sg)	root- PL-DIM-PL
'boat'	bag	bag-où	bag-ig	bag-où-ig-où
'prayer'	pedenn	pedenn-où	pedenn-ig	pedenn-où-ig-où

Caballero and Inkelas derive ME of the plural suffix from the interaction of M-Faith and Wordhood with the following constructicon fragment:

(22) Breton constructicon fragment:

Construction		Comments
a. Plural suffix:	[[ ]$_{N}$ -où]$_{N, Pl}$	Attaches to any type of noun base (Root and Stem); type-preserving, adds Plural feature
b. Diminutive suffix:	[[ ]$_{STEM, N}$ -ig]$_{STEM, N, Dim, Sg}$	Attaches to Stem; type-preserving; adds Diminutive, Singular features
c. Null construction:	[[ ]$_{n}$]$_{n+1}$	Advances stems one step on wordhood scale, from Root to Stem or Stem to Word; no featural contributions

Because the (semantically rich) root is always the first element selected in any round of morpheme/construction competition, the second round of selection only compares constructions that are able to combine directly with Roots. In this grammar fragment, on that round of selection, only the Plural suffix (which combines with any type of input) and the null type-promoting construction compete. If the target meaning is plural and FAITH-M outranks BE-WORD, the Plural suffix will win, setting up a third round of competition. On this third round, the competitors are, again, the Plural, which improves neither faithfulness nor wordhood, the Diminutive, and the null construction. Assuming that faithfulness to Diminutive outweighs faithfulness to number, the Diminutive wins, producing an output Stem

which is now singular.[10] On the fourth round of selection, the candidates are the plural, which produces a Stem which is Diminutive and Plural, the Diminutive, which does not improve faithfulness, and the null construction, which produces a Word. Given that faithfulness outranks Be-Word, the Plural candidate wins. Finally, on the fifth round, the null construction produces the most harmonic candidate, and the derivation ends.

In sum, both 'alternating' and 'reinforcement' ME patterns (Types 2 and 3) in Harris' typology fall from mechanisms already proposed as part of the architecture of OCM. In the next section we address a type of ME (Type 1) not previously addressed within the OCM framework and relate it to a larger set of phenomena involving agreement in compounding.

5 Agreement in Compound Structures As a Source of Multiple Exponence

Harris (2017) discusses the compounding of stems, both of which are inflected for the same properties, as a possible diachronic source - and synchronic analysis - of ME. As one example, Harris presents the case of so-called "twin words" in Uralic languages, in which inflected verb stems are compounded, resulting in the doubling of TAM and person number agreement. In this example, roots are underlined and the relevant inflectional exponents are bolded:

(23) Compound-style ME in Hungarian (Harris 2017: 73)

a. fut-**ott-am**
run-PST-1SG
'I ran'

b. lot-**ott-am**-fut-**ott-am**
bustle-PST-1SG-run-PST-1SG
'I bustled about'

Harris also cites examples of Yabem (Oceanic) compounds with doubling of person-number agreement and Abkhaz (Caucasian) compounds with possessive doubling, among other cases (Harris 2017: 72–82). Harris remains agnostic as to whether all cases of doubling of inflection in compounding constitutes ME or not, and considers some cases to be better candidates of ME in compounds than others. Specifically, cases where the same morphosyntactic features are shared among constituents would be considered true compounds showing ME, vs. cases where

[10] Breton ME has been analyzed in a variety of frameworks (see Harris 2017 for a summary and discussion). In the OCM analysis of Breton summarized above, the inflectional features contributed by the inner plural suffix are attenuated by the diminutive suffix, causing the plural to be added again (Caballero & Inkelas 2013). This analysis is similar to Stump's (2001) proposal that the Breton plural is head-inflecting, given that it has special privilege of attaching directly to the root.

each constituent would inflect separately. Harris considers a pattern found in San Juan Quiahije Eastern Chatino to be an unambiguous case of ME in compounding: originally analyzed in Cruz and Woodbury (2013: 7–8), this language features ME of person agreement, encoded through nasalization of the stem vowel and tone (the tones are represented separately from the segmental representation and are L(ow), M(id), H(igh), and 0 (superhigh)).

(24) ME in compounding in San Juan Quiahije Eastern Chatino (Harris 2017: 77)

a.	snyɻ grab.COMP.1SG	T: M0
b.	yk**ǫ**-jy**ą**ʔ eat.COMP.**1SG**-amount.**1SG** 'I tasted'	T1: **H**, T2: **LM**
c.	yku-jyaʔ = rẹʔ eat.COMP-amount.**3PL** = **3PL** 'They tasted'	T1: toneless, T2: LM

In (24a), a lexically-conditioned tone (M0) and nasalization encode first person singular agreement on the verb. In compounding, both the verb and its complement or modifier may be marked for person agreement: in the case of (24b), with nasalization and H tone in the verb and nasalization and a LM tone on the complement *jyaʔ* 'amount'. Harris cites (24c) to show that there are compound constructions in this variety which lack doubling of inflection: in this case, agreement involves third person plural, marked on the compound modifier (where the lack of nasalization yields the contrast between first singular and third plural agreement in (24b) and (24c)) and redundantly in a dedicated third person plural enclitic.

In some cases, identity between stems is partial. This is exemplified below in Batsbi (25) and Udi (26):

(25) Batsbi class marker agreement in compounding (Harris 2017: 74)

šobi-l^{w}	xširoš	**v**-uyt'-**v**-aɣ-o-s
Pšavs-ALLII	often	**CM**-go-**CM**-come-PRES-1SG.ERG

'I (masculine) often come and go among the Pšavs'

(26) Udi TAM agreement in compounding (Harris 2017: 75)

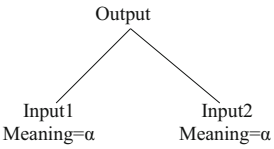
bayɣa-beʕɣa = z
bay-ɣ-**a**-beʕɣ-**a** = z
in-go-**SBJVI**-look-**SBJVI** = 1SG
'I should go in and look'

In Batsbi, case markers (CM) are required in each member of a compound, but TAM and person-number agreement (*-o* 'present' and *-s* 'first person singular ergative') only show up with the final element. In Udi, TAM suffixes (in this case subjunctive) are required by each member of the compound, but there is a single set of agreement marking in a word (the enclitic = *z* for first person singular).

6 Multiple Exponence As Agreement in Compound Structures

We propose, building on Harris's insights and analysis, that Type 1 ME results when a language possesses a compound-like construction requiring agreement, in some property or properties, between its daughters. While this may seem like an explicit stipulation requiring ME, in fact the construction needed to model this phenomenon already exists in CM, in the form of the so-called 'morphological doubling' construction invoked by Inkelas and Zoll (2005) to handle synonym compounding, antonym compounding, and reduplication. It is schematized in (27) for an instance of synonym compounding. These two stems must have identical meaning:

(27)



(In abbreviated notation: [[ ]$_{\text{Input1,SynStem=}\alpha}$ [ ]$_{\text{Input2,SynStem=}\alpha}$]$_{\text{Output}}$

This doubling construction is highly suitable for synonym compounding in an example like that in (28), from Khmer, in which noun-noun compounds involve semantically identical (or nearly identical) nouns that are lexically divergent (28):

(28) Khmer synonym compounds (Ourn and Haiman 2000: 485, 500)

a.	cah+tum	'old+mature'	'village elder'
b.	chap+rɔhah	'quick+fast'	'fast'
c.	clooh+prɑkaek	'squabble+argue'	'quarrel'
d.	cbah+prakɑt	'exact+exact'	'exact'

Inkelas and Zoll (2005) argue that reduplication follows from a construction of the type in (27). Total reduplication, illustrated below with data from Acehnese, differs from synonym compounding only in requiring that the two daughters are phonologically as well as semantically identical – conditions that can be satisfied only if they are two instances of the same lexeme.

(29) Achenese emphatic total reduplication (Durie 1985: 39–40)

a.	tambô-tambô	'drum-drum'
b.	ma-ma	'mother-mother'
c.	tuleueng-tuleueng	'bone-bone'
d.	jamee-jamee	'guest-guest'

In the case of partial reduplication, a variant of the doubling construction is used; it is associated with a cophonology that enforces phonological truncation on one (or in some cases two; see e.g. Caballero 2006) of the two identical daughters. Inkelas and Zoll (2005) demonstrate that echo reduplication, such as 'fancy-shmancy' and other well known patterns, are also amenable to analysis in these terms.

Following Inkelas and Zoll (2005), we posit a construction related to the one in (27), with built-in identity constraints as the source of ME in compounding structures. Instead of requiring total semantic and syntactic identity, however, the construction required for ME requires identity only in specific properties.[11]

For the example of inflectional ME in Hungarian, we assume a compounding construction whose daughters are verb stems constrained to agree in tense, person and number:

(30) $[[\quad]_{V1,TNS=\alpha,PERS=\beta,NUM=\gamma}\ [\quad]_{V2,TNS=\alpha,PERS=\beta,NUM=\gamma}]_V$

Support for this compounding structure is that bipartite verbs clearly exist in many languages (a typological overview is found in Bickel and Nichols 2007); the constructicon thus requires a construction to represent them. ME, in particular, arises in bipartite verbs when, in the construction licensing such structures, the two parts of a bipartite verb have to agree (via co-indexed features, as in (30)). Absent that latter restriction, the grammar can generate singly-inflected complex verbs, including cases like Chintang (Bickel et al. 2007), where either part might be inflected, but it is not necessary for both to be.

Harris (2017) is ultimately noncommittal as to whether compounded inflected stems are true instances of ME. We take the stronger position here that they are. Moreover, we suggest that, if the compounding construction is broadened to include inflected morphemes that are not canonical roots, some if not all instances of Harris's Type I reduplication can be analyzed using the same type of construction invoked for compounding.

6.1 Stem-to-Stem Identity Involving Inflection: Noon and Camling

We turn in this section to two examples of non-canonical compounding constructions that go beyond the canon of root-root or stem-stem compounding, but fit within the more general compounding frame. In these cases the inflected elements are asymmetric: one is the root and the other, a suffix. The constructions, like that in Hungarian above, involve doubly exponed inflection.

The first example, drawn from Harris (2017), involves Noon, a Niger-Congo language (Cangin) originally described in Soukka (2000: 62). In Noon, nouns belong to six declensions, four of which have prefixed class markers in the singular

[11] In contrast, phonological identity approaches to reduplication do not make use of the mechanism proposed here. The debate about the analytical advantages of phonological identity approaches to reduplication vs. morphological doubling ones are outside the scope of the paper (for an overview, see Inkelas and Downing 2015 and Downing and Inkelas 2015). To the extent that, as observed here, certain cross-linguistic patterns of reduplication and compounding can be analyzed with a morphological doubling construction, we argue that this lends further support of the analysis presented here.

and plural paradigms. As shown in (31) below, when the definiteness *-aa* suffix is added to a noun, a redundant class marker is required to appear between the stem and the definiteness suffix. ME is bolded.

	Singular			Plural		
Class	Indefinite		Definite	Indefinite		Definite
1	waas	‘road’	waas-aa	waas	‘roads’	waas-c-aa
2	kaan	‘house’	kaan-f-aa	kaan	‘houses’	kaan-c-aa
3	m-esip	‘sauce’	**m**-esip-**m**-aa	m-esip	‘sauces’	**m**-esip-**c**-aa
4	k-edik	‘tree’	**k**-edik-**k**-aa	t-edik	‘trees’	**t**-edik-**t-**aa
5	p-ëlkit	‘thread’	**p**-ëlkit-**p**-aa	t-ëlkit	‘threads’	**t**-ëlkit-**t**-aa
6	j-okon	‘finger’	**j**-okon-**j**-aa	t-okon	‘fingers’	**t**-okon-**t**-aa

Nouns belonging to classes 3– 6 have class prefixes in the singular (*m-, k-, p-* and *j-*) and plural (*m-* for class 3 and *t-* for classes 4–6). In the definite paradigm, the redundant class markers are identical to the class prefixes in the singular and plural, except for class 3 definite plurals, which require a *-c* suffix before the definiteness suffix (e.g., *m-esip-**c**-aa*).

In a second example, Camling (Kiranti; Tibeto-Burman), we find ME of subject and object marking in stems, where a third person non-singular patient (*−c*) suffix is a carrier morpheme requiring doubling of inflection. The examples below are from Ebert (1997: 20). The carrier morpheme is highlighted with underlining.

(32) ME in Camling (Harris 2017: 56)

a. lod-**u-ng**-c-**u-ng**
tell-3P-1s-3ns.P-3P-1s
‘I told them’

b. lod-**u-m**-c-**u-m**-ka
tell-3P-1/2pA-3ns.P-3P-1/2pA-E
‘We told them’

We propose that the ME patterns in Noon and Camling arise from compounding, or at least from a compound-like construction in which two potentially complex subconstituents must agree in a specified property or set of properties. In the case of Noon, ME results when two stems in the same compound structure must agree in class. One stem contains the root; the other contains the definite marker. Both must combine with the same class-marking prefix in order to be class-identical. In the case of Camling, ME results from compounding two stems which must agree in both subject and object marking. One stem contains the root; the other contains the third non-singular patient marker.

6.2 Stem-to-Stem Identity Involving Derivation

So far we have focused on ME of inflection in our discussion of compounding. However, OCM also predicts derivational ME under certain circumstances. ME

results from agreement of two stems in a particular property. If there is a property that is uniquely associated with a given derivational morpheme, then we predict that ME could result from an agreement requirement for that property. For example, we would not expect ME of a nominalizing affix in a construction where both stems are required to be nouns, if the language in question has both monomorphemic and derived nouns. Agreement in the property "noun" cannot by itself distinguish between a monomorphemic noun and nominalized adjective or verb. But we could expect ME in a construction, where, for example, both stems are required to be participles and the only way to form participles in the language is by means of an affixal construction, or in a construction where both verbs are reciprocal and the only way for a verb to be reciprocal in the language is by combing with a reciprocalizing affix.

We find situations like these in Lusoga (Soga, Olusoga), a Bantu language spoken in Uganda, in which ME involves both inflectional and derivational affixes in reciprocal verbs.

6.3 Case Study: Lusoga Multiple Exponence

Lusoga, like other Bantu languages, has an agglutinating morphological structure with several argument structure changing suffixes (referred to as "extensions" in the areal literature), inflectional prefixes and suffixes, as well as complex morphotactics. Here we focus on Lusoga ME, which involves superfluous exponence of derivation (e.g., causatives and applicatives in (33)), final vowel inflectional suffixes (e.g., irrealis in (34)), or both derivation and inflection (35). In all cases, ME is exclusively attested in morphologically complex words containing the reciprocal morpheme -*agan*. The data below all come from Hyman and Inkelas (to appear).

(33) Lusoga ME of derivational morphology

a.	bà-[tùùn**z**-ágán-**y**-á	3PL-sew-**CAUS**-REC-**CAUS**-FV	'They make each other sew'
b.	bà-[tùùng-**ís**-ágán-**y**-á	3PL-sew-**CAUS**-REC-**CAUS**-FV	'They make each other sew'
c.	bà-[kùb-**ír**-ágán-**ír**-á	3PL-beat-**CAUS**-REC-**CAUS**-FV	'Where do they beat e.o.?'

(34) Lusoga ME of inflectional morphology

a.	mù-[bàl-**é**-gàn-**é**	2PL-count-**IRR**-REC-**IRR**	'Count (pl.) each other!'
b.	mù-bì-[bál-ìr-**è**-gàn-**é**	2PL-count-APPL-**IRR**-REC-**IRR**	'Count (pl.) them for e.o.!'

(35) Lusoga ME of derivation and inflection

tù-lùm-**y-é**-gan-**y-é**	1PL-injure-**CAUS-IRR**-REC-**CAUS-IRR**	'Let's injure each other'

All of these ME patterns are completely superfluous, in the sense of involving multiple morphs that contribute exactly the same information. Causative ME may involve suffixation of two distinct causative morphs, *-is* and *-y*, referred to in the literature as 'long' and 'short' causatives, respectively, which are semantically equivalent, encoding both causation and instrumentals. The short causative (/-i/) surfaces as spirantization of a stem final consonant (33a) or a palatal glide before the final vowel (33a-b). Causative ME may also involve doubling of the short causative (33a). As with the rest of the ME patterns, the redundant causatives, whether the same or different, appear before and after the reciprocal *-agan* suffix.[12] All other ME patterns in Lusoga involve doubling of the same affixal morph.

Finally, ME in Lusoga is optional, whether derivational or inflectional. This is shown in (36).

(36) Optional ME in Lusoga

a.	bà-[tùùn**z**-ágán-**y**-á	sew-**CAUS**-REC-**CAUS**-FV	'They made each other sew'
b.	bà-[tùùng-ágán-**y**-á	sew-REC-**CAUS**-FV	
c.	bà-[tùùn**z**-ágán-á	sew-**CAUS**-REC-FV	
d.	mù-[bàl-**é**-gàn-**é**	2PL-count-**IRR**-REC-**IRR**	'Count (pl.) each other!'
e.	mù-[bàl-ágàn-**é**	2PL-count-REC-**IRR**	

As exemplified in (36a-c), when both the reciprocal and the (short) causative are marked, the short causative may be marked twice (before and after the reciprocal), or only once, either after the reciprocal (36b) or before it (36c). And as shown in (36d-e), only two patterns are available with final inflectional suffixes when a verb contains the reciprocal suffix: the final inflectional vocalic suffix appears doubled (36d) or as single exponence after the reciprocal (36d).[13] While single exponence is available, the double marking patterns are preferred.

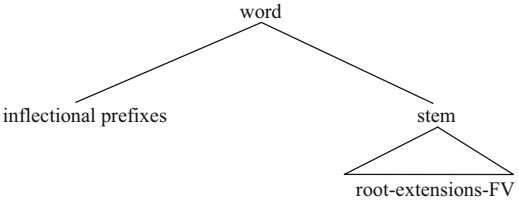
Hyman & Inkelas (to appear) propose that the Lusoga ME patterns are the result of a historical reanalysis of the original structure of the Lusoga verb in verbs

[12]Hyman & Inkelas (to appear) provide evidence that causatives in ME patterns may exhibit other orders with respect to each other and the reciprocal morpheme. These alternative orders, however, while possible, are not preferred. In this paper we focus on the ME patterns that exhibit the preferred order of exponents.

[13]There is also ME of the perfective /-ile/ suffix in verbs containing the reciprocal. These cases involve a complex pattern of allomorphy involving the application of several phonological processes and interfixation. We refer the reader to Hyman & Inkelas (to appear) for the details. Here we only note that, like the pattern of ME of the irrealis suffix, ME of imperfective also displays optionality between single exponence of the inflectional suffix ordered after the reciprocal and doubling of the imperfective before and after the reciprocal.

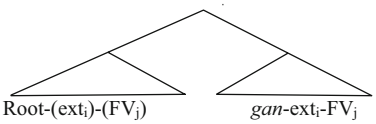
containing the reciprocal. The original morphological structure of Lusoga verbs involves a pan-Bantu template of verbal extensions with the order C(ausative)-A(pplicative)-R(eciprocal)-P(assive) (CARP) (Hyman 2003a, b). In the case of Lusoga, the template includes an additional position for the short causative *-i-* (symbolized as 'I') between the reciprocal and passive morphemes (CAR**I**P) (see discussion in Bastin 1986 and Good 2005 for its historical motivation and reflexes across Bantu languages).[14] Together with inflectional final vowel suffixes, the Lusoga CARIP template constitutes a stem to which inflectional prefixes attach, the domain of ME. This morphological structure is schematized in (37).

(37) Bantu morphological verb structure



In the reanalysis hypothesis, the reciprocal is interpreted as a bimorphemic stem *-a-gan* given its unique phonological properties (the only disyllabic derivational suffix that is *a* initial). In this new morphological structure (schematized in (38)), reciprocalized verbs are compound constructions with two roots, a lexical root plus the reciprocal *-gan* root, both of which head up stems that are optionally required to be identical in their argument structure and inflectional properties

(38) Lusoga compound reciprocal verb structure



Thus, the original structure with a single stem (schematized in (39a)) gives rise to the reanalyzed structure in (39b) with an internal stem boundary ('#') and the analogical extensions with reciprocalized verbs containing other inflectional final vowels (39c).

[14]This template is a key component in understanding affix ordering patterns in most Bantu languages, where patterns of ME of derivational morphology have been analyzed as resulting from the resolution of a mismatch between templatic and scopal constraints (Hyman 2003a, b). Template-scope interactions, while also relevant in Lusoga (Hyman & Inkelas to appear), are not the motivating factor behind the inflectional doubling that occurs in the innovated reciprocal compound construction discussed here, so we do not discuss these template-scope interactions further.

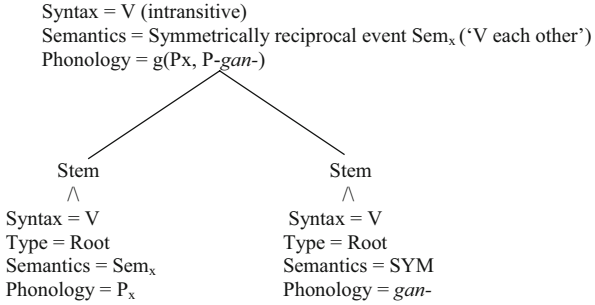
(39)

Inherited		**Innovated**	
a.	ROOT-Reciprocal-FV	b.	ROOT-FV#Reciprocal-FV
	ROOT-agan-a		ROOT-a#gan-a
c.	bàl-ágàn-**é**	d.	bàl-**é**#gàn-**é**
	count-rec-**irr**		count-**irr**#rec-**irr**
	Count (pl.) each other!'		Count (pl.) each other!'

The optionality of ME results from the fact that Lusoga retains the conservative reciprocalized verb structure alongside the preferred, innovative compound structure. This innovative structure fits the characterization of Harris' Type 1 ME, which, we argue, requires a compounding construction.

A sample schema of a simple Lusoga reciprocal verb stem using the Sign Based Morphology formalism is shown in (40). Reciprocals in Bantu are argument-structure changing operations exhibiting what Gaby et al. (2008) have called 'core' reciprocal argument indexation ("the Actor of one instantiation of the event is also the Undergoer of another instantiation of the same event (A1 = U2) while the Undergoer of the first instantiation is the Actor of the second (U1 = A2)" (Gaby et al. 2008: 262; see also König and Kokutani 2006)). In the schema in (40), the semantics of the reciprocal construction is represented as involving symmetric (SYM) events.

(40) Lusoga compounding *-gan-* construction



An abbreviated representation is shown in (41). The right-hand daughter node, the head of the construction, contains a verbal root that encodes a symmetrically reciprocal event that is specified phonologically (*-gan-*).[15] The phonological properties of the compound construction (the mother node) are calculated as a function of the phonological properties of the first stem (described as variable *x*) plus those of the *-gan-* compounding stem.

[15]This schema represents that compounds containing *-gan-* are a type of constructional idiom (Jackendoff 2002; Booij 2009), akin to a representation involving an affix, which captures both the recent diachronic development of the root *gan-* from a reciprocal affix, as well as the general observation that the distinction between compounding and derivational morphology is a gradient one (Booij 2009).

(41) [[*x*]$_{V}$ [-*gan*-]$_{Vi}$] $_{Vi}$ $\leftrightarrow$ '[x]$_{V}$ each other'
   | |
[αF] [αF]

Each member of the compound is linked to a set of morphosyntactic features and argument structure increasing morphology ([αF]). We enrich this compounding schema with the construction with built-in stem-identity exemplified for Hungarian in (30) above. In the case of Lusoga, the compounding construction has daughter verb stems that may agree in their final inflectional vowel (FV), causative and applicative morphology. This is shown in (42).

(42) [[ ]$_{V1,\ (FV = \alpha, CAUS = \beta,\ APPL = \gamma)}$ [-*gan*-]$_{V2,\ FV = \alpha, CAUS = \beta, APPL = \gamma}$]$_{V}$

As mentioned above, the optionality of ME results from the coexistence of inherited monomorphemic verb structures with a reciprocal suffix, and the innovative compounding structure requiring the construction in (42).

The structure of reciprocal Lusoga verbs with ME is shown below, with doubling of the final inflectional vowel (-*é*) in (43a), of the applicative and final inflectional vowel (-*ír*-*á*) in (43b), and of the causative and final inflectional vowel (-*y*-*é*) in (43c).

(43) Lusoga compounding *gan*- construction with ME

a. [[bàl-**é**]$_{V}$**[**gàn-**é**]$_{V}$**]**$_{Vi}$ 'count (pl.) each other'
b. [[[kùb-**ír**-**á**]$_{V}$ [gán-**ír**-**á**]$_{V}$]$_{Vi}$ 'where do they beat each other?'
c. [[tù-lùm-**y**-**é**]$_{V}$ [gan-**y**-**é**]$_{V}$**]**$_{Vi}$ 'let's injure each other'

In sum, the Lusoga case instantiates a Type 1 ME pattern that recently developed from reanalysis of a monomorphemic verb structure as a compound construction. As predicted in OCM, both inflection and derivation are involved in ME. Harris proposes that Type 1 ME often develops historically from grammaticalization of inflected auxiliaries or determiners, but, as mentioned above, may also arise through compounding. In the case of Camling (discussed in §6.1 above), compounds or constructions that resemble compounds exhibit ME of subject or object marking. As Harris notes, the original analysis in Ebert (1997) explicitly characterizes these forms as compounds, where verbs that have lexical meanings have an allomorph in compounding with a functional meaning (e.g., -*pid* 'to give', used as a benefactive in compounding (2017: 141)). Harris notes these constructions may have already been grammaticalized, but draws a connection between compounding and grammaticalization as related mechanisms that have the potential to be historical precursors of Type 1 ME. In the analysis proposed here, this class of patterns, which may have multiple historical sources, require a single synchronic mechanism of stem-identity.

7 Conclusion

Until recently, ME has been a tricky subject to discuss in morphological theory because of uncertainty about its typological status. Recent work by Caballero and Harris (2012) and Harris (2017) has brought the phenomenon onto center stage. It is not a marginal phenomenon to be explained away in theories that prohibit it; nor is it uniform in its origin or synchronic analysis. This relatively programmatic discussion of ME has attempted to show, in one model of morphology, that ME is an emergent property, following from principles independently needed to construct words without ME. In OCM, these principles determine the selection of constructions that combine, and the hierarchical order in which they do so, to construct words that match a meaning target. In OCM, ME emerges when the optimal collection of constructions that produces a given word happen to expone the same property more than once.

Work on Construction Morphology has shown that word formation and inflectional schemas easily account for patterns where the traditionally held view of the one-to-one association between meaning and form in morphological expression do not hold. Construction-based analyses of ME have been proposed for specific languages (e.g., Harris 2009 for ME in Batsbi). We propose here that a whole class of ME patterns exhibiting recurring characteristics result from a stem-identity mechanism that relates ME to other cross-linguistically common morphological phenomena.

More generally, this case study raises important questions about the phonological representation of morphologically complex words and the relation between morphology and phonology in construction-based approaches. OCM shares with Construction Morphology (CxM; Booij 2010) the goal of accounting for both the phonological (formal) and semantic properties of morphologically complex words using a top-down approach and output-oriented schemas that relate form to meaning. This architecture allows both CxM and OCM to analyze morphological phenomena where a one-to-one association between meaning and form does not hold, as in patterns of multiple exponence. While CxM does so by exploiting the motivational role of schemas in an exclusively word-based approach (see discussion in Booij and Audring 2018, this volume), OCM does assume some constructions may be interpreted as involving pieces of structure and adds the competition structure of Optimality Theoretic approaches. We argue this addition allows us to better understand the role of the phonological component in the construction of complex words.

References

Anderson, S.R. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.

Bastin, Y. 1986. Les suffixes causatifs dans les langues bantoues. In *Africana Linguistica* X, 55–145 (Annales du Musée Royale de l'Afrique Centrale. Série IN-8, Sciences Humaines. N. 121. Tervuren).

Bickel, B., and J. Nichols. 2007. Inflectional morphology. In *Language typology and syntactic description*, ed. T. Shopen, 2nd ed., 169–240. Cambridge: Cambridge University Press.
Bickel, B., G. Banjade, M. Gaenszle, E. Lieven, N. Prasad Paudyal, I. Purna Rai, M. Rai, N. Kishore Rai, and S. Stoll. 2007. Free prefix ordering in Chintang. *Language* 83: 1–31.
Booij, G. 2009. Compounding and construction morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.
———. 2010. *Construction morphology*. Oxford: Oxford University Press.
Booij, G., and J. Audring. 2018. Partial motivation, multiple motivation: The role of output schemas in morphology. This volume.
Bybee, J. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam/Philadelphia: Benjamins.
Caballero, G. (2006). Templatic back-copying in Guarijío Abbreviated Reduplication. *Morphology* 16(2):273-289.
Caballero, G. 2008. *Choguita Rarámuri (Tarahumara) phonology and morphology* (University of California dissertation), Berkeley, CA.
Caballero, G. and A.C. Harris. 2012. A working typology of multiple exponence. In *Current issues in morphological theory: (Ir)Regularity, analogy and frequency*, ed. F. Kiefer et al. Selected papers the14th International Morphology meeting, Budapest, 13–16 May 2010. Amsterdam/Philadelphia: John Benjamins, 163–188.
Caballero, G., and S. Inkelas. 2013. Word construction: Tracing an optimal path through the lexicon. In *New theoretical tools in the modeling of morphological exponence*, ed. Jochen Trommer. Heidelberg: Springer. Special issue of *Morphology* 23(2): 103–143.
Cruz, E. and A.C. Woodbury. 2013. *Tonal complexity in San Juan Quiahije Eastern Chatino compound verb inflection*. Presentation from LSA and SSILA Special Session on Inflectional Classes in the Languages of the Americas.
Dahlstrom, A. 2000. Morphosyntactic mismatches in Algonquian: Affixal predicates and discontinuous verbs. In *Proceedings from the panels of the Chicago Linguistic Society's Thirty-sixth Meeting*, ed. A. Okrent and J. Boyle, 63–87. Chicago: Chicago Linguistic Society.
Donohue, M. 2003. Agreement in the Skou language: A historical account. *Oceanic Linguistics* 42: 478–498.
Downing, L., and S. Inkelas. 2015. What is reduplication? Typology and analysis part 2: The analysis of reduplication. *Language and Linguistics Compass* 9: 516–528.
Dressler, W.U. 2004. Hypercharacterization and productivity in inflectional morphology. In *Analecta Homimi Universali Dicata: Festschrift für*, Oswald Panagl zum 65. Geburtstag, ed. U.M.T. Krisch and T. Lindner, 515–524. Stuttgart: Heinz.
Durie, M. 1985. *A grammar of Acehnese on the basis of a dialect of North Aceh*. Dordrecht: Foris.
Ebert, K.H. 1997. *Camling (Chamling)*. München: LINCOM Europa.
Gaby, A., E. König, and V. Gast. 2008. Distinguishing reciprocals from reflexives. In *Reciprocals and reflexives: Theoretical and typological explorations*, ed. K. Thaayorre, 259–288. Berlin: Mouton de Gruyter.
Good, J. 2005. Reconstructing morpheme order in Bantu: The case of causativization and applicativization. *Diachronica* 22: 55–109.
Halle, M., and A. Marantz. 1993. Distributed morphology and the pieces of inflection. In *The view from building 20*, ed. K. Hale and S.J. Keyser, 111–176. Cambridge, MA: MIT Press.
Harris, A.C. 2009. Exuberant exponence in Batsbi. *Natural Language and Linguistic Theory* 27: 267–303.
———. 2017. *Multiple exponence*. Oxford: Oxford University Press.
Hay, J.B. 2002. From speech perception to morphology: Affix ordering revisited. *Language* 78: 527–556.
Hay, J., and H. Baayen. 2002. Parsing and productivity. In *Yearbook of morphology 2001*, ed. G. Booij and J. van Marle, 203–235. Dordrecht: Springer.
Hay, J.B., and H.R. Baayen. 2005. Shifting paradigms: Gradient structure in morphology. *Trends in Cognitive Sciences* 9: 342–348.

Hay, J.B., and I. Plag. 2004. What constrains possible suffix combinations? On the interaction of grammatical and processing restrictions in derivational morphology. *Natural Language & Linguistic Theory* 22: 565–596.

Hyman, L.M. 2003a. Sound change, misanalysis and analogy in the Bantu causative. *Journal of African Languages and Linguistics* 24: 55–90.

———. 2003b. Suffix ordering in Bantu: A morphocentric approach. In *Yearbook of morphology 2002*, ed. G. Booij and J. van Marle, 245–281. Dordrecht: Kluwer Academic Publishers.

Hyman, L., & S. Inkelas, (with F. Jenga). to appear. *Multiple exponence in the Lusoga verb stem*.

Inkelas, S. 2016. Affix ordering in optimal construction morphology. In *Morphological metatheory*, ed. D. Siddiqi and H. Harley, 479–511. Amsterdam/Philadelphia: John Benjamins.

Inkelas, S., and L. Downing. 2015. What is reduplication? Typology and analysis part 1: The typology of reduplication. *Language and Linguistics Compass* 9 (12): 502–515.

Inkelas, S., and Ch. Zoll. 2005. *Reduplication: Doubling in morphology*. Cambridge: Cambridge University Press.

Inkelas, S., C.O. Orgun, and C. Zoll. 1997. The implications of lexical exceptions for the nature of grammar. In *Constraints and derivations in phonology*, ed. I. Roca, 393–418. Oxford: Oxford Clarendon Press.

Jackendoff, R. 2002. *Foundations of language*. Oxford: Oxford University Press.

Kibrik, A. 1991. Organising principles for nominal paradigms in Daghestan languages: Comparative and typological observations. In *Paradigms*, ed. F. Plank, 255–274. Berlin: Mouton de Gruyter.

Kiparsky, P. 1982. Lexical morphology and phonology. In *Linguistics in the morning calm*, ed. S. Yang, 3–92. Hanshin: Seoul.

———. 2000. Opacity and cyclicity. *The Linguistic Review* 17: 351–367.

———. 2005. Blocking and periphrasis in inflectional paradigms. In *Yearbook of morphology 2004*, ed. G. Booij and J. van Marle, 113–135. Dordrecht: Springer.

König, E., and S. Kokutani. 2006. Towards a typology of reciprocal constructions: Focus on German and Japanese. *Linguistics* 44: 271–302.

Lehmann, Ch. 2005. Pleonasm and hypercharacterisation. In *Yearbook of morphology 2005*, ed. G. Booij and J. van Marle, 119–154. Dordrecht: Springer.

Matthews, P.H. 1974. *Morphology*. Cambridge: Cambridge University Press.

McCarthy, J. 2000. Harmonic serialism and parallelism. In *Proceedings of NELS 30*, ed. M. Hirotani, A. Coetzee, N. Hall, and J.-Y. Kim, 501–524. Amherst: GLSA.

———. 2010. An introduction to harmonic serialism. *Language and Linguistics Compass* 4: 1001–1018.

Menn, L., and B. MacWhinney. 1984. The repeated morph constraint: Toward an explanation. *Language* 60: 519–541.

Mortensen, D. 2006. *Logical and substantive scales in phonology*. PhD thesis, University of California, Berkeley.

Müller, G. 2006. *Extended exponence by enrichment: Argument encoding in German, Archi and Timucua*. Unpublished manuscript. University of Leipzig.

———. 1997. *Features, positions and affixes in autonomous morphological structure*. New York: Garland.

Orgun, C.O. 1996. *Sign-based morphology and phonology: With special attention to Optimality Theory*. PhD thesis. University of California, Berkeley.

Ourn, N., and J. Haiman. 2000. Symmetrical compounds in Khmer. *Studies in Language* 24: 483–514.

Paster, M. 2007. Aspects of Maay phonology and morphology. *Studies in African Linguistics* 35: 73–120.

———. 2008. Optional multiple plural marking in Maay. In *Variation and change in morphology*, ed. F. Rainer, W.U. Dressler, D. Kastovsky, and H.Ch. Luschützky, 177–192. John Benjamins: Amsterdam/Philadelphia.

Pater, J. 2000. Non-uniformity in English secondary stress: The role of ranked and lexically specific constraints. *Phonology* 17: 237–274.

Riehemann, S. 1998. Type-based derivational morphology. *The Journal of Comparative Germanic Linguistics* 2: 49–77.

Selkirk, E. 1982. *The syntax of words*. Cambridge, MA: MIT Press.

Siddiqi, D. 2006. *Minimize exponence: Economy effects on a model of the morphosyntactic component of the grammar*. PhD dissertation. University of Arizona.

Soukka, M. 2000. *A descriptive grammar of Noon: A Cangin language of Senegal*. Munich: LINCOM Europa.

Stump, G. 1991. A paradigm-based theory of morphosemantic mismatches. *Language* 67: 675–725.

———. 2001. *Inflectional morphology: A theory of paradigm structure*. Cambridge: Cambridge University Press.

Topuria, V. 1967. *Svanuri ena, I: Zmna* [The Svan Language, I: The Verb]. [Published s volume I of his *Šromebi* [works]. Tbilisi: Mecniereba (First published 1931).

Wiese, R. 1996. *The phonology of German*. Oxford: Clarendon Press.

Wolf, M.A. 2008. *Optimal interleaving: Serial phonology-morphology interaction in a constraint-based model*. PhD dissertation. University of Massachusetts, Amherst.

A Construction Morphology Approach to Sign Language Analysis

Ryan Lepic and Corrine Occhino

Abstract In this chapter, we extend a usage-based theory of Construction Morphology to the analysis of sign language structure, to address two long-standing categorization problems in sign language linguistics. Sign language linguistics traditionally distinguishes monomorphemic core lexical signs from multimorphemic classifier construction signs, based on whether or not a sign form exhibits analyzable morphological structure ("the Core vs. Classifier problem"). In this tradition, core signs are retrieved from the lexicon, while classifier signs are derived productively via grammatical rules. Sign linguists are also accustomed to classifying discrete and listable aspects of sign structure as language, while aspects of signing that exhibit more holism or gradience are considered to be gesture ("the Language vs. Gesture problem"). These categories of core vs. classifier on the one hand and language vs. gesture on the other derive from a shared source: the assumption that linguistic forms are built up from discrete building blocks. Instead, we analyze multimodal usage events in terms of constructions, conventional patterns of meaning and form containing both fixed elements and variable slots and organized in a structured network. We argue that the Construction Morphology approach leads to a uniform analysis of core and classifier signs alike, without resorting to an *a priori* distinction between language and gesture.

Keywords Sign language · Usage-based · Construction grammar · Lexicon · Classifier · Gesture

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1 Introduction

In this article, we extend the theory of Construction Morphology to the analysis of sign language structure. Our goal is to demonstrate that there is much to be gained from the construction-theoretic analysis of sign languages: Construction Grammarians will find that sign languages provide additional support for the position that human languages vary in fundamental ways, even as they exhibit cross-linguistic functional similarities. Sign linguists will find that a Construction Grammar framework can resolve several longstanding puzzles concerning the morphological transparency of conventional signs. However, to date, there have been few points of contact between the literatures on Construction Grammar and sign language analysis.[1] For this reason, we begin with a brief introduction to Construction Grammar, for sign language linguists, and to the structure of signs, for Construction Grammarians.

The family of theories that we refer to here as "Construction Grammar" began in analyses of fixed expressions with idiomatic as well as productive properties. Accounting for phrasal idioms in English like the "let alone" construction (Fillmore et al. 1988) and the "what's X doing Y" construction (Kay and Fillmore 1999), for example, led to increased recognition of the fact that many linguistic constructions exhibit fixed and variable structural elements at once. In the "what's X doing Y" construction, the order and identity of the words *what's* and *doing* are analyzed as fixed components, and the remaining elements are variable slots to be filled with words and phrases like *a fly* and *in my soup*, or *that* and *there*, in the course of actual language use. This tendency for constructions to contain both fixed and variable elements models a speaker's ability to use language in conventional as well as productive ways.

Importantly, in Construction Grammar, phrasal patterns themselves are typically associated with semantic or pragmatic functions that cannot be attributed to the identity and arrangement of their internal constituents alone. In the case of the sentences *What's a fly doing in my soup?* and *What's a poodle-haired rock musician doing writing a book about crinolines?,*[2] the phrasal pattern "what's X doing Y" accounts for the expression of surprise, as well the inference that the request is for an explanation of how the state of affairs came to be, not a literal description regarding the activity being done. These additional aspects of meaning cannot be derived from the individual words in the sentence, but rather are associated with the phrasal template directly. Construction Grammarians thus consider constructions to be theoretical primitives that are crucial for explaining observed patterns of language use.

[1] We are aware only of Johnston and Ferrara (2012), on the topic of phrasal idioms, Lepic (2016), on derivational morphology, and Wilcox and Occhino (2016), on pointing constructions, as articles that explicitly adopt a construction-theoretic view of sign language structure.

[2] https://twitter.com/FTLifeArts/status/722397326287970304

Since the 1980s, several varieties of Construction Grammar have been developed (see Hoffmann and Trousdale (eds.) 2013 for an overview). Though these approaches differ in important ways, they share some fundamental assumptions that set them apart from other approaches to linguistic analysis. Following Goldberg (2013: 15–16), we can articulate some of these assumptions as follows:

Assumptions of a Constructionist Theory

1. **Constructions**: Phrases and lexical items alike are analyzed as constructions, which are learned pairings of form and function (including meaning).
2. **Network organization**: Constructions are related in a single, structured network, and are not sequestered in either "the lexicon" or "the grammar".
3. **A Usage-based theory**: Languages are learned through generalization over events the speaker has experienced as the speaker experiences them, and abstract generalizations are emergent from knowledge about particular items.

Thinking about how a construction-theoretic approach might be extended to the domain of morphology in particular, Booij (2010, 2013) has demonstrated that words exhibit the same sort of schematic structure that phrasal idioms do. Like idioms, words are memorized wholes with analyzable internal structure. Accordingly, in the theory of Construction Morphology, individual word tokens are analyzed as concrete instantiations of abstract word-formation schemas, such that the English words *acceptable*, *believable*, and *doable* license the generalization of a constructional schema "Xable", for example. This schema is a lexical pattern linking a network of learned, conventional English words, and also provides a recipe for the formation of new, previously un-encountered words. Like the phrasal pattern "what's X doing Y", the lexical pattern "Xable" is associated with a meaning, something along the lines of "can be VERB-ed", and it contains both fixed and variable slots that account for its idiomatic and productive properties. Construction Morphology thus fleshes out the lexical side of the construction-theoretic argument that the difference between a phrasal construction and a lexical construction is a matter of degree, rather than kind.

Turning now to introduce the field of sign language linguistics, it is important to note that the analysis of sign language structure has traditionally followed a different set of assumptions than those outlined above. Sign language linguistics began in earnest with William Stokoe's seminal demonstration that signs exhibit contrastive internal structure (Stokoe 1960). While even among linguists, signs had previously and widely been assumed to be concrete, holistic, non-linguistic gestures, Stokoe's structural analysis showed that the signs of sign languages are more like the words of spoken languages than they are like the manual gestures produced by non-signers: like spoken words, signs can be broken down into a finite, listable, and language-specific inventory of formational elements that can, in principle, be recombined to yield a staggering number of possible sign forms.[3]

[3] Vogler and Metaxas (2001) estimate over 1 billion phoneme combinations in ASL, and Morgan (2016) estimates that the distinctive features in Kenyan Sign Language yield over 12 billion possible sign forms.

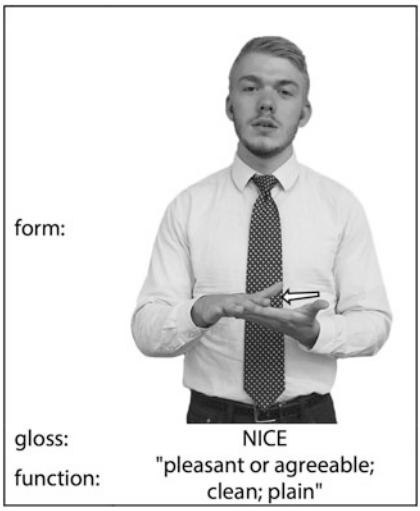

Fig. 1 The ASL sign glossed as NICE is formed with two "flat" hands contacting one another in front of the body

Following Stokoe's example, it remains typical in sign language linguistics to use pairs of minimally different signs to argue for the linguistic status of contrastive and "meaningless" sub-lexical formatives (see Klima and Bellugi 1979: 42 for a widely-cited demonstration of this point, and Fenlon et al. (2018) for an overview of sign language phonology from this perspective). As a result, though the labels and distinctions differ across studies, sign linguists can minimally describe sign forms through reference to the shape of each hand and the way the hands move in the articulation of the sign.[4] As an example, consider the ASL (American Sign Language) sign glossed as NICE, shown in Fig. 1.[5] This sign is formed with the fingers on each hand extended and held together to make a wide, flat shape, and during the articulation of the sign, the palm of the right hand slides across the open palm and fingers of the left hand, in a single movement.

The handshape and movement of the sign NICE can be analyzed as discrete phonological elements in ASL: the "flat" handshape used to form the sign NICE is drawn from the inventory of conventional ASL handshapes, and the straight path movement can also found in other ASL signs. The same "flat" handshape is also

[4]Here we are oversimplifying quite a bit. The "formational parameters" that are most standardly discussed in sign phonology are "handshape", "movement", and "location". However, sign forms also differ according to the relationship between the two hands, including whether one or two hands are used, the orientation of the hand(s) relative to the body, and/or the hands' orientation relative to each other. Some signs are also canonically formed with certain facial expressions or body postures. Here we focus on "the shape of the hands" (handshape) and "how the hands move" (movement + location) only, for ease of exposition. We refer readers to Sandler and Lillo-Martin (2006) for an accessible and comprehensive overview of sign language phonology and morphology from a generative perspective.

[5]Sign language linguistics has developed its own idiosyncratic glossing conventions. English words in SMALL-CAPS indicate single ASL sign forms, as do English multiple words joined by hyphens.

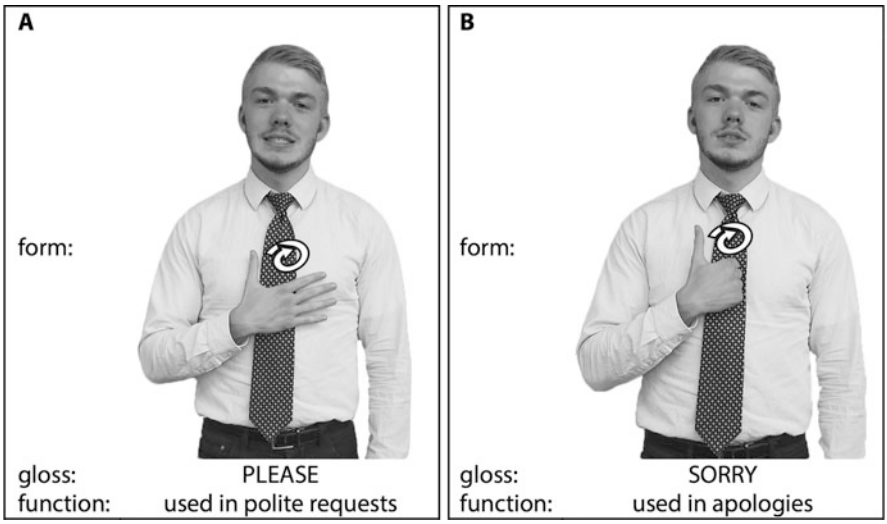

Fig. 2 A minimal pair in ASL: (**a**) the ASL sign glossed as PLEASE is formed with one "flat" hand tracing a small circle on the signer's chest, and (**b**) the ASL sign glossed as SORRY is formed with one "fist" hand tracing a small circle on the signer's chest

used, for example, in the formation of the ASL sign PLEASE. However, this sign's movement pattern is different, as it is formed with the flat hand tracing a small circle on the chest (Fig. 2a). The circular movement pattern in PLEASE is yet another recurring element found in other signs: the ASL sign glossed as SORRY differs from PLEASE only in that the hand forms a closed fist, rather than a flat palm (Fig. 2b).

The signs PLEASE and SORRY can therefore be considered a minimal pair in ASL: they are formed identically, except that they require different handshapes. Though PLEASE and SORRY are also related in function, as both signs are conventional indicators of politeness, it is not possible to compositionally derive the meaning of either PLEASE or SORRY from the combination of the handshape or movement pattern involved. Accordingly, the difference between the signs PLEASE and SORRY is most commonly characterized as an arbitrary phonological difference in ASL.

We have just seen that ASL signs can be formed with one hand or two, and it is possible to describe the phonological structure of a sign in terms of recurring formational elements such as the shape of the hand(s) or how the hand(s) move during the articulation of the sign. These phonological elements can be isolated through comparison of minimally different, semantically unrelated pairs of signs. We contend that this traditional approach to sign language analysis has led the field of sign language linguistics to retain several unquestioned assumptions about the nature of linguistic structure (e.g., Fernald and Napoli 2000: 42 after Liddell and Johnson 1986: 496). These assumptions can be articulated as follows:

Assumptions of a Structuralist Theory

1. **Building blocks**: Linguistic expressions are built from smaller, discrete units, either phonemes (meaningless building blocks) or morphemes (meaningful building blocks).
2. **Lexicon and grammar**: Linguistic knowledge is divided into two types: the lexicon as a list of minimally meaningful forms, and the grammar as the set of rules that create well-formed complex utterances.
3. **A Derivational theory**: Languages are learned through abstraction of rules that combine morphemes to derive semantically compositional expressions.

In the remainder of this article, we present a usage-based implementation of Construction Morphology for the analysis of sign language structure. In advocating for a construction-theoretic approach, we take as our point of departure the "rule/list fallacy" (Booij 2010; Bybee 2006; Langacker 2008). The rule/list fallacy is the belief that grammatical rules and lexical entries constitute mutually exclusive kinds of linguistic knowledge, following from the assumption that the meaning of any complex linguistic expression can be computed as a function of the meanings of its parts. As a consequence of this assumption, any linguistic expression must be treated either as complex and made of smaller meaningful building blocks, or, alternatively, as a simple, minimally meaningful building block, itself. In Sect. 2, we describe how the rule/list fallacy has contributed to two long-standing categorization problems in the field of sign language linguistics, which we refer to as the Core vs. Classifier problem and the Language vs. Gesture problem, and which we address in Sects. 3 and 4, respectively.

2 The Rule/List Fallacy

As we have just described, the field of sign language linguistics has been established on a broadly structuralist foundation. Through exhaustive decomposition of conventional signs into meaningless-seeming parts, sign language linguists have identified formative building blocks that can be considered analogous to the phonemes of spoken languages. In early linguistic analyses of sign language structure, this conceptual move was essential to the argument that sign languages are indeed full-fledged human languages and not collections of pantomimic gestures.

In this section, we demonstrate that the principle of exhaustive semantic decomposition, or *analyzability*, also continues to occupy a central and explanatory role in sign language linguistics. In this "post-Bloomfieldian" tradition (Blevins et al 2016), sign linguists treat analyzability as a metric that can divide linguistic expressions into two categories: linguistic expressions such as words and phrases are *analyzable* when they exhibit compositional and thus meaningful internal structure, and are *unanalyzed* when they are holistic, minimally meaningful forms exhibiting only meaningless internal structure. Analyzability is thus used as a criterion to distinguish minimally meaningful lexical entries from derived complex expressions: a linguistic expression that is not predictable from the meanings of its parts is considered

to be lexically listed as a morpheme, while expressions that are analyzable in terms of their parts are considered to have been derived from the concatenation of morphemes by rule.

Under a post-Bloomfieldian conceptualization of language structure, lexicon and grammar are defined in opposition to one another, such that complex expressions are considered to be derived by the grammar, while minimally meaningful expressions are instead retrieved from a list of learned items in the lexicon (e.g., Pinker and Prince 1988, 1994; Pinker 1999). Accordingly, simple linguistic symbols like *run*, which are considered to have arbitrary meanings, are analyzed as different in kind from complex constructs like *running*, whose forms and meanings are considered to be predictable according to general derivational rules. This view leads naturally and intuitively to the conclusion that, with the appropriate grammatical rules identified, it would be inefficient and inelegant to also commit complex words to lexical storage, whether as part of a speaker's linguistic knowledge or in an actual printed dictionary.[6]

However, it is an error to elevate this axiom of descriptive economy to the level of a foundational assumption about the mental nature of human language (see Hockett 1967: 219 for a similar observation). As formulated by Langacker (1987), the rule/list fallacy is the assumption that these two kinds of linguistic knowledge, rules and lists, are mutually exclusive, to begin with.[7] Though complex expressions may sometimes exhibit regular, fully transparent structure, these structural considerations in no way preclude complex expressions from becoming *entrenched*, or stored and activated holistically in the minds of speakers (Bybee 2001, 2010; Langacker 1987, 2008). The alternative to the rule/list fallacy is for linguistic theories to recognize that knowledge about specific items and knowledge about sets of related items "can perfectly well coexist in the cognitive representation of linguistic phenomena" (Langacker 1987: 42). Accordingly, in a usage-based theory, a speaker's mental representation of their language is affected by their myriad experiences using their language, and not determined by structural principles alone.

This conceptual shift to a usage-based approach has profound implications for analyses that appeal to a notion of *lexicalization*. Because sign linguists have traditionally assumed an *a priori* division between lexicon and grammar, the term lexicalization has been used to describe the process through which an expression with rule-governed, analyzable structure has become lexically listed as an unanalyzed whole (see Battison 1978: 342; Berent and Goldin-Meadow 2015; Cormier et al. 2013; Klima and Bellugi 1979: 80; Liddell and Johnson 1986 for examples of this view). In this sense, lexicalization refers to the process of "having

[6]See Jackendoff (1975), Anderson (1992), and Bochner (1993) for further discussions of the notion of "economy" and the development of morphological theory in generative linguistics.

[7]The rule-list fallacy is part of a larger set of false dichotomies that Langacker (2008: 13) refers to as "exclusionary fallacies". These fallacies stem from creating predetermined, mutually exclusive alternatives when formulating questions related to categorization or membership.

become a part of the lexicon", with holistic rather than compositional semantics (see e.g., Himmelmann 2004; Lepic 2015).[8]

To take one example, stemming from the very practical concern of determining what ought to be listed in a sign language dictionary, Johnston & Schembri (1999: 115) define a *lexeme* as "a linguistic unit with a 'given' rather than a 'generated' meaning", such that lexemes are listed in the lexicon, rather than derived by the grammar. Here the criterion of unanalyzability determines whether a sign has been lexicalized: lexemes are lexicalized signs that are holistically paired with meanings that go beyond the sum of their parts or are otherwise not amenable to compositional analysis (see Johnston and Schembri 1999: 127–129 for examples).

As another example, from a theoretical perspective, Aronoff et al. (2003: 74) are also explicit in their use of analyzability as a metric for lexicalization: they consider signs to be unanalyzed lexical entries, and characterize the lexicalized sign WRITE in Israeli Sign Language as an "unanalyzed sign" that is "listed in the mental lexicon". Though Aronoff and colleagues also demonstrate that signers readily "reanalyze" the structure of "unanalyzed" signs in the course of normal signing, they assume a distinction between listed signs with meaningless phonological structure and reanalyzed signs with morphological structure, treating them as resulting from distinct modes of linguistic knowledge.

In setting aside the rule/list fallacy, we recast "grammatical rules" and "lexical lists" as inherently inseparable forms of linguistic knowledge. Because construction-theoretic accounts do not use the criterion of analyzability to determine whether a construction has been committed to linguistic knowledge, they allow for conventional, actually occurring words, whether simple or complex, to be registered as part of linguistic knowledge. In a usage-based theory of Construction Grammar, a speaker's individual linguistic experience determines the extent to which the expression is represented ("entrenched") as a unit in their linguistic knowledge. This degree of entrenchment is instead determined by facts of language use, particularly frequency of occurrence (see Brooks et al. 1999 on children, Bybee and Scheibman 1999; Bybee 2001 for more general description). As such, the "lexicon" and "grammar" are not considered to be distinct components of linguistic knowledge, and are not adopted as theoretical primitives. Instead, constructions vary in fixedness and specificity and are related to one another in a single, highly structured network (sometimes referred to as the "constructicon"). Similarly, signs with wholly specified forms and meanings co-exist with more variable morphological schemas, and thus exhibit graded rather than discrete internal structure (see also Hay and Baayen 2005 for similar arguments in spoken language morphology).

[8]The term "lexicalization" in signed language linguistics is typically used in a very restricted sense to refer to the process by which any internally-structured construction, whether classifier constructions, fingerspelled words, or multi-sign phrases, become phonologically reduced and non-compositional. In spoken language linguistics, in contrast, the term lexicalization generally refers to a constellation of processes including routinization, conventionalization, and institutionalization, while formal reduction is only one component of a larger process (e.g., Hohenhaus 2005).

3 The Core vs. Classifier Problem

3.1 Signs Exhibit Ambiguous Sublexical Structure

In this section, we address the Core vs. Classifier problem, the first categorization issue following from the assumptions of a structuralist approach to sign language morphology. Here we suggest that assuming an *a priori* division between unanalyzed and analyzable forms precludes an intuitive analysis of transparent morphological structure in conventional ASL signs.

As an initial example, consider the ASL sign pictured in Fig. 3, glossed as MEET. This sign is standardly formed with the hands held upright, with both index fingers extended, and with the hands moving to contact one another in front of the signer's body in a single, coordinated movement. Like the English word *meet*, this sign has a conventional, agreed-upon meaning, "to come together or become acquainted", in ASL.

Following the discussion of sign structure in Sect. 1, we can describe the phonological structure of the sign MEET as involving two "1" handshapes, which are part of the inventory of conventional handshapes in ASL, and a straight "path" movement, also found in other ASL signs, here executed by each hand simultaneously. However, the sign MEET is also instructive because its phonological structure co-varies with its meaning in numerous ways. For example, unlike the English word *meet*, the form of the ASL sign MEET implies that exactly two human participants are involved, carrying out a reciprocal action with a defined endpoint. This is because it is signed with two hands, and the shape and movement of each hand profiles the upright shape and forward movement of a human body in motion

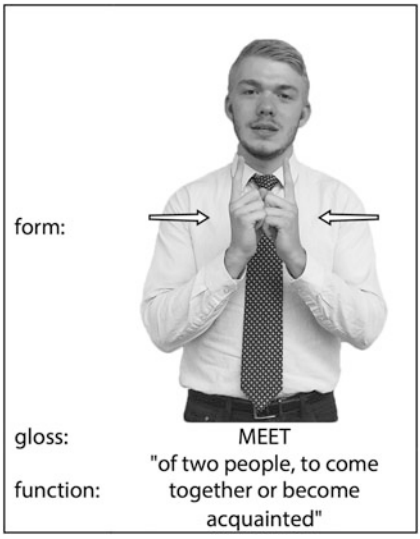

Fig. 3 The ASL sign glossed as MEET is conventionally formed with two "1" hands moving to contact one another in front of the body

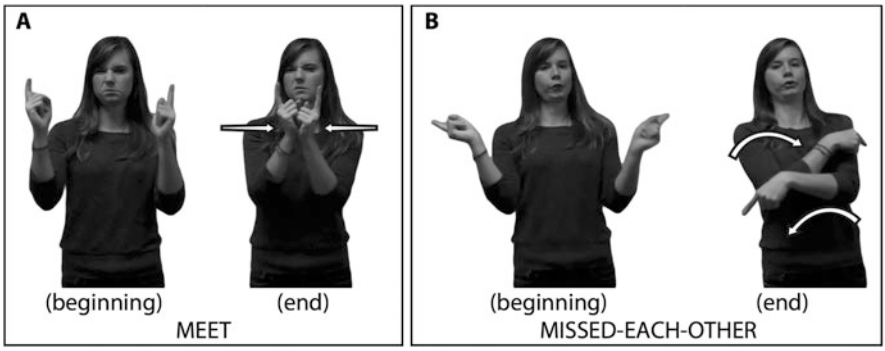

Fig. 4 Two morphologically-related signs from Example 1, (**a**) MEET and (**b**) MISSED-EACH-OTHER

(see Lepic et al. 2016). The structure of the ASL sign MEET can therefore be considered both motivated by and reflective of its meaning: it is a morphologically complex sign.

The form of the sign MEET can also be altered to describe an encounter between a couple and an individual, by changing the shape of the dominant hand to form a "2" handshape, with index and middle finger extended, while keeping only the index finger on the non-dominant hand extended. Or the movement pattern can be altered to spatially align one hand with the signer, and the other with the addressee, as is conventional in the common greeting "nice to meet you".[9] Or the sign MEET can be altered to form a morphologically-related sign that we gloss here as MISS-EACH-OTHER, by moving the hands past one another, instead of bringing them together, as in Example 1, with the relevant signs pictured in Fig. 4:

(1) TWO FRIEND SHOULD **MEET** INDEX SCHOOL, BUT OH-I-SEE, **MISSED-EACH-OTHER**
two friends were supposed to meet at school, but they missed each other

As suggested in Sect. 2, previous treatments of sign-internal structure have discussed the difference between signs like MEET and MISSED-EACH-OTHER in terms of mutual exclusivity between unanalyzed "core" lexical signs and morphologically complex "classifier constructions" (e.g., Brentari and Padden (2001), but see also Brennan (1990) for a different view). Core lexical signs like MEET have standard citation forms and meanings that are considered to be idiosyncratic or are otherwise unpredictable from their sub-lexical structure. As conventional pairings of meaning and form, these signs can be expected to be found in an ASL dictionary, for

[9] https://www.signingsavvy.com/sign/nice+to+meet+you

example. Classifier constructions like MISS-EACH-OTHER, in contrast, exhibit more variability and transparency; they have non-standardized forms and are necessarily interpreted in context, and so are not expected to be found in the dictionary.

In sign language linguistics, classifier constructions are so named because they use an inventory of handshapes to classify referents according to semantic criteria (Supalla 1982, 1986). In ASL, the "1" handshape, with only the index finger extended, is a semantic classifier for upright (human) figures, as in MEET. Similarly, the "3" handshape, with thumb, index, and middle finger extended, is a semantic classifier for vehicles, and the "A" handshape, with only the thumb extended, is semantic classifier for upright objects like statues and buildings, more generally. In any classifier construction, the movement and location of the hands depicts the movement and/or location of the referent entities. For example, Klima and Bellugi (1979: 14) and Supalla (1986: 205) provide illustrations of how these handshapes can be used productively to depict people, vehicles, and objects either meandering along, winding up a hill, or arranged in a row, by altering the way the hand moves in the articulation of the classifier construction. Other types of classifiers include handling classifiers, which categorize referents according to how they are held and manipulated, as well as other classifiers that categorize and describe objects according to their size and shape.

Crucially, classifier constructions all have in common that they are interpreted in context, and seem to straightforwardly derive their meanings from the meanings of their internal parts, namely the shape and movement of the hand(s): "Classifier construction" has become, in a way, a general label for a class of morphologically transparent and highly productive uses of the body and space in discussions of sign language structure (but see Schembri 2003 and Cormier et al. 2012 for critical discussion regarding the name for this class of phenomena).

Relevant for our construction-theoretic analysis here is the point that many core lexical signs exhibit synchronic connections to productive classifier construction signs. One candidate description of this relationship is that the "lexical" sign MEET is homophonous with "classifier construction" meaning "two upright beings approach each other face to face" (Eccarius and Brentari 2007: 1170; recall also Figs. 3 and 4a). Similarly, the conventional ASL sign FALL can be regarded as homophonous with a transparent classifier construction meaning "a two-legged entity inverts and moves downward" (cf. Supalla 1986: 183), and the ASL sign WRITE can be considered an "unanalyzed" sign that is related to a productive classifier construction meaning "a thin instrument is moved across a flat surface" (cf. Aronoff et al. 2003: 74).

As Fig. 5 suggests, these sign forms are each ambiguous between a more idiomatic interpretation as a core lexical sign and a more analytic interpretation as a classifier construction (see also Johnston and Ferrara 2012 for a similar observation). The theoretical puzzle that these sign forms present is how to best account for their dual nature as holistic lexical signs and as complex signs exhibiting analyzable morphological structure. We name this categorization dilemma the Core vs. Classifier problem.

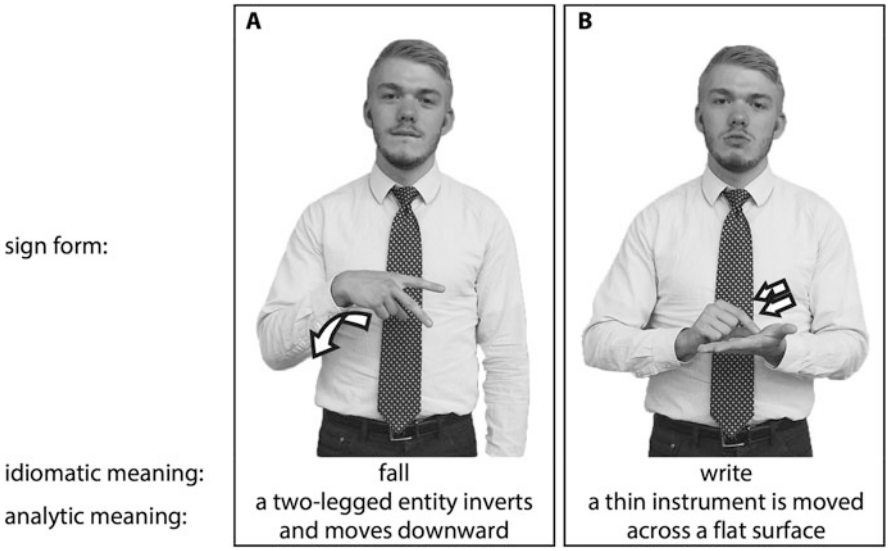

Fig. 5 (**a**) The ASL sign glossed as FALL is formed with a "2" hand moving downward, and (**b**) the ASL sign glossed as WRITE is formed with a dominant "precision grip" hand moving across a "flat" non-dominant hand

We wish to emphasize here that it has never been a question *whether* many ASL signs are amenable to idiomatic- and analytic-seeming interpretations; on the contrary, this ambiguity has been noted in several previous studies. Assuming that core lexical signs and classifier construction signs are mutually exclusive categories, these previous analyses have been primarily concerned with the nature and directionality of the relationship between unanalyzed lexical signs and analyzable classifier constructions. The cross-linguistic tendency for classifier signs to become increasingly idiomatic with repeated use has been described, for example, as "freezing" (Supalla 1986: 183), "lexicalization" (Aronoff et al. 2003), and even "local lexicalization" (Johnston and Schembri 1999: 123). Similarly, the tendency for core lexical signs to be used in a way that suggests that they nevertheless exhibit transparent morphological structure has been described as "mimetic elaboration" (Klima and Bellugi 1979:13), "backformation" (Sandler and Lillo-Martin 2006: 94), and "de-lexicalization" (Cormier et al. 2012: 388).

However, we contend that this fluid ambiguity between idiomatic lexical signs and transparent classifier signs is only remarkable if we assume a categorical division between core lexical signs and classifier construction signs, to begin with. In the remainder of this section, we propose an alternative analysis of sign structure, following the assumptions of a construction-theoretic approach. Rather than stored, unanalyzed forms, frequently-occurring signs are considered to be fixed pairings of meaning and form that become increasingly entrenched in linguistic knowledge as a result of a language user's individual experience with language.

Though "fixed" in form, these entrenched signs nevertheless retain gradient aspects of analyzable structure. We demonstrate that a usage-based theory of Construction Morphology accounts for signers' productive "reanalysis" of lexical signs as productive classifier constructions in signed discourse; this creative re-use of learned patterns demonstrates that lexical signs are holistic gestalts with analyzable internal structure.

3.2 Signs Are Gestalts Exhibiting Analyzable Structure

In Construction Morphology, morphological schemas are patterns that serve two functions: First, they summarize the conventional pairings of form and meaning that speakers (are expected to) have extracted from their experiences using their language over the course of their lives. Second, morphological schemas model any language user's capacity to extend the patterns of their language to create or interpret new complex expressions, productively. By registering actually-occurring complex linguistic expressions as part of linguistic knowledge, along with constructional schemas that generalize across conventional expressions, Construction Morphology avoids the rule/list fallacy described in Sect. 2. Instead, the relationship between a morphological schema and its specific instantiations is one of default inheritance (Goldberg 2013; Booij 2017), with morphological schemas organized in a network according to the aspects of meaning and form that are fixed or variable across its particular instantiations. As a result, a construction-theoretic approach captures the fact that language users' utterances are often at once quite innovative and highly formulaic: some constructions may be fully specified and ready to use "off the shelf", and others specify some aspects of content while also leaving schematic slots open for new content. Though constructions contain both specific and schematic aspects of form and meaning, "specificity" and "schematicity" are gradient rather than categorical notions, and so aspects of form and meaning exist on a cline from more specific to more schematic.

Applying these assumptions to the analysis of sign language morphology, we can first think of concrete utterances or tokens of "the same sign" as instantiations of an abstract constructional representation of that sign type. For example, the sign DEAF, which occurs frequently in ASL discourse, has been previously described as occurring in three phonetic variants: one in which the index finger moves from ear to chin, one in which the index finger moves from chin to ear, and one in which the index finger contacts the cheek only once (Fig. 6, see Liddell and Johnson 1986 and Bayley et al. (2000) for examples and discussion).

Though the use of each of these variant forms is conditioned in part by social and structural factors, including preservation of the preceding phonological place of articulation, the recognition that these different forms are variants of the same sign reflects the fact that signers categorize them as instantiations of the same morphological construction. Grouping distinct usage events as instances of the same

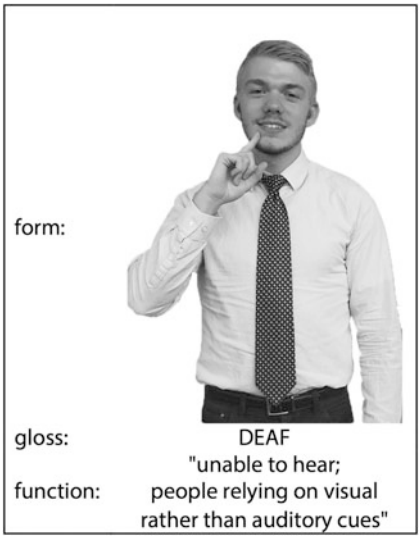

Fig. 6 In all variants, the ASL sign glossed as DEAF is formed with one "1" hand contacting the side of the face between the mouth and ear

element, whether word or phrase, provides evidence for that element's status as a conventional pairing of form and meaning that has been registered as part of the user's linguistic knowledge.[10]

It has similarly been shown that repeated fingerspelled words undergo slight phonetic reduction as they recur within a single stretch of ASL discourse (Brentari 1998): signers' recognition of these distinct usage events as tokens of the same word despite their phonetic reduction suggests that they too are categorized as instantiations of the same morphological construction, that of a particular borrowed English word in ASL discourse. For any newly-borrowed fingerspelled word, the morphological construction may be only weakly or temporarily registered to memory, by virtue of its use being more or less limited to a single usage event as an *ad hoc* borrowed English word. However, certain fingerspelled words that occur frequently across a variety of contexts, such as the signs glossed as #OFF, #BACK, and #OK, have been shown to have undergone considerable phonological restructuring and semantic specialization (cf. Battison 1978, who uses #-notation to indicate highly nativized fingerspelled signs in ASL). These changes can be seen as resulting from (and contributing to) these particular fingerspelled words' becoming entrenched as *bona fide* ASL signs, with corresponding constructional representations, by virtue of their frequent use.

[10]Bybee (2001; 11) demonstrates that in English, syllabicity is lost in sequences of unstressed schwa + resonant more quickly in more frequent forms such as *every* or *memory*. *Every* is often reduced from three to two or even to one syllable /ɛɹi/, as opposed to forms such as *mammary* or *homily*, which are less frequent and typically retain three syllables. Such a process, however, does not preclude speakers from recognizing these phonetic variants as belonging to the same lexical construction.

Language users may also gradually stop categorizing frequently-used variants of "the same sign" as instances of the same sign. For example, when signs undergo the gradual process of grammaticalization, they become conventionally associated with a particular grammatical function, and typically also exhibit specialized phonetic reduction (Bybee 2010). This divergence in usage patterns can result in the gradual formation of a new set of exemplars and a corresponding constructional schema that may overlap only partially with the original schema. This process has been documented with respect to the ASL signs FINISH (Janzen 1995), SELF (Wilkinson 2013), and HAPPEN (Anible and Occhino-Kehoe 2014): these studies all identify phonetic variants of the "same" sign, but demonstrate that the relevant phonetic variants are associated with diverging grammatical functions. This provides evidence that phonetic variants of the same sign may gradually become associated with distinct functions, phonetic realizations, and syntactic distributions, these changes both resulting from and feeding into the formation of increasingly divergent constructional schemas.

A potential outcome of this gradual divergence is that signers may ultimately stop seeing sign tokens as instances of the same sign altogether. Though the historical records necessary for analyzing sign language etymology in depth are scarce, a single historical etymon has likely yielded the synchronically distinct signs PLEASE and ENJOY in ASL (Shaw and Delaporte 2014: 87; recall Fig. 2a): these signs are both formed with a flat palm tracing a small circle on the chest, differing only in that the sign ENJOY is a two-handed sign, formed with the non-dominant hand mirroring the movement of the dominant hand at a slightly lower location on the abdomen, while the sign PLEASE is formed with only one hand. These signs have also diverged in function, as their English glosses suggest, with the one-handed form PLEASE functioning as a marker of politeness, and two-handed ENJOY acting as a full psych verb, in ASL.

While individual sign constructions like DEAF, #OFF, or PLEASE can be thought of as highly specified morphological schemas, representing quite fixed pairings of form and meaning, sign schemas can in turn be analyzed as instantiations of more abstract morphological schemas, which exhibit only partially-fixed structure. Such morphological schemas are referred to descriptively as *sign families* in the literature on sign language morphology (after Frishberg and Gough 2000): sign families are groups of signs with recurring aspects of form and meaning shared among them.

As a concrete example of a sign family, many ASL signs for "women and female family members" are conventionally articulated at the signer's chin, including GIRL, MOTHER, GRANDMOTHER, WOMAN, SISTER, and DAUGHTER. These signs can be analyzed as instantiations of a morphological schema in which the phonological space near the signer's chin is associated with the meaning "female (family member)", represented schematically in Fig. 7. In this representation, the re-use of the chin location among signs referring to "female (family members)" licenses

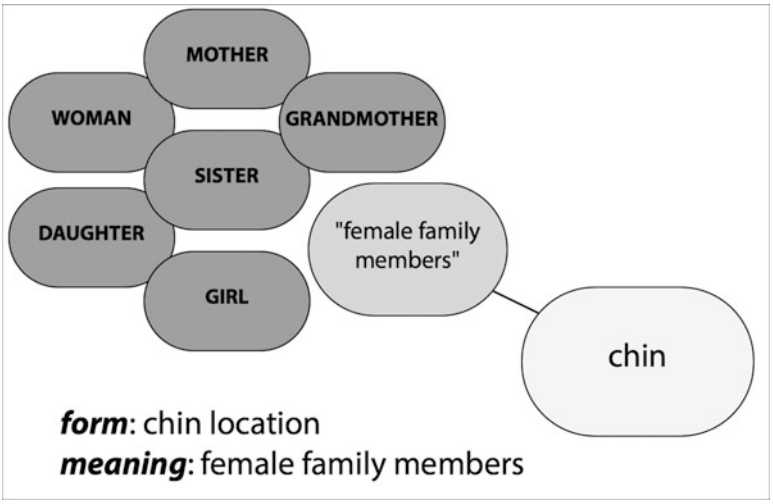

Fig. 7 A family of ASL signs sharing an aspect of meaning and an aspect of form: signs for "female family members" are conventionally signed at the signer's chin

the abstraction of a morphological schema as a pairing of meaning and form.[11] The fixed sign constructions (represented here with glosses) provide the basis for abstraction of a more general pattern, without requiring that the fixed sign constructions necessarily exhibit semantically compositional internal structure.[12]

In ASL, other sign families are also organized around shared use of the chin location, as well: these include families of signs such as EAT, DRINK, and TASTE, all relating to "eating"; signs such as TALK, SHOUT, and ANSWER, all related to "communication"; and NOT, NOTHING, and DENY, all inherently "negative" in some respect. Figure 8 represents this extended network of sign families that all are

[11]Evidence for the psychological reality of this non-compositional morphological schema comes from the fact that the signs glossed as AUNT and FEMALE-COUSIN, which are borrowed lexical items from English (known as "initialized signs", Lepic 2015, Padden 1998, with the underlined letter in the gloss indicating the particular handshape used to form the sign), joined this sign family at the time of their borrowing. Because they also denote "female family members", these borrowed signs are formed to also be signed near the signer's chin.

[12]A more traditional, compositional analysis of the signs in Figs 7 and 8 would be that four morphemes, "chin-female", "chin-communication", "chin-negative", and "chin-eating", are homophonous independent formatives listed as meaningful morphemes in the lexicon. These formatives are then combined with handshapes and movements, which themselves must also contribute meaning as morphemes, to derive signs compositionally via derivational rules (see the "S-morphs" of Liddell & Johnson 1989 and the "ion-morphs" of Fernald and Napoli 2000). This, once again, is the rule/list fallacy at work. We consider this approach to be problematic because there is no principled way to determine how these formatives combine to create a whole sign without access to the meaning of the whole sign in the first place (a familiar dilemma in morphological analysis, see Blevins 2016 for detailed discussion).

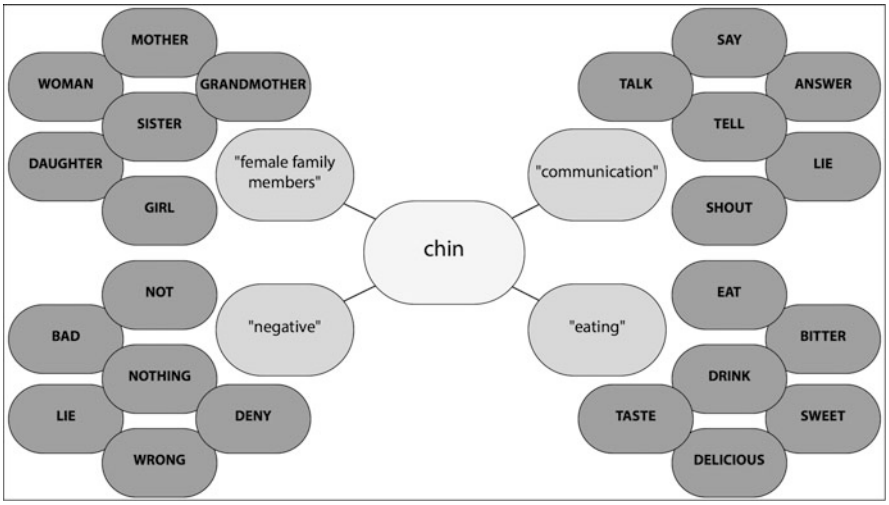

Fig. 8 Four families of ASL signs sharing a place of articulation at the signer's chin

formed at the chin; here we see four clusters of signs that all share some element of form and meaning. In these families of signs, the chin location is a fixed constant across a group of semantically-related signs. However, each family associates the same identifiable formal element with a different aspect of meaning. This view of morphological schemas as emergent generalizations over actually-occurring signs suggests that the chin location is not an independently listed as a phonological realization of a minimal unit of meaning, but rather comes to be associated with particular aspects of meaning as a result of its systematic reuse across a number of conventional signs in ASL.

Thus far, we have been describing how a Construction Morphology analysis can account for relatively fixed, listable sign constructions (which we might otherwise refer to as "core lexical signs") and their corresponding morphological schemas (which we might otherwise refer to as "sign families"). This usage-based, construction-theoretic analysis of sign structure can also be extended to classifier signs to resolve the Core vs. Classifier problem. Under this analysis, "classifier constructions" make productive re-use of morphological schemas that have been extracted across multiple sign tokens.

One such morphological schema is the "movable object" construction. In ASL, several signs are articulated with two "A" hands, a closed fist with the thumb extended, moving relative to one another in signing space. Many of these signs also describe the relative movements and locations of paired referent entities. Frishberg and Gough (2000: 112), for example, list several signs that participate in this sign family, including AHEAD, BEHIND, CHALLENGE, CHASE, DATE, FALL-BEHIND, FAR, FOLLOW, GAME, PASS, and TOGETHER; other conventional signs in this family include AVOID, COMPETE, SUPERIOR, and WHICH (see also Supalla and

Clark 2014). These examples can all be considered conventional sign constructions in ASL, as they are all specified as fixed, conventional pairings of meaning and form. However, these sign constructions also exhibit analyzable internal structure, which provides the motivation for grouping them together in a sign family in the first place.

Like the examples FALL and WRITE discussed above, each of these sign constructions can be said to correspond to both a holistic/idiomatic and a compositional/analytic meaning. However, from a construction-theoretic perspective, idiomaticity is recognized as a gradient rather than categorical status: some signs, such as CHALLENGE, DATE, GAME, and WHICH, seem to exhibit quite unpredictable meanings, while for other signs, like AHEAD, BEHIND, PASS, and TOGETHER, even the learned conventional meaning remains quite transparent. This is illustrated with the signs CHALLENGE, which derives metaphorically from two paired entities contacting "head on", and AHEAD, which straightforwardly places one hand ahead of the other to represent a spatial configuration between two entities, in Fig. 9.

A morphological schema that describes the association of meaning and form across this large family of signs should specify (i) that they are all formed with two "A" hands, and (ii) that they all describe a (spatial) relationship between two entities. However, the exact nature of the relationship between the entities is to be left schematic, as is the movement used in the articulation of the sign construction. Accordingly, this morphological schema can be represented as in Fig. 10 (after

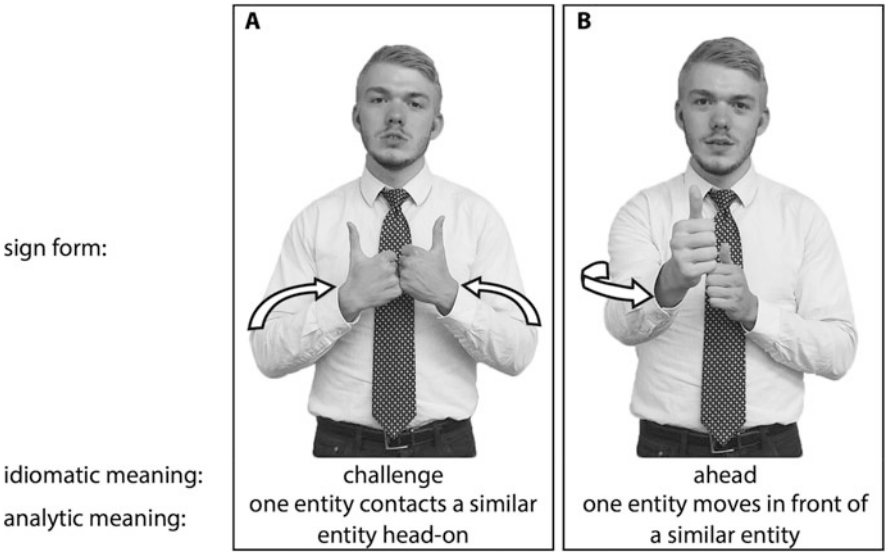

Fig. 9 (**a**) The ASL sign glossed as CHALLENGE is formed with two "A" hands moving to contact one another in front of the body, and (**b**) the ASL sign glossed as AHEAD is formed with a dominant "A" hand moving in front of a non-dominant "A" hand

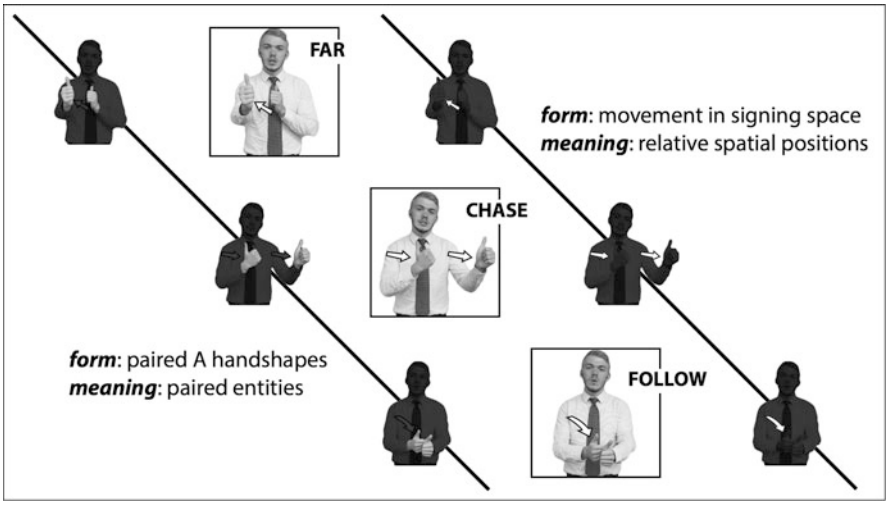

Fig. 10 Two morphological schemas contributing to the "movable object" construction in ASL: across related signs like FAR, CHASE, and FOLLOW, handshape is fixed, but movement is variable

Wilcox and Occhino 2016: 5 and Bybee 2001: 23).[13] Here we use the particular signs FAR, CHASE, and FOLLOW to represent their entire family: across signs in the family of "movable object" signs, the paired A-hands are fixed as part of the construction, and the movement patterns vary across signs as the relationship between the paired referents changes.

In this schematic representation, associations of meaning and form across three signs, FAR, CHASE, and FOLLOW, are extracted to create a morphological schema in which paired A-handshapes are fixed aspects of form that represent "paired entities". Similarly, movement is analyzed as a less fixed, more variable schematic slot: phonological movement patterns profile relative movements and spatial relations between entities, but the particular movement patterns are not specified as part of the general "movable object" construction. Note however, that we neither expect nor reject the possibility of compositional-seeming sign-internal structure here. Though the paired handshapes are fixed as part of a schema, and seem to recombine straightforwardly with different movement patterns, the movement patterns themselves are so variable as to seem unlistable, and can be modified in

[13]Wilcox and Occhino (2016) refer to this type of representation as a phonological rather than morphological schema. In usage-based accounts, these formal divisions are not central to explanations of grammatical phenomena, so we will not insist that a schema must either be phonological or morphological in nature. Nevertheless, these labels can be useful in a more descriptive sense: a phonological schema can be thought of as an abstraction of a formal pattern among related words, a semantic schema as an abstraction of patterns of meaning among related words, and a morphological schema as a statement about systematic relationships between form and meaning schemas.

quite fine-grained ways. This is not surprising if we consider signs to be holistic gestalts that also exhibit analyzable internal structure.

Beyond describing configurations of form and meaning that are shared within a family of sign constructions, morphological schemas also model a signer's ability to create complex expressions productively. Accordingly, a morphological schema like the one in Fig. 10 makes two related predictions. First, conventional (lexical) sign constructions that instantiate a morphological schema are expected to retain analyzable internal structure, even as they begin to gradually take on more idiomatic meanings. This internal structure provides the basis for linking signs together in a family, in the first place. Second, signers are expected to productively modulate their articulation of a schematic sign construction according to the aspects of meaning to be conveyed. Thus, productive extensions of the "movable object" construction will use varied phonological movement patterns to describe the relative location and movement of two referents.

To illustrate how these predictions are borne out in actual signing, consider the ASL sentence in (2), which has been extracted from an online video posting from an ASL news show. This sentence was uttered in a discussion of the United States' Democratic party's primary polling results from September 2015. This sentence contains three instantiations of the "movable object" construction from Fig. 10, highlighted in bold: the sign glossed FALL-BACK is articulated twice, followed by a sign glossed CATCH-UP. These signs are pictured in Fig. 11.

(2) . . . SILLY BIG CHANGE WHY? TWO-MONTHS PAST, INDEX B-E-R-N-I-E
FALL-BACK C-L-I-N-T-O-N
B-Y 21 POINTS **FALL-BACK**, NOW **CATCH-UP** AND LEAD
. . . and that's a huge change, because two months ago, Bernie was trailing Clinton by 21 points, but now he's caught up and is leading

In these sign tokens, the signer's hands represent the relative metaphorical spatial positioning of two discourse referents, "Bernie's ranking in the polls" and "Hillary's ranking in the polls", respectively. The analyzable internal structure in this pair

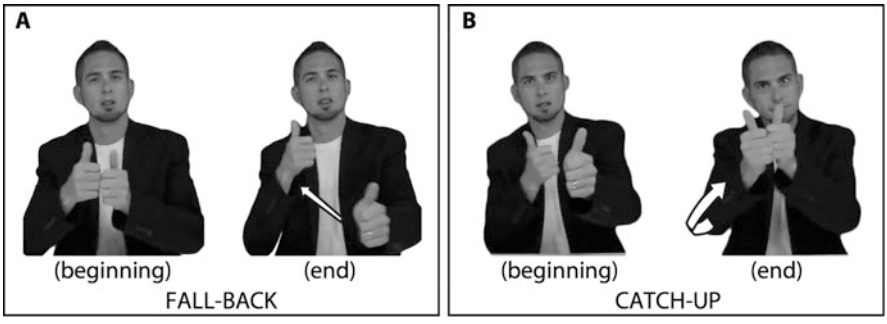

Fig. 11 Two related signs from Example 2, (**a**) FALL-BACK and (**b**) CATCH-UP (Images taken from http://youtu.be/9qeHwcYbCXs?t=2m40s)

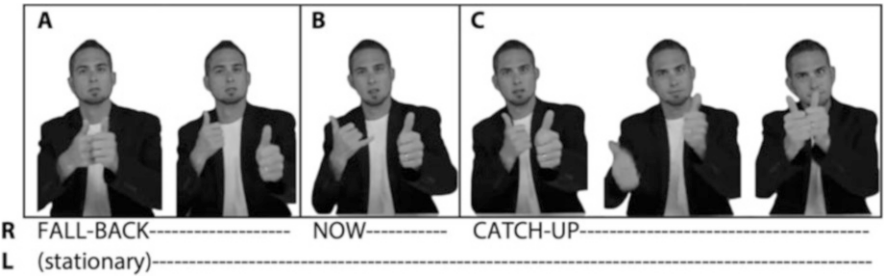

Fig. 12 The configuration and position of the left hand is maintained across the three-sign sequence (**a**) FALL-BACK, (**b**) NOW, and (**c**) CATCH-UP (Images taken from http://youtu.be/9qeHwcYbCXs?t=2m40s)

of signs is also relevant for the structure of the sentence they participate in: as is schematized in Fig. 12, after the second FALL-BACK token, the signer keeps his non-dominant hand (his left hand, L) in the same location in signing space until the dominant hand (his right hand, R) articulates the subsequent sign CATCH-UP.

In this sentence, the continued presence of the non-dominant hand in the signing space after the second FALL-BACK token continually profiles "Hillary's ranking in the polls". The subsequent movement of the dominant hand forward to contact the non-dominant hand matches a semantic construal of "Bernie's ranking in the polls" catching up to "Hillary's ranking in the polls".

The question of whether the signs FALL-BACK or CATCH-UP should be analyzed as core lexical signs or as classifier construction signs is entirely beside the point here: both signs can be analyzed as concrete instantiations of the "movable object" schema represented in Fig. 10, gradiently altering the movement of the hands according to the spatial relationship to be described. Moreover, rather than the degree to which they are analyzable, the degree of entrenchment or conventionality of either sign are expected to be dependent on their frequency of use, both at the level of the sign token and at the level of the constructional type (after Bybee 2010; Hay and Baayen 2005).

In this section, we have demonstrated that a usage-based, Construction Morphology approach to sign language analysis presents a straightforward solution to the Core vs. Classifier problem, the assumption that all signs must belong to one of two mutually exclusive categories, based on their analyzable internal structure. A construction-theoretic analysis instead treats entrenched, highly fixed "lexical" signs and more schematic and productive "classifier" signs alike as learned pairings of form and function (or meaning). Rather than assigning individual sign tokens to distinct domains of linguistic knowledge, all sign constructions can be considered primarily meaningful wholes that also exhibit gradient internal structure. Constructions exist on a continuum from highly entrenched to highly productive sign tokens, with many signs falling somewhere in the middle as wholes exhibiting some analyzable morphological structure.

4 The Language vs. Gesture Problem

Now we turn to discuss the Language vs. Gesture problem, the second categorization dilemma following from the assumption that language is formally discrete and semantically compositional in nature. As we have described in Sect. 1, sign languages were once considered to be non-linguistic systems akin to pantomime. Because they were working against widespread misconceptions even within the field of linguistics, many early studies of sign language structure were devoted to debunking the idea that sign languages are "mere gesture". This was accomplished by showing that, like spoken languages, sign languages exhibit morphophonological and morphosyntactic structure that can be described using symbolic structural rules.

However, several empirical and theoretical questions remain concerning the relationship between signed utterances and the visible actions that hearing people naturally produce while speaking. In large part, these questions arise as a consequence of cognitive scientists also rejecting the assumption that gestures are idiosyncratic wholes lacking conventional or analyzable internal structure (see the work of Abner et al. 2015; Calbris 1990; Kendon 2008; Núñez and Sweetser 2006; Singleton et al. 1993). On the contrary, like signs, gestures may exhibit analyzable structure or become entrenched and conventional for individuals and communities of language users. Several studies have demonstrated that there is a close functional connection between spoken language and co-speech gesture: these studies have revealed that spoken language is embodied (Barsalou 2008; Glenberg and Kaschak 2002; Marghetis and Bergen 2015), multimodal (Andrén 2014; Cienki 2013; Kok and Cienki 2014; Vigliocco et al. 2014), and dynamic (Elman 1995; Langacker 2000).

For example, work in simulation semantics and embodied cognition has shown that linguistic utterances are not discrete or isolated from the real world. Instead, utterances are integrated with real-world cues as humans simulate and update their understanding of what is being said to make contextual inferences in real-time (Barsalou 1999, 2008; Bergen 2007; Zwaan and Madden 2005). Similarly, recent work on multi-modal spoken language has shown that references to analogical, real-world structure are rampant in discourse. One reflex of this is that many speech acts are infelicitous without an accompanying co-speech gesture which makes reference to real space as, in the example, "Then the car went [tracing the trajectory of the car in the air]" (Kok 2016: 164). Zima (2014; 24) also found that 85% of tokens of the "all the way from X PREP Y" construction occurred with a gesture that "filled in" the relevant spatial information, revealing a tight link between the spoken and gestural modes. This mounting evidence from various disciplines suggests that both language and gesture vary in degree of conventionality and innovation, compositionality and idiosyncrasy, discreteness and holism, schematicity and specificity, abstraction and concreteness.

In accordance with this changing perspective on co-speech gesture, in sign language linguistics the discussion of the relationship between sign and gesture has now shifted to determine *to what extent* the gestures of hearing non-signers

and the signs of sign language might similar functions or exhibit similar kinds of structure (Cormier et al. 2012, 2013; Emmorey 1999; Goldin-Meadow and Brentari 2017; Johnston and Schembri 1999; Liddell 2003; Padden et al. 2013; Sandler 2009; Schembri et al. 2005). One consequence of this line of questioning in sign language linguistics has been the hypothesis that, just as spoken language is multimodal, and transmitted through an integrated linguistic (spoken) and gestural (manual) channel, sign language might similarly be viewed as an integration or fusion of linguistic and gestural material. It is here that we encounter the Language vs. Gesture problem, which derives from the structuralist assumption that language and gesture are inherently different in some respect, and are combined in the course of multimodal communication (see also Wilcox and Occhino 2016 for arguments against this view).

In assuming an *a priori*, categorical division between language and gesture, the sign linguist takes on the burden of determining which aspects of sign language use can be considered linguistic and which are gestural (e.g., Emmorey 1999; Goldin-Meadow and Brentari 2017; Goldin-Meadow et al. 2012; Liddell and Metzger 1998; Sandler 2009). In lieu of the obvious articulatory difference between the voice and the hands, previous analyses have sought to define gesture by positing a categorical distinction between elements that are listable, analyzable, and conventional, on the one hand, and those that are holistic, context-dependent, and defy rule-based generalizations, on the other. In sign language linguistics, then, "gesture" has recently been repurposed as a general label for any kind of graded structure, especially aspects of signing that index or analogically represent some real-world property such as space or movement. Gestural analyses have been extended to include several types of signs, namely pronouns, classifier constructions, and directional verbs, which all make productive reference to what could be construed as real-world locations or spaces. Such signs involve gradient forms which are neither derivable by rule, nor listable in the lexicon (Cormier et al. 2013; Lillo-Martin and Meier 2011).

However, as we have already demonstrated in Sect. 3, in a usage-based theory of Construction Morphology, recognition of gradient structure need not pose any problem for sign language analysis: all linguistic constructions exhibit gradient structure, and highly schematic constructions are emergent generalizations extracted by language users through their experiences with language. Under a usage-based approach, gradient structure is not gesture: it is grammar. Morphological schemas of the type represented in Fig. 10 describe the schematic internal structure of conventional and entrenched linguistic constructions, thereby avoiding the Language vs. Gesture problem altogether.

Moreover, morphological schemas can also straightforwardly account for the level of innovation and variability that is observed in everyday language use, whether spoken or signed. Our proposal, then, is that the tools of Construction Morphology can similarly be extended to the analysis of multimodal spoken language which, like sign language, occupies a continuum between more fixed and more gradient aspects of structure.

Accordingly, in the remainder of this section, we illustrate how a Construction Morphology analysis can be extended to the analysis of multimodal spoken language, without appealing to the pre-specified categories of "language" or "gesture". In doing so, we will eschew the traditional labels of speech and co-speech gesture, and instead characterize the multimodal construction as involving vocal articulations together with non-vocal articulations, including manual actions, eye-gaze, and head positioning. The purpose of this exercise is to demonstrate that multimodal spoken language constructions are similar in many ways to multichannel sign language constructions, in the sense that multiple articulatory actions simultaneously co-construct meaning. This analysis demonstrates that both vocal articulations and co-vocal manual movements exhibit recurring aspects of structure which, taken together with the rest of the multimodal utterance, create a composite meaning that exceeds the sum of its parts. In other words, multiple articulators, whether vocal or manual, or fixed or schematic, are used to construct meaning in context.

Here we analyze a two-usage-event sequence involving related multimodal constructions from a televised celebrity interview from January 2016. In this interview, the speaker retells his experience scuba diving with sharks on his honeymoon. The first multimodal construction we analyze is the speaker's description of the movement of sharks swimming in a circle underwater, shown in Fig. 13.

In this multimodal usage event, the speaker explains in the vocal channel, "They swim very close, these guys swim very close." During this spoken utterance, his eye gaze is primarily directed at the studio audience, holding their attention during the recounting of the behavior of the sharks. At the same time, the movement of his right hand provides relevant information about the scene. Extending an index finger on his right hand, the speaker articulates a counter-clockwise cyclic movement in front of his body, beginning with his arm extended away from his torso, and moving first toward his right shoulder, then back around to the original starting position. He executes three full circles in succession during the vocal utterance. The movement of the speaker's hand contributes information not provided by the vocal channel, namely that the sharks move in a circle underwater.

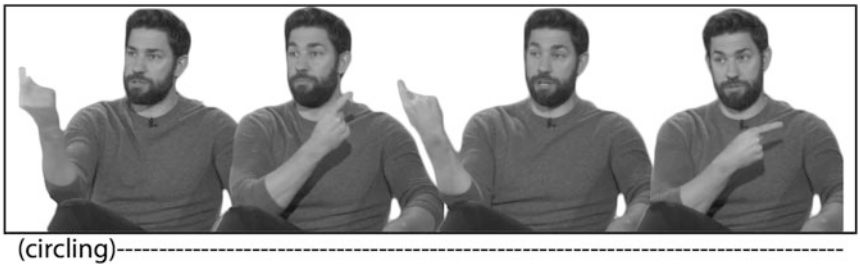

Fig. 13 Manual action co-occurring with vocal information: "They swim very close, these guys swim very close." (Images taken from https://youtu.be/2mPsb3V-Y1g?t=1m16s)

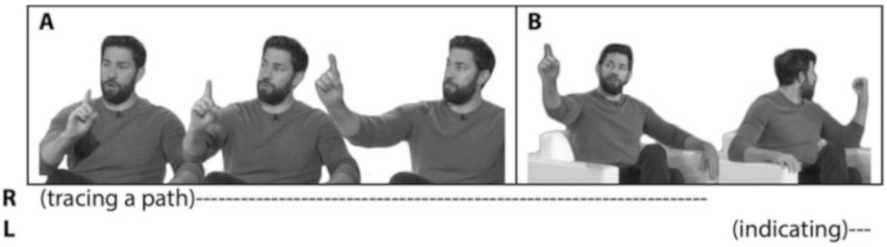

Fig. 14 Manual action, eye-gaze, and bodily movement co-occurring with vocal information: "(**a**) And all of a sudden, one broke off from the circle (**b**) and swam behind us." (Images taken from https://youtu.be/2mPsb3V-Y1g?t=1m25s)

In the second multimodal utterance, after a short aside, the speaker repurposes the elements of the previous multimodal utterance, maintaining the same handshape and the same starting location away from the body, but changing the direction of the cyclic movement. While saying "And all of a sudden, one broke off from the circle and swam behind us", he traces a larger arc to his right, and ultimately ending over and behind his right shoulder. The speaker then shifts his body to look over his left shoulder and to point to an imagined spot in the distance with his thumb, as in Fig. 14.

As the manual arc unfolds, the speaker tracks the movement of his extended index finger with his eyes. Looking beyond his finger, rather than looking directly at it, he conveys the distance of the shark, highlighting the fact that it was farther than a literal arm's length away. As he traces a clockwise arc behind his right shoulder, the speaker's gaze briefly returns forward, and he glances at the host, before turning his body and head to gaze over his left shoulder, and to convey that the shark had completely circled behind him, which he emphasizes by pointing with his thumb.

In this second multimodal utterance, the speaker's manual action and his eye-gaze continue to convey information about the scene established in the first multimodal utterance. His continued use of certain aspects of the previous multimodal construction, such as the extended index finger on his right hand, lend a sense of continuity to the scene as events of the story unfold. The more varied aspects of the manual action, such as the change in motion and the change in overall trajectory, convey that, rather than circling with the rest of the sharks described one utterance prior, a particular shark from that same cohort broke away from the circling pattern, arcing out from the group and circled behind the speaker.

In this two-utterance sequence, we have identified a number of articulatory movements that together co-create a multimodal signal. The vocal channel, the movement of the right hand, and the speaker's eye-gaze all come together to create a full, informative message. A Construction Morphology analysis allows us to capture the fact that these two usage-events make use of recurrent structural elements at varying levels of schematicity. In particular, across both usage events, the speaker's handshape is fixed in a single configuration, while there is some degree of variation

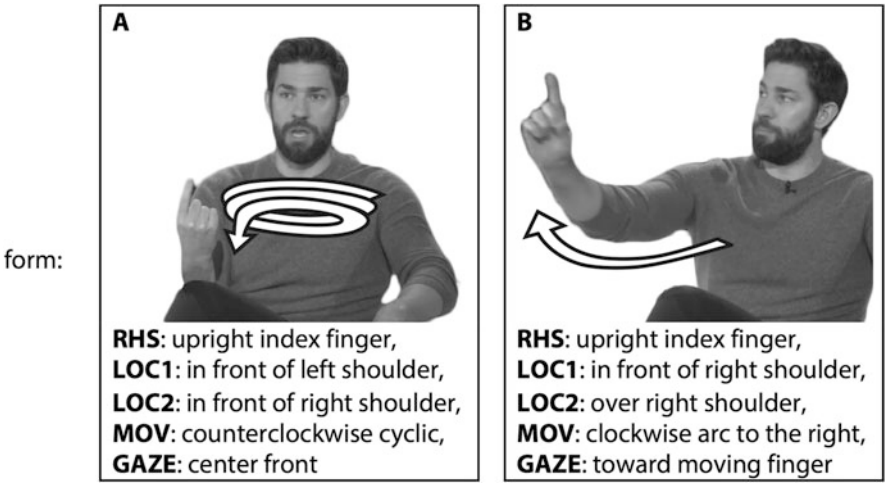

Fig. 15 Constructional analysis of the first (**a**) and second (**b**) multi-modal utterances. These constructional schemas exhibit similar handshapes with differing movements and eye-gaze patterns. *RHS* right hand shape, *MOV* movement, *LOC* location, *GAZE* eye-gaze

in the location, movement, and eye-gaze. These shared and varying aspects of structure alike are represented the constructional schemas in Fig. 15.

Parallel to the analysis of the signs FALL-BACK and CATCH-UP as instantiations of the "movable object" construction in ASL in Sect. 3, here, far from simply sharing an overlap in formal features, these two multimodal utterances re-use the same formal features for similar discourse functions, in a systematic fashion. Across the two vocal utterances "They swim very close, these guys swim very close," and "And all of a sudden, one broke off from the circle and swam behind us," the speaker tracks "the sharks" as a discourse referent with the extended index finger on his right hand, and systematically manipulates the movement of his right hand, along with his eye-gaze, to convey information about the movement of "the sharks".

Though the division between the vocal channel and the manual channel is quite salient to English speakers, and we are accustomed to thinking of vocal information as "language" and manual action as "gesture", here we have demonstrated that it is possible to provide a complete analysis of multimodal communication without assuming these labels as analytic primitives. The alternative, under a Construction Morphology approach, is to start with constructions as pairings of form and function, and to analyze the patterns that emerge from systematic reuse of form-meaning pairings as they unfold in language use. Configurations of form and meaning that recur across constructions are likely to be categorized by the language user as participating in the same construction, leading to the extraction of emergent morphological schemas with repeated use. These schemas both describe the structure of observed multimodal constructions and explain how future usage events can put constructional schemas to productive, innovative use. Aspects of structure that are consistent across usage events are likely to be extracted as a more

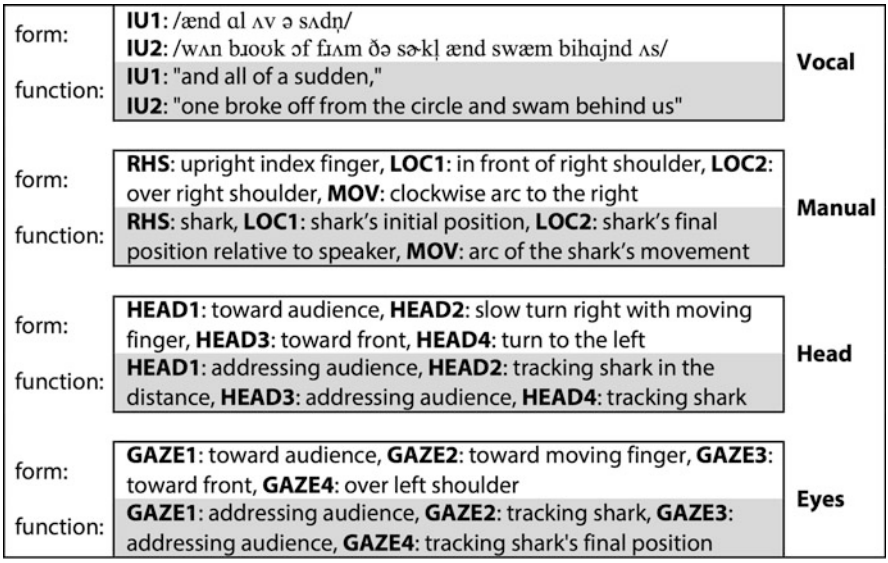

Fig. 16 Multimodal form-function analysis of the bodily actions that accompany the vocal utterance "And all of a sudden, one broke off from the circle and swam behind us". *RHS* right hand shape, *MOV* movement, *LOC* location, *HEAD* head positioning, *GAZE* eye-gaze

fixed aspect of the construction, while aspects of structure that vary across usage events are likely to be extracted as more variable in the construction.

For the sake of completeness, in Fig. 16 we provide a more in-depth characterization of the usage event in Figs. 14 and 15b as a multimodal construction. Here we provide descriptions of the forms and functions of many of the component constructions that together form the larger multimodal composite construction.[14]

The representation in Fig. 16 is compressed and does not illustrate the dynamic, temporal relationship between each of these component articulatory channels. However, it shows that each component construction consists of both a formal and a functional side, forming a symbolically complex unit unto itself. Rather than together determining the meaning of the composite multimodal utterance, these sub-constructions are only meaningful when taken together, in the context of the other component structures, as parts of a larger whole. In other words, the individual channels in Fig. 16 both exhibit aspects of internal structure and derive their meaning from the structured gestalt they appear in: they are structured wholes that themselves are the structure for larger structured wholes. Consistent with Goldberg's (2006: 18) characterization of linguistic organization, the multimodal usage event can be straightforwardly analyzed in Construction Morphology as consisting of "constructions all the way down".

[14]Note that there are still elements of the signal that are not described here: prosody and intonation, widely acknowledged to vary continuously in the vocal signal, thus exhibiting "gestural" properties, even in the spoken modality, are not described in detail here.

5 Conclusion

In this article, we have demonstrated that the theory of Construction Morphology can resolve two long-standing categorization problems in the field of sign language linguistics. These categorization problems arise as a consequence of the assumptions that linguists are accustomed to making in the course of analyzing sign language structure: when we assume that language is inherently compositionally structured, and complex utterances are built up procedurally from independently meaningful parts, we are led to the conclusion that any linguistic expression must either be compositionally structured, or a minimal building block itself. We have named this dilemma the Core vs. Classifier problem. When we assume that language and gesture constitute distinct categories, such that that linguistic patterns are discrete and rule-governed, while gesture is holistic and idiosyncratic, we are led to the conclusion that any gradient aspects of signing must be considered gestural and non-linguistic, by definition. We have named this dilemma the Language vs. Gesture problem.

As a construction-theoretic approach to word-internal structure, Construction Morphology instead assumes that morphological schemas are abstractions of patterns over memorized complex words, exhibiting fixed as well as variable aspects of structure. Under this view, the fact that conventional signs may exhibit transparent, analyzable structure, and that everyday signing may involve both highly conventional and highly innovative utterances, is neither unexpected nor surprising. In a construction-based theory, recurring structurally complex expressions are expected to be associated with holistic meanings and functions, just as they are expected to participate in larger families of related constructions, and just as they are expected to exhibit analyzable internal structure. Our linguistic knowledge consists of a structured network of parts and wholes, in accordance with our daily experiences using our language(s).

This construction-theoretic perspective applies to the signs of sign languages, whose constructional representations may range from almost entirely formally fixed, in the case of well-entrenched, conventional signs, to almost entirely schematic, in the case of one-off sign tokens that occur naturally in everyday signing. This perspective also applies to multimodal communication more generally, which can be viewed as involving structured wholes which themselves display analyzable structure. Though there has been little contact between the fields of Construction Grammar and sign language linguistics, to date, we are confident that sign language linguists and Construction Grammarians alike will benefit from continued discussions of cross-linguistic variation, multimodal language use, and morphological transparency, moving forward.

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References

Abner, N., K. Cooperrider, and S. Goldin-Meadow. 2015. Gesture for linguists: A handy primer. *Language and Linguistics Compass 9* (11): 437–451.

Anderson, S.R. 1992. *A-morphous morphology*. Cambridge/New York: Cambridge University Press.

Andrén, M. 2014. Multimodal constructions in children: Is the headshake part of language? *Gesture 14* (2): 141–170.

Anible, B., and C. Occhino-Kehoe. 2014. What's happening with HAPPEN: The grammaticalization of HAPPEN in American Sign Language. In *Proceedings of the High Desert Linguistics Society Conference*, ed. B. Anible, K. Beers, L. Hirrel, and D. Wager, 27–41. Albuquerque. Retrieved from http://linggraduate.unm.edu/HDLS10Proceedings.html.

Aronoff, M., I. Meir, C.A. Padden, and W. Sandler. 2003. Classifier constructions and morphology in two sign languages. In *Perspectives on classifier constructions in signed languages*, ed. K. Emmorey, 53–84. Mahwah: Lawrence Erlbaum Associates.

Barsalou, L.W. 1999. Perceptual symbol systems. *The Behavioral and Brain Sciences 22* (4): 577–609. discussion 610–660.

———. 2008. Grounded cognition. *Annual Review of Psychology 59* (1): 617–645.

Battison, R. 1978. *Lexical borrowing in American Sign Language*. Silver Spring: Linstok Press.

Bayley, R., C. Lucas, and M. Rose. 2000. Variation in American sign language: The case of DEAF. *Journal of Sociolinguistics* 4: 81–107. https://doi.org/10.1111/1467-9481.00104.

Berent, I., and S. Goldin-Meadow. 2015. Language by mouth and by hand. *Frontiers in Psychology 6*: 78. https://doi.org/10.3389/fpsyg.2015.00078.

Bergen, B. 2007. Experimental methods for simulation semantics. In *Methods in cognitive linguistics*, ed. M. Gonzalez-Marquez, I. Mittleberg, S. Coulson, and M.J. Spivey, 277–301. Amsterdam/Philadelphia: John Benjamins.

Blevins, J.P. 2016. *Word and paradigm morphology*. Oxford: Oxford University Press.

Blevins, J.P., F. Ackerman, and R. Malouf. 2016. Morphology as an adaptive discriminative system. In *Morphological metatheory*, ed. D. Siddiqi and H. Harley, 271–302. Amsterdam: John Benjamins.

Bochner, H. 1993. *Simplicity in generative morphology*. Berlin/New York: Mouton de Gruyter.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2013. Morphology in construction grammar. In *The Oxford handbook of construction grammar*, ed. A. Bergs and G. Trousdale, 255–273. Oxford: Oxford University Press.

———. 2017. Inheritance and motivation in construction morphology. In *Defaults in morphological theory*, ed. N. Gisborne and A. Hippisley, 18–39. Oxford: Oxford University Press.

Brennan, M. 1990. Productive morphology in British Sign Language. *Proceedings of the International Congress on Sign Language Research and Application,* Hamburg, 205–228.

Brentari, D. 1998. *A prosodic model of sign language phonology*. Cambridge, MA: MIT Press.

Brentari, D., and C. Padden. 2001. A language with multiple origins: Native and foreign vocabulary in American Sign Language. In *Foreign vocabulary in sign language: A crosslinguistic investigation of word formation*, ed. D. Brentari, 87–119. Mahwah: Lawrence Erlbaum.

Brooks, P.J., M. Tomasello, K. Dodson, and L.B. Lewis. 1999. Young children's overgeneralizations with fixed transitivity verbs. *Child Development 70* (6): 1325–1337.

Bybee, J.L. 2001. *Phonology and language use*. Cambridge/New York: Cambridge University Press.

———. 2006. From usage to grammar: The mind's response to repetition. *Language 82* (4): 711–733.

———. 2010. *Language, usage and cognition*. Cambridge/New York: Cambridge University Press.

Bybee, J., and J. Scheibman. 1999. The effect of usage on degrees of constituency: The reduction of don't in English. *Linguistics 37* (4): 575–596. https://doi.org/10.1515/ling.37.4.575.

Calbris, G. 1990. *The semiotics of French gesture*. Bloomington: Indiana University Press.

Cienki, A. 2013. Image schemas and mimetic schemas in cognitive linguistics and gesture studies. *Review of Cognitive Linguistics 11* (2): 417–432.

Cormier, K., D. Quinto-Pozos, Z. Sevcikova, and A. Schembri. 2012. Lexicalisation and de-lexicalisation processes in sign languages: Comparing depicting constructions and viewpoint gestures. *Language & Communication 32* (4): 329–348. https://doi.org/10.1016/j.langcom.2012.09.004.

Cormier, K., S. Smith, and Z. Sevcikova. 2013. Predicate structures, gesture, and simultaneity in the representation of action in British Sign Language: Evidence from deaf children and adults. *Journal of Deaf Studies and Deaf Education 18* (3): 370–390. https://doi.org/10.1093/deafed/ent020.

Eccarius, P., and D. Brentari. 2007. Symmetry and dominance: A cross-linguistic study of signs and classifier constructions. The Linguistics of Sign Language Classifiers: Phonology, Morpho-Syntax, Semantics and Discourse. *Lingua 117* (7): 1169–1201. https://doi.org/10.1016/j.lingua.2005.04.006.

Elman, J.L. 1995. Language as a dynamical system. In *Mind as motion: Explorations in the dynamics of cognition*, ed. R.F. Port and T. Van Gelder. Cambridge, MA: MIT Press.

Emmorey, K. 1999. Do signers gesture? In *Gesture, speech, and sign*, ed. L. Messing and R. Campbell, 133–159. Oxford: Oxford University Press.

Fenlon, J., K. Cormier, and D. Brentari. 2018. The phonology of sign languages. In *Handbook of phonological theory*, ed. S.J. Hannahs and A. Bosch. New York: Routledge.

Fernald, T.B., and D.J. Napoli. 2000. Exploitation of morphological possibilities in signed languages comparison of American Sign Language with English. *Sign Language & Linguistics 3* (1): 3–58.

Fillmore, C.J., P. Kay, and M.C. O'Connor. 1988. Regularity and idiomaticity in grammatical constructions: The case of *let alone. Language 64* (3): 501–538. https://doi.org/10.2307/414531.

Frishberg, N., and B. Gough. 2000. Morphology in American Sign Language. *Sign Language & Linguistics 3* (1): 103–131. https://doi.org/10.1075/sll.3.1.08fri.

Glenberg, A.M., and M.P. Kaschak. 2002. Grounding language in action. *Psychonomic Bulletin & Review* 9 (3): 558–565.

Goldberg, A. 2006. *Constructions at work: The nature of generalisations in language*. Oxford: Oxford University Press.

———. 2013. Constructionist Approaches. In *The Oxford handbook of construction grammar*, ed. T. Hoffmann and G. Trousdale, 15–31. Oxford/New York: Oxford University Press.

Goldin-Meadow, S., and D. Brentari. 2017. Gesture, sign and language: The coming of age of sign language and gesture studies. *Behavioral and Brain Sciences*: 1–82. https://doi.org/10.1017/S0140525X15001247.

Goldin-Meadow, S., A. Shield, D. Lenzen, M. Herzig, and C.A. Padden. 2012. The gestures ASL signers use tell us when they are ready to learn math. *Cognition 123* (3): 448–453. https://doi.org/10.1016/j.cognition.2012.02.006.

Hay, J., and R. Baayen. 2005. Shifting paradigms: gradient structure in morphology. *Trends in Cognitive Sciences 9* (7): 342–348. https://doi.org/10.1016/j.tics.2005.04.002.

Himmelmann, N.P. 2004. Lexicalization and grammaticalization: Opposite or orthogonal? In *What makes grammaticalization? A look from its fringes and its components*, ed. W. Bisang, N. Himmelmann, and B. Wiemer, 21–42. Berlin/New York: Mouton de Gruyter.

Hockett, C.F. 1967. The Yawelmani basic verb. *Language 43* (1): 208. https://doi.org/10.2307/411395.

Hoffmann, T., and G. Trousdale. 2013. Construction Grammar: Introduction. In *The Oxford handbook of construction grammar*, ed. id, 1–14. Oxford: Oxford University Press.

Hohenhaus, P. 2005. Lexicalization and institutionalization. In *Handbook of word-formation*, ed. P. Štekauer and R. Lieber, 353–373. Dordrecht: Springer Netherlands. https://doi.org/10.1007/1-4020-3596-9_15.

Jackendoff, R. 1975. Morphological and semantic regularities in the lexicon. *Language 51* (3): 639–671.

Janzen, T. 1995. *The Polygrammaticalization of FINISH in ASL.* Master's thesis. University of Manitoba, Winnepeg. Manitoba.

Johnston, T., and L. Ferrara. 2012. Lexicalization in signed languages: When is an idiom not and idiom? *Selected Papers from UK-CLA Meetings 1*: 229–248.

Johnston, T., and A. Schembri. 1999. On defining lexeme in a signed language. *Sign Language & Linguistics 2* (2): 115–185.

Kay, P., and C.J. Fillmore. 1999. Grammatical constructions and linguistic generalizations: The what's X doing Y? Construction. *Language* 75 (1): 1–33.

Kendon, A. 2008. Some reflections on the relationship between "gesture" and "sign". *Gesture 8*: 348–366.

Klima, E.S., and U. Bellugi. 1979. *The Signs of Language*. Cambridge, MA: Harvard University Press.

Kok, K. 2016. The grammatical potential of co-speech gesture: A functional discourse grammar perspective. *Functions of Language* 23 (2): 149–178.

Kok, K., and A. Cienki. 2014. Taking simulation semantics out of the laboratory: Towards an interactive and multimodal reappraisal of embodied language comprehension. *Language and Cognition* 9: 1–23. https://doi.org/10.1017/langcog.2014.25.

Langacker, R.W. 1987. *Foundations of Cognitive Grammar: Theoretical Prerequisites*. Vol. 1. Stanford: Stanford University Press.

———. 2000. A Dynamic Usage-Based Model. In *Usage-based models of language*, ed. M. Barlow and S. Kemmer. Stanford: CSLI Publications, Center for the Study of Language and Information.

———. 2008. *Cognitive grammar: A basic introduction*. Oxford/New York: Oxford University Press.

Lepic, R. 2015. *Motivation in morphology: Lexical patterns in ASL and English*. Dissertation. University of California, San Diego, CA.

———. 2016. Lexical blends and lexical patterns in English and in American Sign Language, 98–111. Presented at the Quo Vadis Morphology? Online proceedings of the tenth Mediterranean Morphology Meeting. http://xantho.lis.upatras.gr/pasithee/index.php/mmm/article/view/2728.

Lepic, Ryan, Carl Börstell, Gal Belsitzman, and Wendy Sandler. 2016. Taking meaning in hand: Iconic motivations in two-handed signs. *Sign Language and Linguistics* 19 (1): 37–81. https://doi.org/10.1075/sll.19.1.02lep.

Liddell, S. 2003. *Grammar, gesture, and meaning in American Sign Language*. Cambridge/New York: Cambridge University Press.

Liddell, S.K., and R.E. Johnson. 1986. American Sign Language compound formation processes, lexicalization, and phonological remnants. *Natural Language & Linguistic Theory 4* (4): 445–513.

Liddell, S.K., and R.E. Johnson. 1989. American sign language: The phonological base. *Sign Language Studies* 64: 195–277.

Liddell, S., and M. Metzger. 1998. Gesture in sign language discourse. *Journal of Pragmatics 30* (6): 657–786.

Lillo-Martin, D. and R. Meier. 2011. On the linguistic status of 'agreement' in sign languages. *Theoretical Linguistics*, 37(3-4): 95–141. Retrieved 6 February 2018, from https://doi.org/10.1515/thli.2011.009.

Marghetis, T., and B. Bergen. 2015. Embodied meaning, inside and out: The coupling of gesture and mental simulation. In *Body-language-communication*, ed. C. Mueller, A. Cienki, E. Fricke, S.H. Ladewig, D. McNeill, and S. Tessendorf. New York: Mouton de Gruyter.

Morgan H. 2016. The effect of modality on signal space in natural languages. In *The evolution of language: Proceedings of the 11th international conference (EVOLANG11)*, ed. S.G. Roberts, C. Cuskley, L. McCrohon, L. Barceló-Coblijn, O. Fehér, and T. Verhoef. Available online: http://evolang.org/neworleans/papers/192.html.

Núñez, R.E., and E. Sweetser. 2006. With the future behind them: Convergent evidence from Aymara language and gesture in the crosslinguistic comparison of spatial construals of time. *Cognitive Science 30*: 401–450.

Padden, C.A. 1998. The ASL Lexicon. *Sign Language & Linguistics 1* (1): 39–60. https://doi.org/http://dx.doi.org.ezproxy.rice.edu/10.1075/sll.1.1.04pad.

Padden, C.A., I. Meir, S.-O. Hwang, R. Lepic, S. Seegers, and T. Sampson. 2013. Patterned iconicity in sign language lexicons. *Gesture 13* (3): 287–308. https://doi.org/10.1075/gest.13.3.03pad.

Pinker, S. 1999. *Words and rules: The ingredients of language*. New York: Harper Perennial.

Pinker, S., and A. Prince. 1988. On language and connectionism; analysis of a parallel distributed processing model of language acquisition. *Cognition 28*: 73–193.

———. 1994. Regular and irregular morphology and the psychological status of rules of grammar. In *The reality of linguistic rules*, ed. S.D. Lima, R.L. Corrigan, and G.K. Iverson. Amsterdam: Benjamins.

Sandler, W. 2009. Symbiotic symbolization by hand and mouth in sign language. *Semiotica 2009* (174): 241–275.

Sandler, W., and D. Lillo-Martin. 2006. *Sign language and linguistic universals*. Cambridge/New York: Cambridge University Press.

Schembri, A. 2003. Rethinking "classifiers" in signed languages. In *Perpectives on classifier constructions in sign languages*, ed. K. Emmorey, 3–34. Mahwah: Lawrence Erlbaum Associates.

Schembri, A., C. Jones, and D. Burnham. 2005. Comparing action gestures and classifier verbs of motion: evidence from Australian Sign Language, Taiwan Sign Language, and nonsigners' gestures without speech. *Journal of Deaf Studies and Deaf Education 10* (3): 272–290. https://doi.org/10.1093/deafed/eni029.

Shaw, E., and Y. Delaporte. 2014. *A historical and etymological dictionary of American Sign Language: The origin and evolution of more than 500 signs*. Washington, DC: Gallaudet University Press.

Singleton, J.L., J.P. Morford, and S. Goldin-Meadow. 1993. Once is not enough: Standards of well-formedness in manual communication created over three different timespans. *Language 69* (4): 683–715. https://doi.org/10.2307/416883.

Stokoe, W.C. 1960. *Sign language structure*. Silver Spring: Linstok Press.

Supalla, T. 1982. *Structure and acquisition of verbs of motion and location in American Sign Language* (Dissertation), University of California, San Diego.

———. 1986. The classifier system of American Sign Language. In *Noun Classification: Proceedings of a Symposium on Categorization and Noun Classification*, 181–214. Philadelphia: John Benjamins.

Supalla, T., and P. Clark. 2014. *Sign Language Archaeology*. Washington, DC: Gallaudet University Press.

Vigliocco, G., P. Perniss, and D. Vinson. 2014. Language as a multimodal phenomenon: implications for language learning, processing and evolution. *Philosophical Transactions of the Royal Society B: Biological Sciences 369* (1651): 20130292. https://doi.org/10.1098/rstb.2013.0292.

Vogler, C., and D. Metaxas. 2001. A Framework for Recognizing the Simultaneous Aspects of American Sign Language. *Computer Vision and Image Understanding 81* (3): 358–384. https://doi.org/10.1006/cviu.2000.0895.

Wilcox, S., and C. Occhino. 2016. Constructing signs: Place as a symbolic structure in signed languages. *Cognitive Linguistics* 27(3): 371–404. https://doi.org/10.1515/cog-2016-0003.

Wilkinson, E. 2013. A functional description of SELF in American Sign Language. *Sign Language Studies 13* (4): 462–490. https://doi.org/10.1353/sls.2013.0015.

Zima, E. 2014. *English multimodal motion constructions. A construction grammar perspective*. Studies van de BKL – Travaux du CBL – Papers of the LSB, Volume 8. http://uahost.uantwerpen.be/linguist/SBKL/sbkl2013/Zim2013.pdf.

Zwaan, R.A., and C.J. Madden. 2005. Embodied sentence comprehension. In *The grounding of cognition: The role of perception and action in memory, language, and thinking*, ed. D. Pecher and R.A. Zwaan, 224–245. Cambridge: Cambridge University Press.

Part III
Studies of Specific Languages

Combinatorial Morphology in Visual Languages

Neil Cohn

Abstract Just as structured mappings between phonology and meaning make up the lexicons of spoken languages, structured mappings between graphics and meaning comprise lexical items in visual languages. Such representations may also involve combinatorial meanings that arise from affixing, substituting, or reduplicating bound and self-standing visual morphemes. For example, hearts may float above a head or substitute for eyes to show a person in love, or gears may spin above a head to convey that they are thinking. Here, we explore the ways that such combinatorial morphology operates in visual languages by focusing on the balance of intrinsic and distributional construction of meaning, the variation in semantic reference and productivity, and the empirical work investigating their cross-cultural variation, processing, and acquisition. Altogether, this work draws parallels between the visual and verbal domains that can hopefully inspire future work on visual languages within the linguistic sciences.

Keywords Visual language · Drawings · Visual morphology · Metaphor · Combinatorial structure

1 Introduction

If drawings only conveyed things as they looked in the world, many graphics would appear downright bizarre. Lines trailing a moving object denote movement, and gears above a head no longer represent just a machine, but thinking. Meanwhile, hearts or dollar signs may substitute for someone's eyes to convey lust or desire for money. Conventional patterns like these require the construction of meaning beyond just iconic perception, and indeed, such forms have been used in drawing systems for thousands of years (Wichmann and Nielsen 2016; Díaz Vera 2013a, b; Petersen

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2011). Because of their combinatorial qualities, these forms have frequently been compared to lexical items in language (Cohn 2013b; Forceville 2011; McCloud 1993; Walker 1980). We here explore this linguistic and combinatorial nature.

2 Visual Language Theory

Comparisons between graphic communication and language have recently been formalized in ***Visual Language Theory*** (VLT), which argues for parallels between the structure and cognition of language and drawing (Cohn 2013b). A language consists of a system of patterns in the mind/brain of a speaker. To the extent that the patterns of a person's idiolect are similar to those in other people, they share a common language. This basic principle can be applied not only to verbal or signed languages, but also to the representations and mechanisms used in producing and comprehending drawn, graphic information. A "language" is thus a system of expression shared across a population using a modality (phonology, graphics) mapped to meanings to create lexical items (words, images), which are ordered using a sequential grammatical system (syntax, narrative) (Cohn 2013b). VLT thus proposes that similar structures and mechanisms in the mind/brain extend across domains, with variation between systems arising from differences motivated by the modalities themselves. Thus, shared systematic sequential meaningful sounds constitute spoken languages of the world, while shared structured systematic sequential images are manifested by ***visual languages***. VLT thus draws parallels between the structure and cognition of verbal and signed modalities and that of the visual-graphic modality, and incorporates all three systems into a single cognitive architecture that allows for multimodal interactions (Cohn 2016b).

Visual languages arise in many socio-cultural contexts—instruction manuals, art, aboriginal sand drawing, emoji, etc.—and especially in the highly consistent and codified systems used in comics. Just as spoken languages vary between populations, visual languages differ based on different cultural and functional contexts. For example, mainstream superhero comics use a particular dialect of American Visual Language, which contrasts with the Japanese Visual Language stereotypically used in manga. In addition, many visual languages extend beyond one context; the conventions used in comics also appear in emoji and other aspects of visual culture (Forceville et al. 2014).

We here focus on this visual vocabulary: the structured mappings between form (graphics) and meaning that make up drawings. In particular, this article examines the combinatorial qualities of morphology that extend beyond iconic representations. This discussion will attempt to illustrate that structures of visual lexical items parallel those found in other linguistic systems, and that these structures can be formalized using the methods of the linguistic sciences.

3 Visual Morphology

Like verbal languages, the lexical items in a visual language can be categorized as either ***open-class*** or ***closed-class*** (Cohn 2013b). Open-class lexical items easily allow for new patterns to be created. In visual form, these are typically iconic representations: it is easy to create a novel schematic pattern for iconic elements, based on the way they look (such as schemas for people, animals, plants, buildings, and their subcomponents, etc.). Closed-class lexical items require more conventionalization and are thus more constrained in creating novel forms. These are typically elements that depict invisible or non-iconic elements, such as motion lines (Fig. 1b), speech balloons (Fig. 1a), or hearts above the head to mean love (Fig. 2a). These latter elements are the most interesting in terms of combinatoriality because they exhibit the most similarities to languages in other domains.

Combinatorial qualities arise in the lexicons of visual languages between forms that can stand alone (like an image of a person), and those that cannot (like a motion line). The latter elements must attach to another element, and thus have been likened to *bound morphemes* in other linguistic systems (Cohn 2007, 2013b; Engelhardt 2002; Forceville 2011).

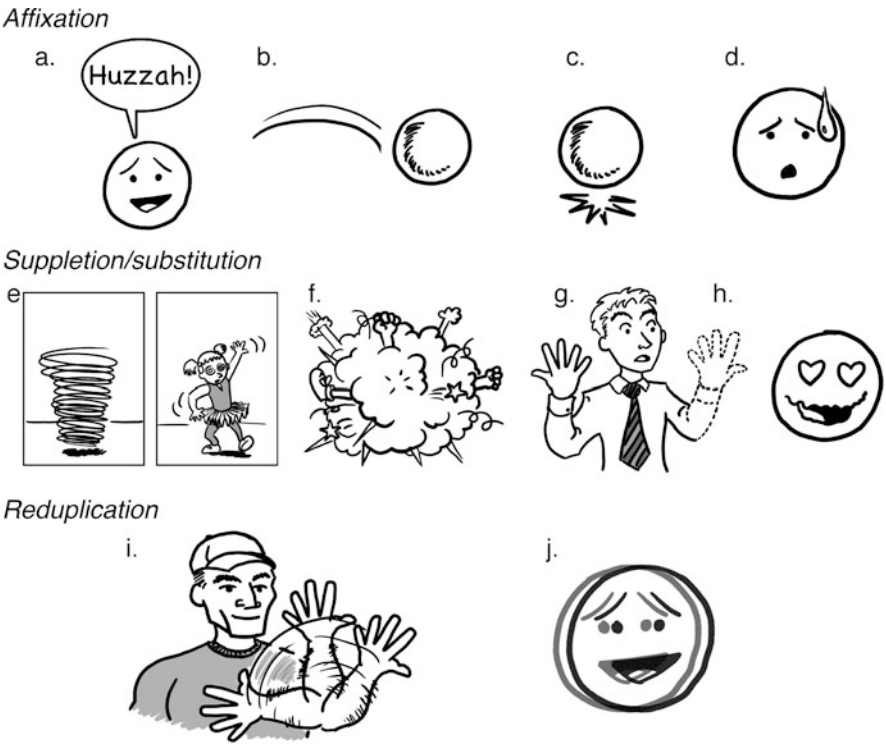

Fig. 1 Visual morphological relations using (**a**–**d**). affixation, (**e**–**h**). suppletion/substitution, or (**i**–**j**). reduplication

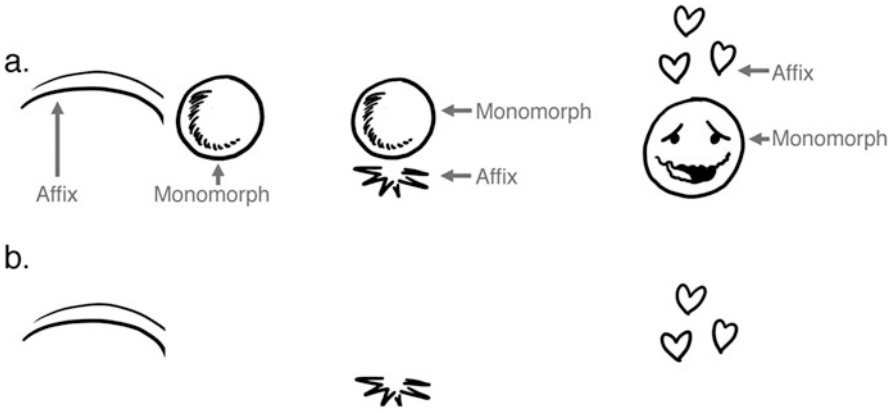

Fig. 2 Examples of affixes attaching to monomorphs (**a**) moving ball, impact star, hearts above head and (**b**) affixes without their stems

Visual languages use similar basic strategies to combine morphemes as verbal languages (Cohn 2013b). For example, affixation in verbal languages attaches an affix to a stem in front (prefix; *un*happy), behind (suffix; jump*ed*), inside (infix; abso-*frickin'*-lutely), or around (circumfix; *en*light*en*). Similarly, visual elements attach in "upfixes" (affixes that are "up") such as lightbulbs, hearts, stars, etc. which appear *above* a character's head. Attachment also occurs between the affixes of word balloons to a speaker (Fig. 1a), motion lines to a mover (Fig. 1b), impact stars to a collider (Fig. 1c), or anxious sweat drops to a worrier (Fig. 1d). None of these affixes could stand alone if their stems were omitted.

Visual languages can also use substitution. In verbal language, substitution appears in suppletion (*go* ➔ *went*) and internally for umlaut (s*i*ng ➔ s*a*ng). Whole unit substitution occurs visually when a figure spins to become a tornado (Fig. 1e), when several people fight inside a "fight cloud" with arms and legs sticking out (Fig. 1f), or when something becomes invisible with dotted outlines (Fig. 1g). Internal substitution occurs for "eye-umlauts" where the eyes of a character are replaced by hearts (lust; Fig. 1h), stars (desire for fame), dollar signs (desire for money), etc. A character-specific suppletion happens to Spider-Man when he detects danger: half of his ordinary face is depicted with his mask, even though he is not wearing the costume.

Finally, visual languages also might repeat forms, just as verbal languages use reduplication (*salad-salad*; *tick-tock*). Repetition occurs overtly when all or part of a figure is shown in different postures to indicate movement (Fig. 1i). It also occurs when lines repeat with slight offset to depict shaking, or alternatively the double-vision of another character (Fig. 1j).

Thus, similar basic strategies of morphological combination occur in the verbal and visual modalities. Note that these options comprise virtually all possible relations of forms: attachment, insertion, substitution, repetition, etc. This similarity

does not necessarily mean that visual languages "are like" verbal languages in their morphological combinations, but rather more likely that all modalities—visual, verbal, and signed—make use of available combinatorial possibilities.

4 Units of Visual Morphology

If bound morphemes attach to stems in visual forms, what are the "base units" and "morphemes"? This question bears on a persistent critique of applying linguistic theories to graphic information: Just what is a minimal unit? I will argue that searching for a "minimal unit" is misguided. First, the visual modality deals with meaningful information in different ways than the verbal domain. The analog nature of visual information allows for graphic representation to embed meaningful (and schematized) forms in each other simultaneously, rather than in a temporally sequential fashion as in speech. Thus, the differences in modality are not parallel in this regard. Second, the language sciences have acknowledged that structuralism's focus on minimal units is no longer tenable. Rather, within linguistics itself there is a strong and persistent critique of the notion of minimal meaningful units in morphology (Booij 2010; Jackendoff 2002; Jackendoff and Audring 2016; Sadock 1991; Anderson 1992; Stump 2001), where the emphasis in some circles is on the mapping between form and meaning—here, the form being graphic rather than phonological—regardless of the size of the lexical item.

Graphic forms do differentiate between elements that can stand alone and those that cannot, just as words can stand alone, but bound morphemes cannot. For example, though a head is recognized as necessarily attaching to a body, it has more ability to stand alone as a perceptual form than an isolated nose, or even just a body (such as when a body is depicted in a comic panel, but its head lies outside the frame).

We can thus introduce a notion for a visual isolatable form—whether or not it may also be divisible into smaller morphemes. This is roughly analogous to the level of a "word" in verbal language. I will call this form a ***monomorph***.[1] Similar to the morphological level of a "word," a monomorph is *a visual representation that can stand alone without needing to attach to other morphemes, can be made up of smaller morphemes, and can combine with other elements to form even larger monomorphs.*

Because monomorphs are perceptual objects that can stand alone as an isolatable "morphological bundle," we should be able to crop these elements (as with the frame of a comic panel) and still recognize them as the same entity. For example, a character's face, bust, or whole body would all be sufficient for identifying the

[1] A precedent for this exists in Koch's (1971) proposal for "logemes" which are made up of visual morphemes, though Koch did not distinguish "stems" versus bound morphemes. For a summary in English, see Wildfeuer and Bateman (2016).

identity of that character. For animate entities, the face may thus be "marked" as an essential identifying feature of monomorphs. Cropping that limits identification and would depict less than a monomorph (i.e., eyes alone, a hand, body, etc.), though would still be recognizable *as part of* a potentially isolatable object. These "morphological bundles" that are subsets of a monomorph will be termed as ***micromorphs***. The quantity of information does not matter—as long as it falls beneath the level of a monomorph it classifies as a micromorph. Thus, as in other part-whole relations, depiction of just part of an entity (a micromorph) would entail the existence of the whole (monomorph).

It is important to stress that this theory of morphology does not aim to describe meanings (i.e., semantics). Rather, this level of analysis describes the relations between *forms* alone, and these forms interface with semantics (in a manner formalized below). In verbal language, a word like *disbelieve* consists of two morphological units: a word (*believe*), which can stand alone, and an affix (*dis-*) which cannot stand alone, and must attach to another object. This morphological information then maps to the semantic information of NOT-BELIEVE. This theory of visual morphology posits an analogous relationship, as it aims to describe the visual forms that map to semantic information.

The bound morphemes in the visual modality thus attach to a ***stem*** of a monomorph to form a larger composition. For example, motion lines attach to a moving object, impact stars to an impacting object, and upfixes to a face to depict an emotional/mental state. As depicted in Fig. 2a, each of these affixes attaches to a monomorph. These are all bound morphemes, evident through the odd and incomplete nature when their monomorphs are deleted, as in Fig. 2b. This bound and compositional nature can thus be captured in a general schema as:

1. $[_{\text{Monomorph}}$ {Monomorph – (Affix)}]

It is important to stress that, in line with constructional models of morphology (Booij 2010; Jackendoff and Audring 2016), this expression is a schema stored in memory, not a procedural rule. The schematic notation here articulates that a monomorph is made up of a monomorph and an (optional) affix. Also, order does not matter (notated by the curly brackets). Since the graphic structure may specify different physical relations, it is unimportant whether our notation reflects spatial relations (i.e., for an upfix, we do not need to specify in this notation that the "affix" is above the "monomorph"). In most cases, monomorphs are stems, though some affixes can attach to micromorphs (such as a cropped image of a hand with stars indicating pain).

In addition, this process can be hierarchical: affixes can serve as the stem for other affixes. Consider now the morphology in Fig. 3a. Here, the impact star does not attach to a monomorph, but to the affix of a motion line. In addition, the "circumfixing" motion lines surround the affix of the gears, not the monomorph of the head. Deletion tests further show that these elements do not affix to their stems, but rather to the other affixes. As shown in Fig. 3b, omission of these affixes leaves a coherent representation (though it changes the meaning). However, omission of the primary affix renders the image incoherent (Fig. 3c), as would omission of the

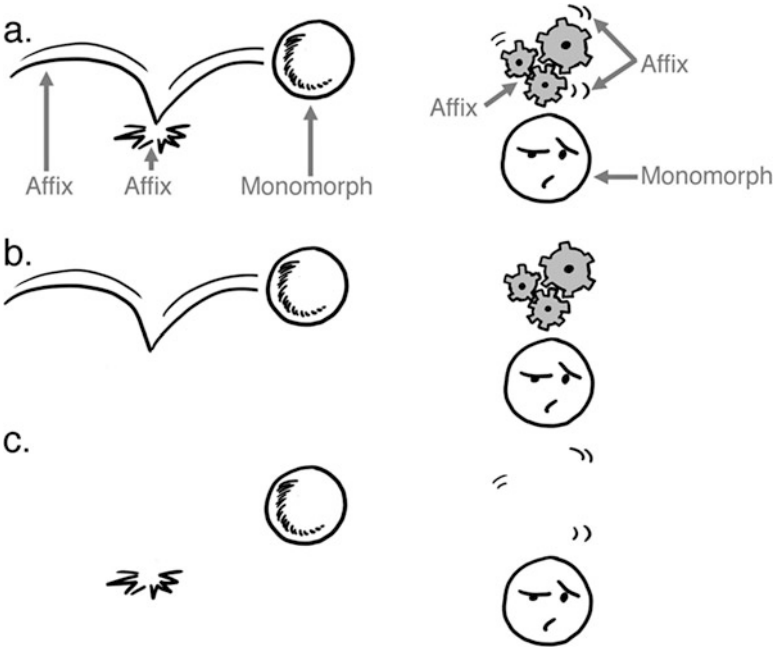

Fig. 3 (**a**) Affixes that attach to other affixes, and (**b–c**) deletion tests to illustrate these dependencies

stem. This suggests that in the visual form, affixes can possibly combine with other affixes. We can generalize this as:

2. $[_{\text{Affix}}$ {*Affix* – (Affix)}]

This schema outlines that a primary, "head" affix (italics) can attach to another affix within a larger affix. Often a clear hierarchic relationship exists between affixes: the impact star attaches *to* the motion lines, not both equally applying to their stem (again, see Fig. 3c).

We have thus arrived at basic constructs in visual morphology, which involve mappings of form-meaning information. Clusters of morphological information that can stand alone are monomorphs, while sub-sections of monomorphs that cannot stand alone are micromorphs. Affixes are bound morphemes that must attach to monomorphs (and sometimes micromorphs), and in certain cases can also attach to other affixes.

5 The Parallel Architecture

Having defined basic aspects of visual morphology, as separate from semantics, we can now incorporate this information into a larger model that specifies these relationships. Visual Language Theory is embedded within the broader linguistic

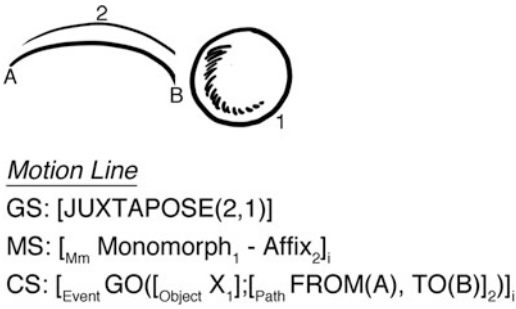

Fig. 4 A lexical entry for motion lines within a parallel architecture

framework of the ***parallel architecture*** (Jackendoff 2002; Jackendoff and Audring 2016), which balances different forms of structure that make up a linguistic system (Cohn 2016b). For example, a word (like *cat*) reflects the linkages between phonology (/kæt/), morphology (word), syntax (noun), and semantics (CAT) that are encoded in memory as a lexical item. Similarly, visual morphology involves an interaction between a graphic structure (the lines and shapes that make up a depicted image), a morphological structure (discussed above), and a conceptual structure of semantics.

Consider the affix of a motion line in Fig. 4, which depicts a ball moving. Beneath the image is a notation for the "lexical entry" of the motion line in combination with an object. Each structure describes a separate type of information involved in the representation, which are cross-listed using indices. The graphic structure (GS) should specify the graphic elements involved in depicting these visual forms as lines, curves, dots, and the rules of their combinations. This requires a theory with the sophistication of phonology that would be beyond the scope of this chapter. Here, I instead characterize the *relational* aspects of graphic elements. These relations involve operations juxtaposing elements, substituting one for another, inserting one into another, fusing them together, distorting them, etc. (Phillips and McQuarrie 2004; Schilperoord 2013, 2017), similar to the morphological strategies described above (affixation, suppletion, reduplication). It is acknowledged that these variables do not describe purely graphic structures, but rather interactions between graphics and morpho-semantics. For our purposes of describing how morphological information manifests visually though, they will suffice.

In the motion lines of Fig. 4, the graphic relations here *juxtapose* the motion lines (subscript "2") with the objects they affix to (subscript "1"). This juxtaposition is fairly content neutral—it does not specify whether the lines are in front or behind the object, only that one graphic shape is next to another one. The contents of those shapes are determined by the semantics (see below). This meaning also generates an inference that motion lines are placed behind their object, which prevents, for example, the incongruous positioning of motion lines ahead of their stem (Cohn and Maher 2015; Ito et al. 2010).

The morphological structure (MS) specifies that motion lines are an affix (1), which attaches to a monomorph (the ball: 2) to form a larger monomorph (subscript "i"). Finally, the conceptual structure (CS) specifies the meaning of a motion line,

here notated using Jackendoff's (1990) Conceptual Semantics. It says that an object X (here, the ball) goes along a path from one place (A) to another (B), with the motion line depicting the path (subscript 1). Because of this path information, we therefore infer that the graphic element of the motion line falls *behind* its juxtaposed object. Together, these pieces of structure combine to give the overall structural understanding of a basic motion line.

This type of formalization is useful for two reasons. First, formalizing these structures allows us to be specific about their component elements. Such specificity also allows for predictions, which can be examined with experimentation (see below). Second, formalization allows us to represent the componential parts of a visual lexicon in line with lexical entries for other modalities of language. The parallel architecture thus predicts that the cognitive instantiation of visual morphemes encodes links between different domains of structure in memory—and the involved structures may operate across modalities (for example, conceptual structure specifies the meaning of both verbal and visual forms).

6 Complementary Distributionality

As in other languages, the meaning of visual morphemes arises from an interaction between the signs themselves and their contextual distribution (Cohn 2013b; Forceville 2011; McCloud 1993). In visual morphology, part of that context is a location and orientation relative to other graphic elements (Cohn 2013b; Forceville 2011). This section will explore these relationships.

Let's begin with the morpheme of a heart, which retains largely the same meaning when placed in different locations. Figure 5a formalizes the structure of hearts as upfixes. First, the graphic structure places the upfix (here hearts) as juxtaposed with the head/face. In this case, the juxtaposition is specific, placing the upfix *above* the head/face (Cohn 2013b; Cohn et al. 2016), and that upfix is oriented vertically (Forceville 2011). The morphological structure again simply links the monomorph (head/face) to the affix (upfix) to form a larger monomorph.

Finally, the conceptual structure is depicted in two parts. First, the box below describes the "components" of the upfix: this is the meaning for the face and hearts independently.[2] The composite meaning appears in the main lexical entry (i.e., the meaning that results from combining those component parts). On its own, the face shows that the person (X) is in a state of being happy (1, i). The hearts alone mean love (2, j). Their union means that the person is happily in love (i, j), as in the resultant meaning listed in the lexical entry. This compositional meaning is fairly straightforward.

[2]If being complete, we could specify full lexical entries (GS, MS, CS) for the face, the upfix, and their combination separately. For concision, I here just notate the combinatorial whole in full, and the componential aspects of the conceptual structure.

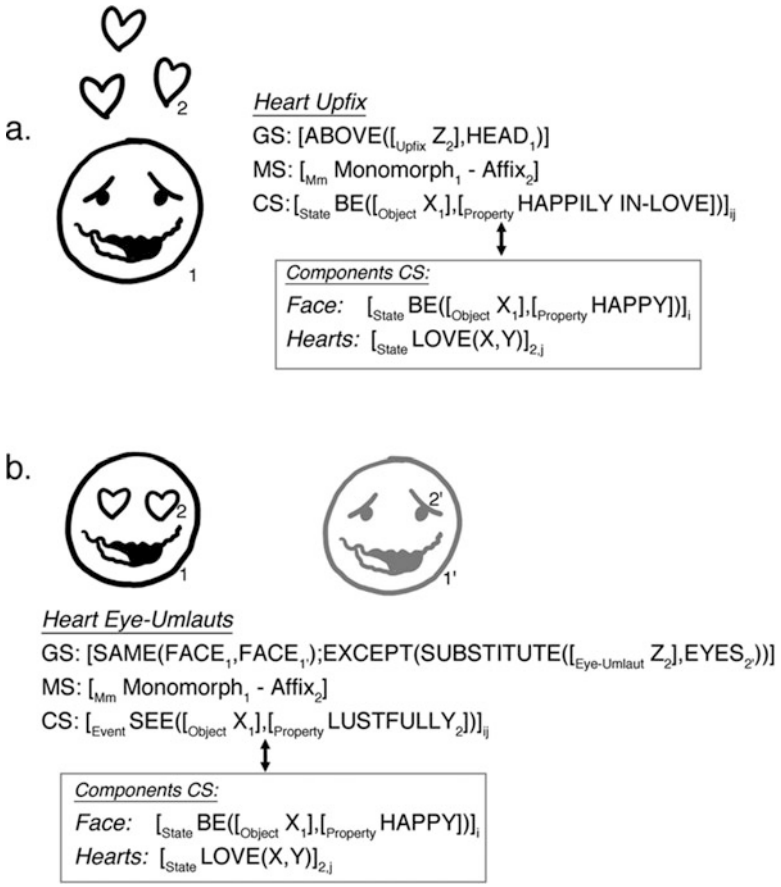

Fig. 5 The visual morpheme of hearts with largely similar meanings in different locations as either (**a**) upfixes or (**b**) eye-umlauts

Now let's consider the "eye-umlaut" using hearts, where they replace eyes (Fig. 5b). This overall meaning is largely the same as the upfix. In this case, the graphic structure is slightly more complex, because it uses substitution/suppletion (hearts into eyes) rather than affixation (hearts juxtaposed above head). In order to substitute hearts for eyes, it requires comparing the eye-umlaut face (1) to a default, basic face in memory that has eyes intact (1′). All aspects of the eye-umlaut face are thus co-indexed to the default face through paradigmatic relationships. The contrast between these faces uses a relation of "same-except" (Culicover and Jackendoff 2012) whereby some of the *same* features appear in both, *except* the crucial components of interest. Here, those exceptions are the substitution of the hearts for the eyes. This is formalized with a function of SAME applying both to the manifested face (1) and the basic schematic face (1′) to notate the similarities between the faces, and with the function of EXCEPT specifying the substitution of eye-umlauts (2) for eyes (2′).

The morphological relationship between heart eye-umlauts and heart upfixes does not differ. Both use a monomorph (face) and affix (hearts), but in different graphic relations. In addition, the semantics also subtly differ. The componential parts are the same as the upfix (face, hearts), but the compositional meaning has a slight variation. Because the hearts substitute for eyes, they do not just mean that the person is in the state of being in love (as with upfixes), but that the person sees in a loving/lustful manner. The substituted element (eyes) thus contributes to the compositional semantics.

Overall, hearts use the same morpheme with largely the same meaning in different locations. This is in part facilitated by the relatively fixed semantics of the heart itself which is widespread beyond specific visual languages (Forceville et al. 2014), though different locations add nuanced change to the meaning. Now let's compare this to a star, which has totally different meanings depending on placement as an upfix, eye-umlaut, or affix.

First, stars as upfixes (Fig. 6a) mean dizziness or disorientation. This upfix uses a compounding of affixes of a group of stars and curved motion lines. Stars, unlike hearts, on their own have no intrinsic meaning besides being a shape. This is notated in conceptual structure with an object (here the stars, "Y") going along a circular path repeatedly (notated with the plural marker PL). Together with the face, these morphemes give the idea that the person is dizzy, a marginally compositional meaning. Such meaning rests in part on the English idioms "seeing stars" and "head spinning" to mean dizziness, which are entrenched in memory (depicted here in grey) and invoked by the composite morphemes of stars and a circular motion line path.

Now consider the eye-umlaut in Fig. 6b. Here, stars substitute for eyes and have nothing to do with seeing (despite the idiom "seeing stars" invoked by an upfix) or with dizziness. Rather, they mean a desire for fame. Again, as with hearts, this eye-umlaut invokes a more basic schematic face (not depicted) with a same-except function. On its own the face is in a state of being happy, with the stars not having any meaning. These morphemes together lack any compositionality. Rather, the final meaning of desire for fame arises through their connection to an entrenched verbal idiomatic expression of "stars in one's eyes" (grey box).

Finally, stars as affixes mean pain, as in Fig. 6c. Here, stars combine with radial lines to a stem of some body part. The stars again convey no meaning on their own (2) but the radial lines specify a path for the stars to radiate from (A). This location is thus the place where the person feels pain. Some uses of pain stars lack radial lines, instead signaling a general, non-focal pain to the area they surround. In this affix, the stars use a conventionalized meaning, with no reference to an additional entrenched idiom.

Thus, in contrast to the relatively stable meanings for hearts in different locations, stars change their meanings entirely based on their distribution. Because of this, the stars themselves may be considered as different morphemes with a similar graphic structure. Similar variation occurs between verbal homonyms, such as the difference between the *un-*'s that negate adjectives (*unhappy*) and reverse actions (*untie*), or the *-er*'s that compare properties (*stronger*) and doers of actions (*baker*). Note also that one cannot "switch" the meanings between distributions. While the pain affixes

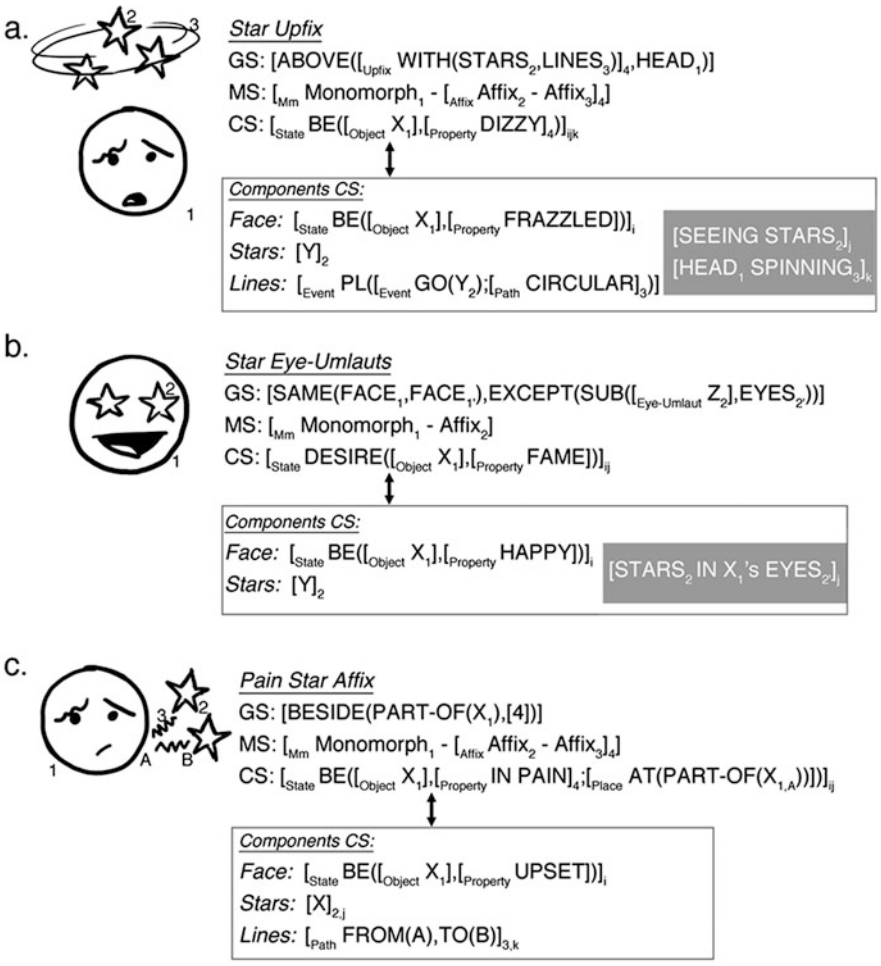

Fig. 6 Stars appearing as different affixes based on location, either (**a**) upfixes or (**b**) eye-umlauts, or (**c**) affixes

may apply somewhat to the upfix (particularly if not spinning), the eye-umlaut stars cannot be seen as pain in the eyes. Similarly, the stars as affixes cannot indicate a desire for fame. Several visual morphemes have this type of distributionally defined meaning (see Cohn 2013b; Forceville 2011; McCloud 1993 for more examples).

Let's examine two additional contrasts: a single morphological distribution with multiple meanings, and different morphemes with the same meanings. Figure 7a uses reduplication of the lines of a face. The graphic structure thus repeats the same lines (1) with a slight offset (1′). In full formalization, this offset would specify a particular distance—not close enough to seem like single thick lines or shadows, but not so far away as to appear like a separate entity. Multiple repetitions may also be

Fig. 7 The same graphic structure using reduplication with two different meanings (**a**), and a different morpheme (motion lines) depicting one of those same meanings (**b**)

possible. Both faces are thus monomorphs that combine to form a larger *compound monomorph*. There is no affixation here of adding a bound morpheme, but rather the base itself is altered.

Under one interpretation (CS1), this depicts shaking between one location (1) and another (1′). Again, the recursive repetition of this event is notated with the plural marker (PL). This same representation can have an alternative meaning though (CS2): It could also represent the "double vision" of a person (Y, not depicted) who is drunk or dizzy. Thus, this graphic structure is polysemous, although both meanings share a trait of instability (of object or viewer of object).

Note also that the first interpretation (shaking) can also be conveyed with circumfixing motion lines surrounding the object. Here, the offset reduplication does not mark the start and endpoints of the path, but rather this is conveyed by the affixed lines. Thus, here we have a single morphological representation with two possible meanings, and one of those meanings can be conveyed with a different morpheme. Indeed, circumfixing motion lines themselves are slightly polysemous: here their movement has a manner of *shaking*, but next to gears, as in Fig. 3a (and Fig. 9, further on), their manner is *spinning*. Again, note that both meanings cannot be maintained at the same time: it is difficult to retain a construal where Fig. 7a is someone shaking who is *also* seen by another person with double vision.

Thus, to summarize, visual morphemes have a complicated relationship with their distribution (Cohn 2013b; Forceville 2011). Some morphemes retain largely the same meaning in different distributions (hearts), while others wholly depend on

distribution to determine their meanings (stars). In addition, some single morphemes can convey multiple meanings (offset reduplicative lines), while the same meaning might be conveyed by multiple morphemes (reduplication, circumfixing motion lines).

7 Semantic Variation in Visual Morphology

Compositional visual morphology uses a variety of types of semiotic reference to express meaning. As discussed, hearts have a fixed meaning of LOVE. Thus, when combined with a face, they rely on that intrinsic symbolic meaning, even when in different distributional locations (Fig. 5). In contrast, stars have no intrinsic meaning and are wholly context dependent (Fig. 6). These combinations are also illustrations of idiomatic expressions ("seeing stars" or "stars in their eyes"), which make them "permeable" (Cohn 2016a) in the sense that they are a conceptualization shared across multiple expressive modalities (here, verbal and visual).

Motion lines use another type of reference, as a depiction of an invisible, yet basic, cognitive conceptualization, i.e., paths (Jackendoff 1990; Talmy 2000). Such folk understanding of paths also occurs in *scopic lines* that use dotted lines to depict the vector from characters' eyes to what they are looking at (Fig. 8a). Paths also occur with *radial lines*, like the straight lines that emerge from something shiny (like the sun) or the wavy lines used to depict heat or smells (like above trash or coffee) as in Fig. 8b. These examples depict varying invisible paths. These are different from representations like *focal lines* which have a deictic function of drawing attention to something (Cohn 2013b; Forceville 2011), like eyes (Fig. 8c). Focal lines are not paths, but belong to the broader category of *indexical lines* (Cohn 2013b). Note also that the radial lines on the gold in Fig. 8b and focal lines on the eye in Fig. 8c are another example of distributionally defined morphemes, like the stars discussed above. They share a common graphic structure (three converging lines) but have a different distribution and construed meaning, making them homonyms.

Some morphology uses iconicity. Reduplicative offset lines (Fig. 7a) either show an iconic subjective point-of-view (double-vision) or attempt to replicate an iconic phenomenon (shaking). Iconic visual morphology undergoes more complexity when it is transformed by ***conceptual metaphors*** (Lakoff and Johnson 1980; Forceville 2016) whereby one semantic domain is understood in terms of another. These include spinning gears evoking the idea that the mind is a machine, or steam coming

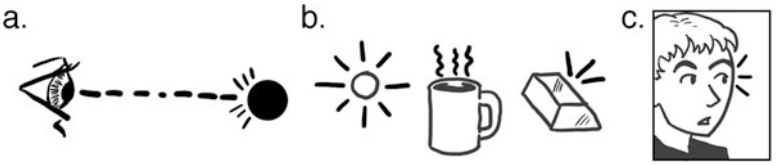

Fig. 8 Path lines including (**a**) scopic lines depicting the line of sight, (**b**) radial lines for brightness and shine (sun, gold) and heat/smell (coffee). Also, (**c**) depicts focal lines drawing attention to something, but without a path

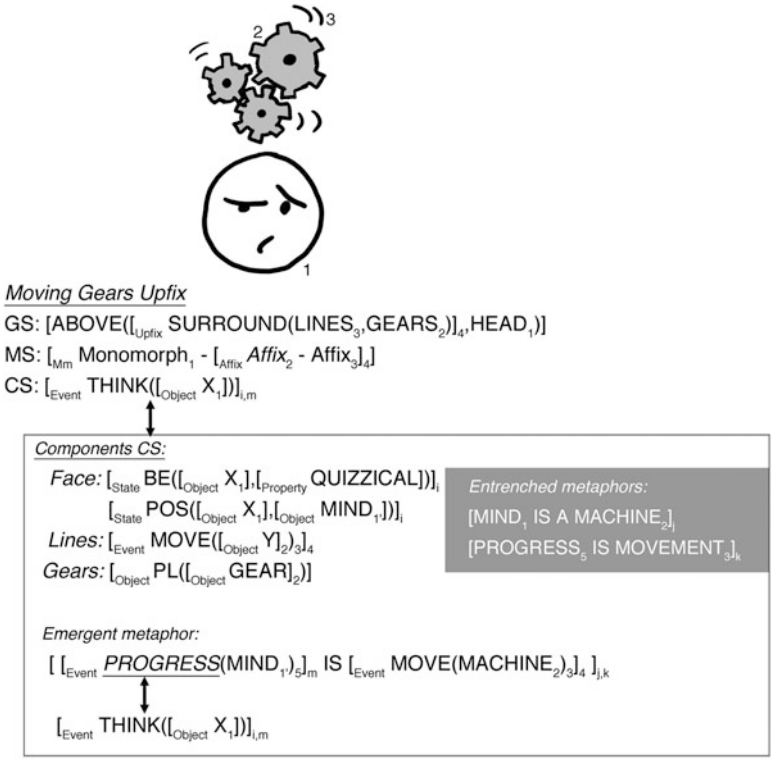

Fig. 9 Formalized structure for gear upfix involving conceptual metaphors

from ears as if anger is fluid in a pressurized container (elaborated on below). In a sense, these representations evoke a kind of "semiotic coercion" (e.g., Audring and Booij 2016) whereby iconic representations (gears, lightbulbs, birds) are "coerced" into a symbolic construal via their connection to an underlying metaphor and their emerging inferences.

Take for examplethe upfix of spinning gears to convey the meaning that the person is thinking (Fig. 9). The literal semantics of this representation are of a quizzical face (1)—which requires the background knowledge that the person possesses a mind (i)—and that gears (2) are moving (3). On their own, gears have little to do with thinking. Rather, this upfix involves two entrenched conceptual metaphors (grey box): MIND IS A MACHINE and PROGRESS IS MOVEMENT (Cohn 2010; Lakoff and Johnson 1980). MIND IS A MACHINE specifies that the properties of a mind are similar to that of a machine, with gears being the mechanisms by which thinking occurs. PROGRESS IS MOVEMENT describes that advancement occurs because of motion—here, that effort is being exerted because of the motion of gears.

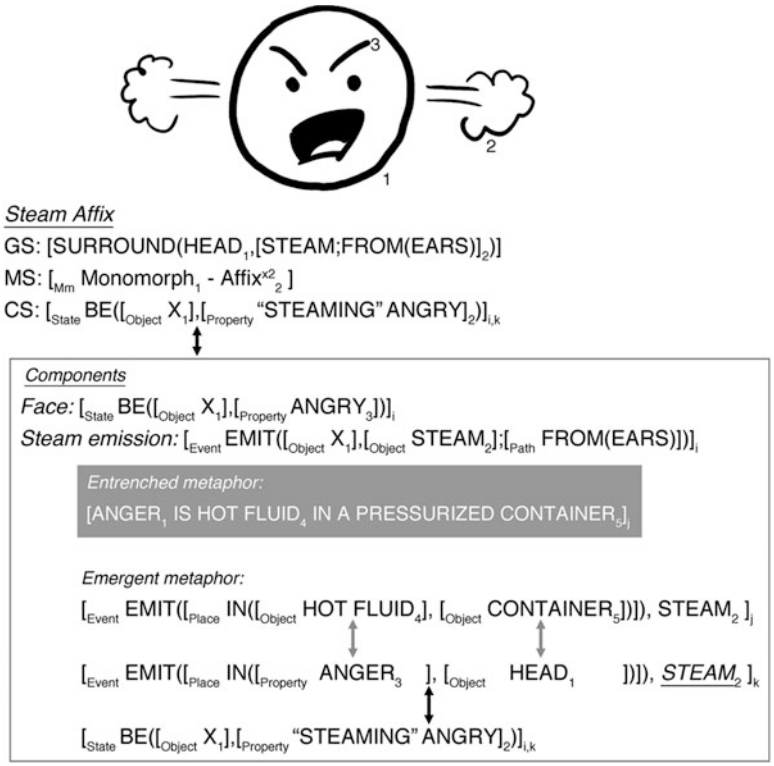

Fig. 10 Formalized structure for affix of steam coming from ears involving conceptual metaphor

Together, an emergent metaphor maps moving machines (4) as being representative of *progress of the mind* (m). Moving machines are directly depicted in the image (gears with motion lines), but "progress of the mind" is an emergent, inferred property of this representation and the combination of these conceptual metaphors (thus, underlined). "Progress of the mind" is essentially "thinking" and thus yields the overall interpretation that spinning gears above the head mean thinking. Note, that both metaphors are necessary: If the motion lines were absent (as in Fig. 3b), it would lose the PROGRESS IS MOVEMENT metaphor and thus the active sense of thinking as a process. Such movement means that the event is durative and ongoing (in contrast to the punctive state of inspiration with an upfix of a lightbulb). Though these complex mappings underlie the resultant meaning of this upfix, all of this information is encoded in the basic understanding of this visual lexical item.

Another conceptual metaphor isinvolved in the representation of steam coming from a person's ears, as in Fig. 10. Graphically, the steam surrounds the head on either side, meaning that steam cannot just be from one side (also note that here, we infer the ears because of the compositional meaning, despite not being depicted). This representation evokes the metaphor of ANGER IS HOT FLUID

IN A PRESSURIZED CONTAINER, which appears in several visual and verbal expressions (Forceville 2005; Lakoff 1992), such as *He was steaming mad*, and also upfixes with emanating heat lines (wiggly lines above the head).

In this case, the depiction directly has a face (1) with an expression of anger (3) and steam (2) being emitted from the inferred ears. To involve steam, the entrenched metaphor must involve the understanding first that hot fluid in a pressurized container emits steam. The container is mapped to a head, and anger is mapped to the hot fluid (grey lines). But, steam remains constant in both, yielding the inference that anger in a head *emits steam* (underlined). This then leads to the depiction of steam coming from the ears creating the overall inference that the person is *steaming angry*. Again, though this understanding uses fairly complex mappings within conceptual structure, such meaning is encoded in memory for this visual lexical item.

Beyond metaphors, additional richness in visual representations may involve conceptual blending (Forceville 2016; Fauconnier and Turner 2002). Blending is a mapping of conceptual domains onto each other, but may not evoke an entrenched metaphor. Take for example blending that occurs in the graphic novel of *Maus* by Art Spiegelman, which chronicles his family's experiences in World War II and the Holocaust. It blends different types of people with animals: Nazis as cats and Jews as mice. These blends are overt, with the heads of the animals appearing directly on the bodies of humans. However, because of these visually depicted blends, an additional emergent inference arises—the predatory relationship between cats and mice is then mapped onto the relationship between Nazis and Jews. Blends between animals and people (typically animal heads with quasi-human bodies) are well entrenched as patterns in drawings and cartoons, and the practice extends far back in history in several cultures (Petersen 2011; Schodt 1983). However, these particular relationships (Nazis to cats, Jews to mice) do not necessarily represent conventionalized metaphors that are entrenched in memory, but rather are novel relations from Spiegelman's creativity. Because blending results from novel mappings, they do not often involve conventionalized morphology.

8 Productivity

Like the verbal and signed modalities, visual morphology makes use of several methods for creating novel forms. One method is through borrowing from other modalities directly. For instance, they may visually "translate" idiomatic expressions from speech such as stars as upfixes ("seeing stars") or eye-umlauts ("stars in his eyes") as in Fig. 6. This is also found in a trail of daggers to show the path of an eye-line as in "starring daggers" at someone (McCloud 1993). Idioms may be one way that new closed-class morphemes may emerge. Similarly, depictions involving conceptual metaphor, and blending may allow for creative morphology that grows to become conventional, through systemization from repeated use.

Other lexical items may grow from extending and systematizing iconic representations. For example, Japanese Visual Language (JVL) in manga uses a tubular X-shape to depict popped-out veins for anger, originally placed iconically on characters' foreheads. Over time, this depiction became more schematized, and extended as a symbolic affix placed on various body parts (foreheads, hands, etc.) and even floating in speech balloons (Shinohara and Matsunaka 2009). A similar trajectory is suggested by a novel affix in Tatsuya Ishida's *Sinfest* (www.sinfest.net, January 5, 2017), which combined floating pain stars, as in Fig. 6c, with floating X-shaped band-aids. Band-aids may not yet be conventionalized closed-class morphology (though they may be conventionalized open-class items), but their extension as affixes over repeated usage could become regularized. Thus, lexical items can grow from an unconventional iconic representation, to a systematic sign (Garrod et al. 2007), to a lexicalized affix. Many examples of closed-class visual morphology followed a similar trajectory (Petersen 2011), which is akin to the development of some lexical items in other modalities, such as sign language (Fay et al. 2014).

Existing schemas may also incorporate novel morphemes. For example, upfixes appear to be a ***semi-productive*** morphological class, whereby new forms can be generated that stay within the constraints of the pattern. That is, new items can be put above a character's head to become novel upfixes. Though they are less comprehensible than conventional upfixes, experimentation has shown that novel upfixes are rated as more comprehensible than incongruous ones (mismatches between face and upfix), and are subject to the same constraints as conventional ones. The upfix must be above, and not beside, the head, and the facial expression must "agree" with the upfix. For instance, storm clouds cannot be above a smiling face (Cohn et al. 2016). These results imply that upfixes use a productive schema, and are not simply memorized instances.

Such productivity may also be possible with eye-umlauts, though the signs must be small enough without detail to substitute for eyes. For example, it may be easier to create novel eye-umlauts of simple windows as eyes (for the idiom "eyes are the windows to the soul") than for a fully detailed bedroom with bed, wardrobe, and dresser (for the idiom "bedroom eyes"). The small graphic space for eyes will likely constrain the ability to convey complex visual details.

Semi-productivity may modulate the manner of other signs. For example, "carriers" of text like "speech balloons" can modulate the shape or texture to convey the volume (e.g., jagged lines for yelling or dotted lines for whispering), pragmatic intent (e.g., a drippy carrier for sarcasm), or origin (e.g., square carriers for a robotic voice) of speech (Cohn 2013b). Other semi-productive classes may exist in different visual languages. JVL uses several affixes that are placed either on the forehead—like a sweat drop for anxiety in Fig. 1a—or emerging from the nose—like bloody noses for lust or a bubble for sleepiness (Cohn and Ehly 2016). Might these constitute (or become) classes of "foreheadfixes" or "nosefixes"? Such analysis requires further research, but visual morphology clearly allows for both fully productive and semi-productive morphology, as in other modalities.

9 Empirical Research

The growing literature on visual morphology over the past decades raises several issues for future research, including cross-cultural variation, processing, and acquisition. I review this work below.

9.1 Cross-Cultural Variation

Visual morphology differs across cultures. This is particularly apparent in the conventions of one culture that appear opaque to those unfamiliar with that visual language. For example, without fluency in Japanese Visual Language, bloody noses for lust and bubbles out of a nose for sleep might seem perplexing. Just as the vocabularies of spoken and signed languages differ across the world, so too do those of visual languages. Research on such diversity can thus follow the lead of corpus linguistics research to investigate the variation, historical development, and typology of the lexicons of visual languages. This includes the variation between visual languages used in comics, those outside of comics, and their relations. For example, the emoji now popular in digital communication originally borrowed heavily from the vocabulary of Japanese Visual Language used in manga (Danesi 2016; Katsuno and Yano 2002). Some researchers subdivide between the visual morphology that appears specifically in the visual languages of comics (e.g., motion lines, pain stars), and those used in comics appropriated from outside those specific visual languages (e.g., hearts, dollar signs) (Forceville et al. 2014). Such categorization is often hard to distinguish, but increased corpus analyses could clarify these distinctions.

A growing literature of theoretical and corpus studies has already begun. Some work has attempted to simply characterize and categorize various lexical items both within and across comics (Cohn and Ehly 2016; Forceville 2011), especially word balloons and thought bubbles (Cohn 2013a; Forceville et al. 2010; Pratha et al. 2016). Similar work has focused on visual lexical items in the context of conveying conceptual metaphors (Forceville 2005; Shinohara and Matsunaka 2009; Abbott and Forceville 2011). Morphology has also been studied in visual languages outside of comics, such as in the sand drawings used by Central Australian Aboriginals (Wilkins 1997; Munn 1962, 1966, 1986/2016; Green 2014), and in older visual languages like those found on Mayan pottery (Wichmann and Nielsen 2016) and in the Old English Bayeux Tapestry (Díaz Vera 2013a, b), among others.

Corpus research also has looked at morphology as a way to characterize the differences between visual languages. Cohn and Ehly (2016) found that most closed-class visual morphology used in 10 shonen (boy's) and 10 shojo (girl's) manga from Japan were similar, suggesting a shared visual vocabulary. However, different morphemes were used in varying proportions between genres, suggesting distinct sub-dialects. Such analyses can be extended across comics from other

cultures and time periods (and contexts beyond comics) to explore to what degree different visual lexical items have spread across the globe and/or different time periods.

At the same time, cross-cultural studies can examine the degree to which there may be universal tendencies for systems to convey similar conceptual information. For example, does closed-class morphology in visual languages across the world tend to convey non-iconic information? While particular morphemes are no doubt culturally specific (even extended across cultures via globalization), certain meanings may be consistently conveyed across visual languages. Consider the sand drawings by Australian Aboriginals. Though they differ in most regards from the visual languages found in comics of the world, they do use a variety of conventionalized ways of drawing paths, somewhat akin to motion lines (Green 2014; Wilkins 1997/2016; Munn 1986/2016).

As corpus and annotation efforts grow, research can address questions of cross-cultural diversity and typology of the vocabularies of visual languages around the world and in historical contexts. It can also examine more carefully the development and history of changes in lexical items over time.

9.2 Processing

Research on the processing of various aspects of visual morphology goes back decades. Early work focused on the basic construal of meaning from these forms, especially with regard to the ages children begin to understand them (see below). Substantial work has been done looking at how kids understand carriers—like speech balloons and thought bubbles (Yannicopoulou 2004). This includes work suggesting that thought bubbles can be a successful intervention tool for teaching *theory of mind* to individuals with autism (Kerr and Durkin 2004; Parsons and Mitchell 1999; Wellman et al. 2002)—i.e., the idea that other individuals have thoughts that are different from one's own (Premack and Woodruff 1978).

Additional psychological research has looked at the understanding of motion lines. Some work has claimed that motion line understanding originates in basic aspects of vision, mimicking the "streaks" that are left behind in the visual system when viewing a moving object (Burr 2000; Burr and Ross 2002; Kawabe and Miura 2006, 2008; Kim and Francis 1998). However, recent research has shown that motion line understanding cannot be attributed to basic perceptual processing (Cohn and Maher 2015; Ito et al. 2010), and understanding this conventional representation is modulated by fluency in the visual language of comics (Cohn and Maher 2015). Measurements of electrophysiology have also suggested that the omission of motion lines evokes brain responses similar to those for incongruously reversed motion lines (Cohn and Maher 2015). Such findings suggest that, at least within the context of comics, motion lines do not just add meaning to an otherwise understandable representation, but rather they are an expected part of depicting events.

Research has also investigated more compositional aspects of visual morphology, such as the constraints on upfixes (Cohn et al. 2016; Ojha 2013; Newton 1985). This work has shown that upfixes need to be above a head, not beside it, and the upfix must "agree" with the facial expression (Cohn et al. 2016). For example, as mentioned above, a smiling face cannot be below a storm cloud. These constraints hold for both conventional and novel upfixes, suggesting that this is a semi-productive class of visual morphology, not simply memorized tokens.

Several questions have emerged as salient for future research: What are the cognitive mechanisms at work in compositional aspects of building meaning from monomorphs and visual affixes? To what extent do these processes overlap with the mechanisms operating in verbal and signed languages? How are these structures balanced with aspects of perceptual processing? And, to the degree that visual morphology differs between visual languages, how does experience with different visual morphology modulate their understanding?

9.3 Acquisition

An additional line of research involves how people learn this visual vocabulary. Most prior work on the acquisition of visual morphology has focused on the ages at which children are able to understand their meanings. In general, visual morphology appears to be understood better as individuals age (Nakazawa 2016), and may also be modulated by the frequency that those visual morphemes appear in comics (Newton 1985).

Nevertheless, the developmental trajectory of understanding visual morphemes may vary. For example, the meanings of speech balloons and thought bubbles appear to be understood by around 4 years old (Wellman et al. 1996). However, additional traits like loudness—denoted by jagged lines—appear to be understandable by even preliterate children (Yannicopoulou 2004). Motion line understanding progresses as children age, going from a fairly moderate understanding around age 6 to full understanding by age 12 (Friedman and Stevenson 1975; Gross et al. 1991; Carello et al. 1986; Mori 1995; Nakazawa 2016). This understanding also involves the shift from children interpreting them as physical elements (like wind) to fully symbolic conventions (Gross et al. 1991). This developmental trajectory differs from reduplication of body parts to show movement, which is understood even at earlier ages (Friedman and Stevenson 1975).

Thus, different visual morphemes do not appear to have a uniform timeline for the acquisition of their meanings. Future research can further examine these types of trajectories, but can also progress beyond interpretation alone to investigate compositionality and constraints on structure.

10 Conclusion

This article has examined the combinatorial aspects of visual lexical items, mostly between bound morphemes and isolatable forms (monomorphs). These combinations create meaning out of a balance between the intrinsic meaning of a representation with its spatial distribution using similar strategies as in spoken and signed languages: affixation, suppletion/substitution, and reduplication. This combinatorial meaning may involve a variety of semiotic reference types—possibly with inferential meaning drawing upon idiomatic or metaphorical knowledge. Such structure thus arises similarly between visual lexical items and those in the verbal and signed modalities. Drawing these parallels can hopefully inspire future work integrating research on visual languages into the linguistic sciences.

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References

Abbott, M., and Ch. Forceville. 2011. Visual representation of emotion in manga: Loss of control is Loss of hands in Azumanga Daioh Volume 4. *Language and Literature* 20 (2): 91–112. https://doi.org/10.1177/0963947011402182.

Anderson, S.R. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.

Audring, J., and G. Booij. 2016. Cooperation and coercion. *Linguistics* 54 (4): 617–637.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

Burr, D.C. 2000. Motion vision: Are "speed lines" used in human visual motion? *Current Biology* 10 (12): R440–R443. https://doi.org/10.1016/s0960-9822(00)00545-5.

Burr, D.C., and J. Ross. 2002. Direct evidence that "speedlines" influence motion mechanisms. *The Journal of Neuroscience* 22 (19): 8661–8664.

Carello, C., L.D. Rosenblum, and A. Grosofsky. 1986. Static depiction of movement. *Perception* 15 (1): 41–58.

Cohn, N. 2007. A visual lexicon. *Public Journal of Semiotics* 1 (1): 53–84.

———. 2010. Extra! Extra! Semantics in comics!: The conceptual structure of *Chicago Tribune* advertisements. *Journal of Pragmatics* 42 (11): 3138–3146.

———. 2013a. Beyond speech balloons and thought bubbles: The integration of text and image. *Semiotica* 2013 (197): 35–63.

———. 2013b. *The visual language of comics: Introduction to the structure and cognition of sequential images*. London: Bloomsbury.

———. 2016a. Linguistic relativity and conceptual permeability in visual narratives: New distinctions in the relationship between language(s) and thought. In *The visual narrative reader*, ed. N. Cohn, 315–340. London: Bloomsbury.

———. 2016b. A multimodal parallel architecture: A cognitive framework for multimodal interactions. *Cognition* 146: 304–323.

Cohn, N., and S. Ehly. 2016. The vocabulary of manga: Visual morphology in dialects of Japanese visual language. *Journal of Pragmatics* 92: 17–29.

Cohn, N., and S. Maher. 2015. The notion of the motion: The neurocognition of motion lines in visual narratives. *Brain Research* 1601: 73–84.

Cohn, N., B. Murthy, and T. Foulsham. 2016. Meaning above the head: Combinatorial constraints on the visual vocabulary of comics. *Journal of Cognitive Psychology* 28 (5): 559–574.

Culicover, P.W., and R. Jackendoff. 2012. Same-except: A domain-general cognitive relation and how language expresses it. *Language* 88 (2): 305–340.

Danesi, M. 2016. *The semiotics of emoji: The rise of visual language in the age of the internet*. London: Bloomsbury.

Díaz Vera, J.E. 2013a. Embodied emotions in Medieval English language and visual arts. In *Sensuous cognition explorations into human sentience: Imagination, (e)motion and perception*, ed. R. Caballero and J.E. Diaz Vera, 195–219. Berlin: de Gruyter.

———. 2013b. Woven emotions: Visual representations of emotions in medieval English textiles. *Review of Cognitive Linguistics* 11 (2): 269–284.

Engelhardt, Y. 2002. *The language of graphics*. Dissertation, University of Amsterdam.

Fauconnier, G., and M. Turner. 2002. *The way we think: Conceptual blending and the mind's hidden complexities*. New York: Basic Books.

Fay, N., M. Ellison, and S. Garrod. 2014. Iconicity: From sign to system in human communication and language. *Pragmatics & Cognition* 22 (2): 244–263.

Forceville, Ch. 2005. Visual representations of the idealized cognitive model of anger in the Asterix album *La Zizanie*. *Journal of Pragmatics* 37 (1): 69–88.

———. 2011. Pictorial runes in *Tintin and the Picaros*. *Journal of Pragmatics* 43 (3): 875–890.

———. 2016. Conceptual metaphor theory, blending Tteory, and other cognitivist perspectives on comics. In *The visual narrative reader*, ed. N. Cohn, 89–114. London: Bloomsbury.

Forceville, Ch., T. Veale, and K. Feyaerts. 2010. Balloonics: The visuals of balloons in comics. In *The rise and reason of comics and graphic literature: Critical essays on the form*, ed. J. Goggin and D. Hassler-Forest, 56–73. Jefferson: McFarland & Company, Inc.

Forceville, Ch., E. El Refaie, and G. Meesters. 2014. Stylistics in comics. In *The Routledge handbook of stylistics*, ed. M. Burke, 485–499. London: Routledge.

Friedman, S.L., and M.B. Stevenson. 1975. Developmental changes in the understanding of implied motion in two-dimensional pictures. *Child Development* 46: 773–778.

Garrod, S., N. Fay, J. Lee, J. Oberlander, and T. MacLeod. 2007. Foundations of representation: Where might graphical symbol systems come from? *Cognitive Science* 31 (6): 961–987.

Green, J. 2014. *Drawn from the ground: Sound, sign and inscription in Central Australian sand stories*. Cambridge: Cambridge University Press.

Gross, D., N. Soken, K.R. Rosengren, A.D. Pick, B.H. Pillow, and P. Melendez. 1991. Children's understanding of action lines and the static representation of speed of locomotion. *Child Development* 62: 1124–1141.

Ito, H., T. Seno, and M. Yamanaka. 2010. Motion impressions enhanced by converging motion lines. *Perception* 39 (11): 1555–1561.

Jackendoff, R. 1990. *Semantic structures*. Cambridge, MA: MIT Press.

———. 2002. *Foundations of language: Brain, meaning, grammar, evolution*. Oxford: Oxford University Press.

Jackendoff, R., and J. Audring. 2016. Morphological schemas. *The Mental Lexicon* 11 (3): 467–493.

Katsuno, H., and C.R. Yano. 2002. Face to face: On-line subjectivity in contemporary Japan. *Asian Studies Review* 26 (2): 205–231.

Kawabe, T., and K. Miura. 2006. Representation of dynamic events triggered by motion lines and static human postures. *Experimental Brain Research* 175 (2): 372–375.

———. 2008. New motion illusion caused by pictorial motion lines. *Experimental Psychology (formerly Zeitschrift für Experimentelle Psychologie)* 55 (4): 228–234.

Kerr, S., and K. Durkin. 2004. Understanding of thought bubbles as mental representations in children with autism: Implications for theory of mind. *Journal of Autism and Developmental Disorders* 34 (6): 637–648.

Kim, H., and G. Francis. 1998. A computational and perceptual account of motion lines. *Perception* 27 (7): 785–797.

Koch, W.A. 1971. *Varia semiotica*. Hildensheim: Olms.

Lakoff, G. 1992. The contemporary theory of metaphor. In *Metaphor and thought*, ed. A. Ortony, 202–251. Cambridge: Cambridge University Press.
Lakoff, G., and M. Johnson. 1980. *Metaphors we live by*. Chicago: University of Chicago Press.
McCloud, S. 1993. *Understanding comics: The invisible art*. New York: Harper Collins.
Mori, K. 1995. The influence of action lines on pictorial movement perception in pre-school children. *Japanese Psychological Research* 27 (3): 183–187.
Munn, N.D. 1962. Walbiri graphic signs: An analysis. *American Anthropologist* 64 (5): 972–984.
———. 1966. Visual categories: An approach to the study of representational systems. *American Anthropologist* 68 (4): 936–950.
———. 1986/2016. The Warlbiri sand story. In *The visual narrative reader*, ed. N. Cohn, 230–249. London: Bloomsbury.
Nakazawa, J. 2016. Manga literacy and manga comprehension in Japanese children. In *The visual narrative reader*, ed. N. Cohn, 157–184. London: Bloomsbury.
Newton, D.P. 1985. Children's perception of pictorial metaphor. *Educational Psychology* 5 (2): 179–185.
Ojha, A. 2013. *An experimental study on visual metaphor.* Dissertation, International Institute of Information Technology, Hyderabad, India.
Parsons, S., and P. Mitchell. 1999. What children with autism understand about thoughts and thought bubbles. *Autism* 3 (1): 17–38.
Petersen, R.S. 2011. *Comics, manga, and graphic novels: A history of graphic narratives*. Santa Barbara: ABC-CLIO.
Phillips, B.J., and E.F. McQuarrie. 2004. Beyond visual metaphor: A new typology of visual rhetoric in advertising. *Marketing Theory* 4 (1–2): 113–136.
Pratha, K., N. Avunjian, and N. Cohn. 2016. Pow, punch, pika, and chu: The structure of sound effects in genres of American comics and Japanese manga. *Multimodal Communication* 5 (2): 93–109.
Premack, D., and G. Woodruff. 1978. Does the chimpanzee have a 'theory of mind'? *Behavioral and Brain Science* 4: 515–526.
Sadock, J.M. 1991. *Autolexical syntax: A theory of parallel grammatical representations*. Chicago: University of Chicago Press.
Schilperoord, J. 2013. Raising the issue: A mental-space approach to Iwo Jima-inspired editorial cartoons. *Metaphor and Symbol* 28 (3): 185–212.
———. 2017. Ways with pictures: Visual incongruities and metaphor. In *Visual metaphor; structure and process*, ed. G. Steen. Amsterdam: John Benjamins.
Schodt, F.L. 1983. *Manga! Manga! The world of Japanese comics*. New York: Kodansha America Inc.
Shinohara, K., and Y. Matsunaka. 2009. Pictorial metaphors of emotion in Japanese comics. In *Multimodal metaphor*, ed. Ch. Forceville and E. Uris-Aparisi, 265–293. Berlin/New York: Mouton De Gruyter.
Stump, G.T. 2001. *Inflectional morphology: A theory of paradigm structure*. Cambridge: Cambridge University Press.
Talmy, L. 2000. *Toward a cognitive semantics*. Cambridge, MA: MIT Press.
Walker, M. 1980. *The lexicon of comicana*. Port Chester: Comicana, Inc.
Wellman, H.M., M. Hollander, and C.A. Schult. 1996. Young children's understanding of thought bubbles and thoughts. *Child Development* 67: 768–788.
Wellman, H.M., S. Baron-Cohen, R. Caswell, J.C. Gomez, J. Swettenham, E. Toye, and K. Lagattuta. 2002. Thought-bubbles help children with autism acquire an alternative to a theory of mind. *Autism* 6 (4): 343–363.
Wichmann, S., and J. Nielsen. 2016. Sequential text-image pairing among the Classic Maya. In *The visual narrative reader*, ed. N. Cohn, 282–313. London: Bloomsbury.
Wildfeuer, J., and J. Bateman. 2016. Linguistically oriented comics research in Germany. In *The visual narrative reader*, ed. N. Cohn, 19–66. London: Bloomsbury.

Wilkins, D.P. 1997. Alternative representations of space: Arrernte narratives in sand. In *Proceedings of the CLS opening academic year '97 '98*, ed. M. Biemans and J. van de Weijer, 133–164. Nijmegen: Center for Language Studies.

———. 1997/2016. Alternative representations of space: Arrernte narratives in sand. In *The visual narrative reader*, ed. N. Cohn, 252–281. London: Bloomsbury.

Yannicopoulou, A. 2004. Visual aspects of written texts: Preschoolers view comics. *L1- Educational Studies in Language and Literature* 4: 169–181.

De-adjectival Human Nouns in French

Dany Amiot and Delphine Tribout

Abstract This chapter deals with adjectives used as nouns in French. Such uses of adjectives are cross-linguistically attested, and in recent years there have been numerous studies on this topic, often in a cross-linguistic perspective. Two kinds of interpretation are generally distinguished for these nouns: either the noun is abstract and refers to the property denoted by the adjective; or it is concrete and countable and refers to an individual, generally a human being. This study will focus on the latter, named de-adjectival human nouns. We will first present the main properties of de-adjectival human nouns in French, then we will give an account of the literature on de-adjectival nouns. Such nouns are generally analysed as being either syntactically derived or morphologically converted from adjectives. We will show, however, that both types of analysis suffer drawbacks. Finally, in line with the framework of Construction Grammar, we will provide an alternative analysis, in terms of syntactic coercion.

Keywords De-adjectival human nouns · Coercion · Construction Morphology · Syntax-morphology interface

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1 Introduction

Adjectives in nominal use are cross-linguistically attested, and in recent years there have been numerous studies on this topic, often from a cross-linguistic perspective (among many others Baker 2003; Corblin et al. 2004; Borer and Roy 2010; Schwarze 2012; Sleeman 2013; McNally and de Swart 2015; Alexiadou 2015). These works generally distinguish two kinds of interpretation: the noun refers to the property denoted by the adjective, or it refers to an individual, generally a human being. In this article, we are focusing on the latter, named here de-adjectival human nouns (*vs.* de-adjectival property nouns). In line with the framework of Construction Grammar and contrary to previous analyses, we show that de-adjectival human nouns are produced syntactically by override coercion.

This article is organized as follows: Section 2 presents the main characteristics of de-adjectival human nouns in French. Section 3 gives an account of the literature on de-adjectival nouns, be they property nouns or human nouns. Two main analyses have been proposed in the literature on the topic: de-adjectival nouns are the result of syntactic derivation (Sect. 3.1) or morphological conversion (Sect. 3.2). Section 4 provides an alternative analysis, in terms of syntactic coercion. Such an analysis has already been proposed by Lauwers (2008) to account for the formation of de-adjectival property nouns; we extend this analysis, with some adjustments, to de-adjectival human nouns.

2 Properties of De-adjectival Human Nouns

In French, most adjectives, if they denote properties that apply to human beings, can be used as nouns in order to denote humans.[1] This applies to all types of adjectives, be they morphologically underived, such as *jeune* 'young', *grand* 'tall' and *petit* 'small' in (1a), or morphologically derived, such as *orgueilleux* 'proud', *féministe* 'feminist' and *parlementaire* 'parliamentarian' in (1b).

(1) a. *les jeunes* 'the young', *les grands* 'the grown-ups/tall people', *un petit* 'a kid / small person'
b. *les orgueilleux* 'proud people', *un féministe* 'a feminist', *un parlementaire* 'a parliamentarian'

Even adjectives deriving from past participles (2a) or present participles (2b) can be used as nouns, as illustrated in the examples (2) taken from the French database Frantext.

[1] Our study proposes a unified analysis of de-adjectival human nouns without taking into account the different degrees of lexicalization these de-adjectival nouns may have. This issue requires further study.

(2) a. Son agence de détective n'avait pas pour but de retrouver les **disparus.** (Frantext)
'His detective agency did not aim to find missing persons'
b. Il y avait toujours un **gagnant** et des **perdants** (Frantext)
'There always was one winner and several losers'

In what follows, we present the properties of de-adjectival human nouns in French. Such nouns have already been studied, not only in French (Winther 1996; Schwarze 2012; Lauwers 2008, 2014a) but also in Dutch, English, Greek, Romanian, and Slovak (see Alexiadou 2015; Borer and Roy 2010; Ferrari 2005; Giannakidou and Stavrou 1999; McNally et al. forthcoming).

First, it should be noted that de-adjectival human nouns behave like ordinary nouns. They show all properties of nouns. They can be used either in the singular (3a) or in the plural (3b), even though they tend to be used more often in plural contexts, as will be discussed in Sect. 4.3.

(3) a. À peine Edmond l'eut-il quittée [. . .] qu'un **téméraire** vint pour s'emparer de ce nouveau bouquet (Frantext)
'Edmond had barely left her [. . .] when a bold man came to seize the new bouquet'
b. Jamais les **démissionnaires** n'ont été plus prêts à tout faire et à tout souffrir (Frantext)
'Never have outgoing employees been more ready to do and to undergo anything'

Moreover, de-adjectival human nouns inflect like ordinary nouns: when used in the plural, they bear a plural marker (*s*), as can be seen in (3b). This is true even for irregular plurals, as in the examples (4), which have a singular form in *-al* [al] and a plural form in *-aux* [o].

(4) a. Je comprenais les **marginaux** allongés sur les bancs. (Frantext)
'I understood misfits lying on benches'
b. Mais les **radicaux** se divisaient sur la loi des trois ans (Frantext)
'But the radicals were divided on the three-years law'
c. Il pense que la seule solution viable est une paix séparée avec les **occidentaux**. (Frantext)
'He thinks that the only viable solution is a separated peace agreement with Westerners'

This situation contrasts with that of English where de-adjectival human nouns usually do not show number variation even if they trigger plural agreement, as illustrated by example (5). On this topic see, among others Borer and Roy (2010), Glass (2013), and Alexiadou (2015).

(5) The rich are enclosed behind their walled villas. (web)

As regards the possibilities of determination, de-adjectival human nouns combine with all kinds of determiner a noun allows. Unlike English nouns, in French they are not limited to generic uses: they can combine either with a definite determiner, as illustrated by examples (6a–b) or an indefinite one (6c–d), be they singular ((6a) and (6c)) or plural ((6b) and (6d)), and they can also be determined by numerals (6e) or demonstrative determiners (6f). The examples under (6) show that even if *ambitieux* is not lexicalized as a noun, it seems to be fully countable according to the criteria given by Lauwers (2014c): it may especially be determined by the indefinite determiner *plusieurs* 'several' (6d) and by a numeral (6e), which both indicate a high degree of individuation.[2]

(6) a. L'**ambitieux** qui vint était formé comme un tueur de coûts. (Frantext)
'The ambitious man who came was educated as a price killer'
b. Les **ambitieux** m'inspirent un sentiment de deuil (Frantext)
'Ambitious persons give me a feeling of bereavement'
c. Le père est un **ambitieux** boulimique, un arriviste (Frantext)
'the father is an insatiable ambitious man, a social climber'
d Plusieurs **ambitieux** aspiraient au pouvoir suprême (web)
'Several ambitious men strived for the supreme power'
e. Trois **ambitieux** de la plus basse catégorie résolurent de participer au salaire réservé à la classe rivale (Frantext)
'Three ambitious men from the lowest category decided to participate in the salary of the rival class'
f. Cet **ambitieux** ne pouvait se résoudre à une carrière de généraliste (Frantext)
'This ambitious man could not resign himself to being a general practitioner'

De-adjectival human nouns also behave like ordinary nouns with respect to modification: they can be modified by either an adjective (7a), a prepositional phrase (7b) or a relative clause (7c).

[2]It is likely, however, that not all de-adjectival human nouns show the same degree of individuation. In order to assess their individuation ability, an extensive analysis of all de-adjectival human nouns would be necessary. This is beyond the scope of the present study, and we leave it to further research.

(7) a. La méfiance pour ces **notables** plus rusés, plus poseurs que les autres (Frantext)
'The mistrust for these public figures who are sneakier and more hypocritical than the others'
b. Même avec les **grands** du bourg, petit Bosco n'a jamais baissé la tête (Frantext)
'Even with the older boys from the village, petit Bosco never put his head down'
c. Je me rassis et contemplai les **vieux** qui jouaient aux échecs (Frantext)
'I sat back down and gazed at the old men playing chess'

Finally, they can fulfil all syntactic functions nouns can: subject (8a), object (8b), noun complement (8c), or they can be used predicatively (8d).

(8) a. Un **humanitaire** a cette fois-ci chopé un tir de flash-ball (Frantext)
'This time a humanitarian worker was caught by a flash-ball shot'
b. Les hommes aiment les **chanceux** (Frantext)
'Men love the lucky'
c. Ces événements n'ont rien changé à l'opinion des **parisiens** (Frantext)
'These events didn't change the minds of the Parisians'
d. C'était le **démissionnaire** de 1904 (Frantext)
'He was the resigning man of 1904'

To conclude, de-adjectival human nouns behave like true nouns in many ways. However, some of them still show adjectival properties such as the possibility to be modified by an adverb. As can be seen in example (9) the human noun *riche* 'rich' can combine with the adverb *très* 'very'.

(9) Combien sont les très **riches**? (web)
'How many very rich people are there?'

Moreover, example (10) shows that this noun seems to have both adjectival and nominal properties at the same time: it can be modified by both an adverb (*très*) and a relative clause (*qui n'ont pas leur jet privé*) in the same context.

(10) Pour les très **riches** qui n'ont pas leur jet privé, quelles sont les compagnies aériennes plébiscitées? (web)
'For the very rich, who do not have their own private jet, what are the preferred airlines?'

It should be noted that a high degree of lexicalization does not necessarily imply the loss of the ability to be modified by an adverb of degree. As can be seen in (11) *notable* still displays a categorial ambiguity despite its high degree of lexicalization.

(11) Seuls les très **notables** des peuplades gauloises ayant pactisés [sic] eurent droit de citoyenneté (web)
'In the Gallic tribes, only the very prominent figures who had made a deal got citizenship'

This very property gives them a special status among nouns because ordinary nouns cannot be modified by an adverb. As it has been pointed out by Lauwers (2014b) for French and Audring and Booij (2016) for English, nouns can sometimes be modified by an adverb, but only if they are coerced by a predicative construction and thus have a property meaning, such as *femme* 'woman' in (12):

(12) Marie fait très femme maintenant
Mary looks very woman now
'Mary looks like a real woman now'

We also find de-adjectival human nouns that maintain the subcategorized complements of their original adjectives, as can be seen in examples (13):

(13) a. tout en se moquant gentiment des nationalistes et autre[s] régionalistes, **les fiers de leur patelin** (web)
'while making kindly fun of nationalists and regionalists, people who are proud of their village' (lit. 'the proud of their village')
b. Une ligne de démarcation entre **les aptes à la vie autonome** et les inaptes ne saurait être déterminée en général (web)
'A dividing line between people capable of an independent living and those incapable cannot be generally drawn'

More interestingly, when the adjective comes from a participle the human noun can still display the argument structure of the base verb:

(14) a. **Le gagnant du premier prix** accepte également d'être suivi par un journaliste (web)
'The winner of the first prize also agrees to be followed by a journalist'
b. Pour **les abonnés au journal** papier, la version numérique coûte 2€ mensuels (web)
'For subscribers to the printed newspaper, the digital version costs 2€ monthly'
c. Je ne vois pas apparaître le nom de [. . .] ni dans la liste **des élus par les militants** ni, bien entendu, dans la liste **des élus par le comité préfectoral** (web)
'I see the name of [. . .] neither in the list of members elected by the militants (lit. 'the elected by the militants'), nor, of course, in the list of members elected by the prefectural committee (lit. 'the elected by the prefectural committee')'

The above examples show that at least some de-adjectival human nouns retain the properties of their original adjectives, even when they derive from present or past participles.

To sum up, de-adjectival human nouns seem to be an in-between category showing all properties of nouns and some properties of adjectives or participles at the same time. The next section will present different accounts of these nouns found in the literature.

3 Previous Analyses

3.1 Syntactic Analyses

Syntactic analyses are usually proposed to account for both de-adjectival human nouns and de-adjectival property nouns. They are basically of two types: the null (pro)noun analysis, and the nominalization analysis. These analyses are in fact close to each other (McNally et al. forthcoming). In the null noun analysis (Borer and Roy 2010, McNally and de Swart 2015) the adjective is embedded under a DP via a NP whose nominal head is, in some way, deleted (cf. Fig. 1). Differences between the human interpretation and the property interpretation lie in the features of the null noun (± human). According to Alexiadou (2015), NP1 is the level of the property noun, and DP the level of human noun.

In the nominalization analysis (Alexiadou and Iordăchioaia 2013, Alexiadou 2015), an uncategorized root is embedded under an aP, which is projected under a DP with additional functional information "ClassP" (cf. Fig. 2). According to Alexiadou (2015: 21) "All nouns enter the derivation as mass and become count in the syntax, via ClassP, which introduces Bale and Barners's (2009) IND function; IND gives individuated readings." Consequently, the difference in meaning between the two types arises via the presence *vs*. absence of ClassP (see Alexiadou 2015 for more details).

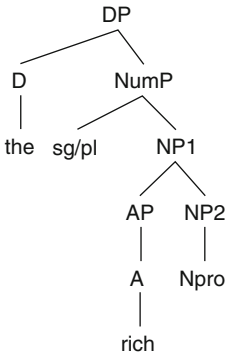

Fig. 1 The null noun analysis (By McNally et al. forthcoming)

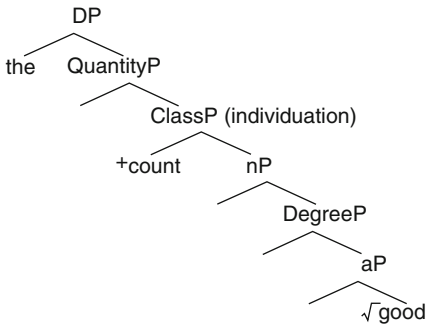

Fig. 2 The nominalization analysis (Representation of Borer 2005 by Alexiadou 2015: 19)

In either case, be it by means of a null noun analysis or by means of nominalization, the human noun is derived from the property noun and is located higher in the tree structure.

Because syntactic patterns are always productive, such syntactic analyses allow the authors to account for the high productivity of the phenomena. However, these analyses have two shortcomings: they imply (i) an underlying noun that is deleted, and (ii) a link between de-adjectival property noun and de-adjectival human noun, the latter deriving from the former.

First, as Lauwers (2014a: 211) notes about the null noun analysis of property nouns ("abstract nouns" in his terminology), "the identity of the deleted nominal element is far from clear". He illustrates this point with the noun *le vulgaire* 'the vulgar/vulgarity': if the noun is derived from an adjective by deletion of an underlying noun, we have to decide what that noun is. Yet, as the examples in (15) show, none of the possible nouns seems relevant:

(15) *?le [truc] vulgaire/*? *le [concept (de)] vulgaire/?la [notion (de)] vulgaire*
"the vulgar [thing]"/"the [notion (of)] vulgar"/"the [concept (of)] vulgar"

These examples show that there is no fixed interpretation for this null noun.

The case of de-adjectival human nouns is slightly different. As can be seen in examples (16)–(18), in French the noun *personne* 'person' could easily be postulated to fill the empty slot of the alleged deleted noun:

(16) a. *les jeunes* 'the young' b. *les personnes jeunes* 'young people'

(17) a. *le peureux* 'the fearful' b. *la personne peureuse* 'the fearful person'

(18) a. *un blessé* 'an injured person' b. *une personne blessée* 'someone injured'

Yet, postulating the underlying noun *personne* suffers from three flaws:

(i) we cannot always use the noun *personne* with the adjectives, especially with those derived from present participles such as *les perdants*:*??les personnes perdantes* 'the loosing people'[3];
(ii) as regards the meaning, the two series of examples, (a) and (b), are not exactly equivalent. De-adjectival human nouns intrinsically denote a class defined in a holistic way via the adjectival property and refer to the entire class (16a) or to a member of this class, (17a) and (18a), depending on the context, whereas the (b) phrases refer to people who are qualified as being young, fearful or injured. In the attributive use, the property is extrinsic, not intrinsic;
(iii) the underlying noun *personne* cannot correctly account for the gender of de-adjectival human nouns. If the feminine noun *personne* were the actual deleted noun, de-adjectival human nouns should be feminine throughout. Yet, de-adjectival human nouns can be either masculine (by default or by choice) or feminine, which proves that they do not result from the mere deletion of the (feminine) noun *personne*.

Secondly, syntactic analyses assume that de-adjectival human nouns are in some way derived from a de-adjectival property noun (cf. *supra*, especially Fig. 2). This supposition implies that each human noun has a corresponding property noun. This is not consistent with the fact that there exist many de-adjectival human nouns that have no de-adjectival property noun counterpart, e.g. *peureux* as a noun can only denote a fearful person, not the property itself. The same applies to nouns such as *missionnaire* 'a missionary person', *opéré* 'a person who has been operated on', and *gagnant* 'winner': none of these nouns can be used as a property noun.

In sum, a syntactic analysis of de-adjectival human nouns is not satisfactory because no underlying noun can be postulated, and de-adjectival human nouns do not always imply de-adjectival property nouns. Another analysis is called for.

3.2 Morphological Analysis: Conversion

Conversion (also called zero/non-affixal derivation) is another frequently proposed analysis of de-adjectival human nouns. Conversion is a lexeme-formation process in which the base lexeme and the derived one are phonologically identical but belong to two different parts of speech (Corbin 1987; Kerleroux 1999; Tribout 2010, 2012 for V/N conversions), as can be seen in the examples (19):

(19) a. Fr. $orange_{N}$ 'orange (fruit)' > $orange_{A}$ 'orange (colour)'
b. Eng. $talk_{V}$ > $talk_{N}$

In a conversion analysis, de-adjectival human nouns are analysed as morphologically derived from adjectives. It is, among others, the analysis proposed by Winther (1996) and Schwarze (2012) for de-adjectival human nouns in general. It is also the

[3]We thank an anonymous reviewer for drawing our attention to this point.

solution adopted by Corbin (1988) for French nouns in *–iste* (such as *un gauchiste* 'a leftist') derived from adjectives that are suffixed with *–iste* (such as *gauchiste* 'leftist').

The conversion analysis has two distinctive characteristics, which make it very different from the syntactic analysis:

(i) Conversion is morphological in nature, which means that it takes place in the morphological component of the grammar, and works exactly like overt derivation such as affixation, except that it does not add any affix.
(ii) It results in two distinct lexical items (that are phonologically identical).

Point (ii) is very important: since the derivation produces a new noun distinct from the base adjective, the conversion analysis can account for the fact that de-adjectival human nouns behave like true nouns as regards determination and modification.

However, a conversion analysis of human nouns faces two problems. First, as pointed out in Sect. 2, many nouns still show properties of their base: (i) most of them can be modified by an adverb (see examples (9) and (10)), which is impossible for true nouns; (ii) participle-based nouns can still display the argument structure of the base verb (see examples (14)). Secondly, the great productivity of the phenomenon also appears to be a problem for a conversion analysis. Indeed, the possibility to use adjectives (or participles) as human nouns is automatically available as soon as the property denoted by the base adjective (or participle) can apply to human beings. This systematic aspect of the phenomenon casts doubt on a derivational analysis because lexeme formation processes are rarely unrestrictedly productive and we often find gaps in the lexicon. So, as regards productivity, it seems difficult to view de-adjectival human nouns as formed in a morphological way.

Given these drawbacks of a conversion analysis, we present our own alternative analysis of the phenomenon in the next section.

4 An Alternative Analysis: Coercion

We propose that, except in cases of lexicalization, adjectives, when used in nominal contexts, are coerced by this context and adopt a nominal behaviour. Our analysis is quite similar to that of Lauwers (2014a) concerning de-adjectival abstract nouns. After an overview of different kinds of coercion (Sect. 4.1), we will justify why override coercion can explain the use, or even the existence, of de-adjectival human nouns (Sect. 4.2).

4.1 Different Kinds of Coercion

Coercion has given rise to an important literature (Francis and Michaelis 2004; Jackendoff 1997; Lauwers and Willems 2011; Michaelis 2003; Pustejovsky 1991). As stated in Lauwers and Willems (2011: 1219) "at the basis of coercion, there is a mismatch (cf. Francis and Michaelis 2004) between the semantic properties of a selector (be it a construction, a word class, a temporal or aspectual marker) and the inherent semantic properties of a selected element, the latter being not expected in that particular context."

Audring and Booij (2016) distinguish three types of coercion: coercion by selection, coercion by enrichment and coercion by override. Coercion by selection and coercion by enrichment are fundamentally contextual adaptations of semantic features, while coercion by override can concern a category/function mismatch. Override coercion is indeed the strongest type of coercion. It is based on the override principle of Michaelis (2003: 9):

> *Override principle*. If lexical and structural meanings conflict, the semantic specifications of the lexical element conform to those of the grammatical structure with which that lexical item is combined.

In override coercion the context replaces or removes properties of the coerced item.

In the literature on French, a first account of such phenomena was given by Kerleroux (1991, 1996) through the notion of « distorsion catégorielle » ('distortion of the category'). This author uses the distinction between slot (*position*) and lexical filler (*terme*) made by Milner (1989) to account for examples such as (20):

(20) Il est d'un élégant!
He is of an elegant! (= 'He is so elegant!')

In this use, the adjective *elegant* fills the slot of a noun. This analysis corresponds more or less to the AN (Abstract Noun) analysis of Lauwers (2014a). Kerleroux's concept of "distorsion catégorielle" is very close to the concept of "override coercion" in Construction Grammar.

4.2 Override Coercion

In the prototypical case (Croft 2001), a noun phrase construction has two slots, one for a determiner and one for a noun. If an adjective fills the slot for the noun, a mismatch occurs, and the construction triggers an appropriate holistic meaning. In a noun phrase construction, an adjective can refer to a property if it is integrated in a mass noun phrase construction (Lauwers 2014a) as in (21), but it can also refer to an individual if it is integrated in a count noun phrase construction (22).[4]

[4]We adopt here the terminology of Glass (2013) taken up by other scholars, *i.e.* the distinction between mass nouns and individual nouns. It should be noted that 'individual nouns' includes

Table 1 Prototypical correlations of syntactic categories (Croft 2001: 55)

	Syntactic category		
	Noun	*Adjective*	*Verb*
Semantic class	Object	Property	Action
Pragmatic function	Reference	Modification	Predication

(21) a. prototypical case: $[_{\text{NPmass}}$ Det N] ↔ 'mass Noun'
b. override coercion: $[_{\text{NPmass}}$ Det A] ↔ 'mass Noun'

(22) a. prototypical case: $[_{\text{NPcount}}$ Det N] ↔ 'individual Noun'
b. override coercion: $[_{\text{NPcount}}$ Det A] ↔ 'individual Noun'

This is the hypothesis we adopt here. We rely on Croft (2001) to explain how adjectives work when integrated into a count noun phrase construction.

Croft distinguishes between semantic lexical classes (object, properties and actions) and pragmatic functions (reference, modification, predication). These semantic lexical classes and pragmatic functions are prototypically associated with lexical categories as indicated in Table 1.

Prototypical adjectives in prototypical uses denote properties and are used to modify referential units, as illustrated by the adjective *triste* 'sad' in (23).

(23) "La ***triste*** fin du petit enfant huître" (T. Burton book title translation)
The Melancholy Death of Oyster Boy (original title)

There are different ways for an adjective to assume the pragmatic function of a noun (*i.e.* reference), as can be seen in (24):

(24) a. La ***tristesse*** est une émotion simple (web)
'Sadness is a simple emotion'
b. **Le *triste*** de cette histoire c'est que des braves gens risquent de payer cher pour . . . (web)
'The sad thing of this story is that brave people risk paying a high price for . . . '
c. **Les *tristes*** sont vaincus d'avance (Frantext)
'The sad are beaten from the start'

In (24a), derivational morphology transposes an adjective into a noun (*tristesse* 'sadness') by means of suffixation (*-esse* '-ness'); the framework of Construction Morphology (Booij 2010) can account for the formation of a noun such as *tristesse*, regularly formed by suffixation. De-adjectival suffixed nouns are generally property nouns: their semantic class is preserved even if their pragmatic function is not. As

human nouns (which are under study here) and inanimate nouns. Coercion within a count noun phrase construction does not allow to distinguish between human and inanimate interpretation and other mechanisms must be involved.

often observed in previous studies (Alexiadou 2015; Glass 2013; Borer and Roy 2010; Lauwers 2008, 2014a), these derived forms are fully nominal: there is no specific constraint on their use.

Example (24b) exemplifies the coercion of an adjective into a property noun. Unlike suffixed property nouns, coerced property nouns exhibit mixed class properties and are subject to strong constraints, especially on number and determination (e.g. Lauwers 2014a). These differences in behaviour show that coerced property nouns remain fundamentally adjectival; they are nominal by usage, not by nature.

Finally, (24c) illustrates coerced individual (human) nouns. The same mechanisms as for coerced property nouns apply, but with a major difference: as can be seen in Table 2, this kind of coercion modifies both the semantic class of the adjective (property → object) and its pragmatic function (modification → reference), which is probably the highest degree of coercion. This double shift (semantic class and pragmatic function) explains why coerced de-adjectival human nouns behave like true nouns (cf. Sect. 2): this kind of coercion leads to prototypical nouns, that is items that denote objects and function referentially. The only observed constraint concerns the adjectives that fill the nominal slot: an adjective, or even a past participle (cf. *opéré*), can only be coerced into a count noun phrase construction with the correct interpretation (*i.e.* reference to a human being) if it can be predicated of a human being. As we will see below, the double shift has an impact on the semantic behaviour of these "nouns".

The different possibilities are synthesized in Table 2 (the prototypical properties of nouns have been added (right column) for comparison).

The analysis in terms of coercion, either mass or count coercion, has several advantages:

– Since de-adjectival property nouns and de-adjectival human nouns are nouns only by usage and are still adjectives by nature, it explains why such "nouns" still display properties of adjectives, especially the possibility to be modified by an adverb (*les très riches* 'the very rich', *les plus pauvres* 'the poorest', cf. Sect. 2).
– De-adjectival property nouns and de-adjectival human nouns can be dealt with separately by two different kinds of coercion. Our analysis is therefore consistent

Table 2 Prototypical use *vs.* nominal non-prototypical uses of an adjective

	Prototypical	Non-prototypical			Prototypical
Category	A (22)	N (23a)	"N" (23b)	"N" (23c)	N
Semantic class	Property	Property	Property	Object	Object
Pragmatic function	Modification	Reference	Reference	Reference	Reference
Example	*triste* 'sad'	*tristesse* 'sadness'	[$_{NPmass}$ Det *triste*]	[$_{NPcount}$ Det *triste*]	*table* 'table'
			'the sad'	'the sad (people)'	
	simplex	Derived noun	Mass coercion	Count coercion	simplex

with the above observed fact (cf. Sect. 3.1) that many de-adjectival human nouns do not have a de-adjectival property noun counterpart, e.g. *le peureux* 'the fearful', *le missionnaire* 'the missionary', *l'opéré* 'a person who has been operated on', *le gagnant* 'the winner'.
– It also explains the high productivity of de-adjectival human nouns: syntactic coercion better accounts for the systematic character of the formation of de-adjectival human nouns. As noted above in Sect. 3.2, morphological lexeme formation processes are rarely unrestrictedly productive.

However, the coercion analysis does not solve all problems. In particular, it does not explain (i) why coerced count/individual nouns fundamentally denote human beings, and (ii) why they have an affinity with the plural. We provide a partial explanation in Sect. 4.3.

4.3 Human Denotation and Plural Affinity

The two characteristics mentioned at the end of the previous section can be characterized as the semantic shift from property to object (in the terminology of Croft 2001), or to individual (in the terminology of Glass 2013). As often observed (Borer and Roy 2010; Alexiadou 2015; Schwarze 2012), the difference between the denotation of properties and the denotation of objects (or individuals) is important. The higher complexity of de-adjectival individual nouns led some researchers to analyse theses nouns as syntactically derived from de-adjectival property nouns (cf. Sect. 3.1). Semantic analyses were also proposed (Schwarze 2012; Glass 2013). Schwarze (2012), for example, claims that even though, according to him, both de-adjectival property nouns and de-adjectival human nouns are built by morphological conversion, an additional stage is required to build de-adjectival human nouns: these nouns need a specification of the "conceptual class" they belong to, while de-adjectival property nouns receive a sort of default interpretation (they denote properties as adjectives do).

In our view, de-adjectival count/individual nouns have essentially a human reference because human beings form a homogeneous class, unlike inanimate entities. For example, in French, the noun *bleu* 'blue' (< $bleu_A$) denotes a kind of cheese, a haematoma, a novice, coveralls, etc. *i.e.* all individuals characterized by their colour, blue in this case. Likewise, the noun *commode* 'chest of drawers' denotes a piece of furniture characterized by its convenience (*commode* 'convenient'); however, many other kinds of objects could be called a *commode*. Cognitively, human beings form a sort of homogeneous conceptual class, unlike inanimate entities. This cognitive reason could explain why de-adjectival human nouns are

cross-linguistically attested (Borer and Roy 2010; McNally and De Swart 2015; Alexiadou 2015).[5]

To bridge the gap between the property denotation of the adjectives and the individual denotation of the de-adjectival human nouns, the use of the plural enables to emphasise an individuated reading (not a mass reading), especially for generic interpretation. This is frequent in French (25), but not obligatory (26), as opposed to English (cf. Sect. 2).

(25) Il dénonçait l'oligarchie des **notables** (Frantext)
'He condemned the oligarchy of public figures'

(26) Il s'est présenté [...] contre le **notable** chiraquien du cru (Frantext)
'He ran against the local pro-Chirac public figure'

The coercive strength of the plural has already been noted (Michaelis 2003, Alexiadou 2011, Booij and Audring forthcoming, Acquaviva 2008); cf. the well-known example of *soup/soups* commented on as follows by Michaelis (2003: 10): "The nominal construction which licenses the combination of a noun and plural suffix *-s* requires that its nominal head denote a count entity. While *soup*, as a liquid, is prototypically viewed as a mass, the noun *soup*, when combined with the plural construction [. . .] receives the individuated construal associated with count entities, and is thereby seen [. . .] as denoting a portion or type.". We think it is possible to extend the coercive strength of plural to the categorial shift of de-adjectival human nouns. Such an extension can explain the affinity of these nouns with the plural marking.

5 Conclusion

In this article, we studied de-adjectival human nouns, which are very common in French as well as in other languages. We demonstrated that previous analyses of the phenomenon, whether purely syntactical or morphological, are not satisfactory, and we put forward a new analysis within the framework of Construction Grammar. We argued that when used as nouns in order to denote humans, adjectives are still adjectives but are coerced into the nominal slot of a noun phrase construction. This analysis explains why such human nouns display all noun properties with respect to determination and modification, while still showing adjectival properties such as the possibility to be modified by adverbs. If this analysis is correct, it explains why adjectives can be used as nouns as soon as they apply to humans.

[5]This does not predetermine the analysis of de-adjectival inanimate nouns as coercion, conversion, or ellipsis. This question remains open.

This analysis by coercion can also do justice to more general facts:

(i) It accounts for the ambiguity between adjectival and nominal categories, here through the study of de-adjectival human nouns;
(ii) As regards the location of constructions in grammar, it offers a third option besides morphological constructions, as accounted for by Construction Morphology (Booij 2010), and syntactic constructions, as studied in the framework of Construction Grammar. Our study (after others) shows that syntactic coercion (which here involves an A in the slot of a N inside a NP) can produce hybrid items. Some of these may then be lexicalized and fully integrated into the lexicon with a new category, that of a noun.

Our study thus provides some further articulation of the relation between morphology, syntax and lexicon within a constructional perspective.

The analysis presented above may have a "natural" extension in the study of inanimate individual nouns, such as *commode* 'chest of drawers' or *bleu* 'haematoma' (cf. Sect. 4.3). Contrary to de-adjectival human nouns and property nouns, these nouns cannot be modified by an adverb, their formation is not systematic and they are strongly lexicalized. Hence, coercion may not be the best analysis in this case.

In addition, de-adjectival human nouns and de-adjectival inanimate individual nouns could be further studied by investigating the productivity of this kind of noun phrase coercion. For example, the degree of entrenchment of de-adjectival human nouns seems to depend on (at least) two parameters: the token-frequency of the adjectives, and the frequency with which the adjectives are predicated of human beings. Such an analysis, which should be corpus-based, would give a better idea of the extension of these phenomena in French.

References

Acquaviva, P. 2008. *Lexical plurals*. Oxford: Oxford University Press.

Alexiadou, A. 2011. Statives and nominalization. *Recherches linguistiques de Vincennes* 40: 25–52.

———. 2015. *Encoding properties: The case of English 'nominalized' adjectives*. https://wp.nyu.edu/roots4/wp-content/uploads/sites/1403/2015/07/alexiadou.pdf

Alexiadou, A., and G. Iordăchioaia. 2013. Two syntactic strategies to derive (abstract) deadjectival nominalizations. Paper presented at the Workshop on *Adjectives and their nominalizations*, U. Stuttgart, February 2013.

Audring, J., and G. Booij. 2016. Cooperation and coercion. *Linguistics* 54: 617–637.

Baker, M. 2003. *Lexical categories: Verbs, nouns and adjectives*. Cambridge: Cambridge University Press.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

Booij, G., and J. Audring. forthcoming. Category change in construction morphology. In *Category change from a constructional perspective*, ed. E. Coussé, K. Van Goethem, M. Norde, and G. Vanderbauwhede. Amsterdam/Philadelphia: Benjamins.

Borer, H. 2005. *In name only*. Oxford: Oxford University Press.

Borer, H., and I. Roy. 2010. The name of the adjective. In *Adjectives: Formal analyses in syntax and semantics*, ed. P. Cabredo Hofherr and O. Matushansky, 85–114. Amsterdam: John Benjamins.

Corbin, D. 1987. *Morphologie dérivationnelle et structuration du lexique*. Tübingen: Max Niemeyer Verlag.

———. 1988. Une hypothèse à propos des suffixes *-isme*, *-ique*, *-iste* du français: la troncation réciproque. In *Aspects de linguistique française. Hommage à Q.I.M. Mok*, ed. R. Landheer, 63–76. Amsterdam: Rodopi.

Corblin, F., J.-M. Marandin, and P. Sleeman. 2004. Nounless determiners. In *Handbook of French semantics*, ed. F. Corblin and H. de Swart, 23–41. Stanford CA: CSLI Publications.

Croft, W. 2001. *Radical construction grammar: Syntactic theory in typological perspective*. Oxford: Oxford University Press.

Ferrarri, F. 2005. *A syntactic analysis of the nominal system of Italian and Luganda: How nouns can be formed in the syntax*. Doctoral dissertation, New York University.

Francis, E.J., and L. Michaelis, eds. 2004. *Mismatch. Form-function incongruity and the architecture of grammar*. Stanford: CSLI.

Giannakidou, A., and M. Stavrou. 1999. Nominalization and ellipsis in the Greek DP. *The Linguistic Review* 16: 295–332.

Glass, L. 2013. Deriving the two readings of English determiner + adjective. *Proceedings of Sinn and Bedeutung* 18: 164–181.

Jackendoff, R. 1997. *The architecture of the language faculty*. Cambridge, MA: MIT Press.

Kerleroux, F. 1991. "Il est d'un élégant! Et d'un calme!" Un phénomène de distorsion entre l'appartenance catégorielle des termes et l'étiquette des positions syntaxiques. *Bulletin de linguistique appliquée et générale* 17: 79–116.

———. 1996. *La coupure invisible. Études de syntaxe et de morphologie*. Lille: Presses Universitaires du Septentrion.

———. 1999. Identification d'un procédé morphologique: la conversion. *Faits de Langue* 14: 89–100.

Lauwers, P. 2008. The nominalization of adjectives in French: From morphological conversion to categorial mismatch. *Folia Linguistica* 42: 135–176.

———. 2014a. Between adjective and noun. Category/function mismatch, constructional overrides and coercion. In *Word classes: Nature, typology and representations*, ed. R. Simone and F. Masini, 203–226. Amsterdam/Philadelphia: John Benjamins.

———. 2014b. Copular constructions and adjectival uses of bare nouns in French: A case of syntactic recategorization? *Word* 60: 89–122.

———. 2014c. Les pluriels «lexicaux». Typologie quantifiée des déficits de dénombrabilite. *Langue Française* 183: 117–132.

Lauwers, P., and D. Willems. 2011. Coercion: Definition and challenges, current approaches, and new trends. *Linguistics* 49: 1219–1235.

McNally, L., and H. de Swart. 2015. Reference to and via properties: The view from Dutch. *Linguistics and Philosophy* 38: 315–362.

McNally, L., V. Richtarcikova, and H. de Swart. forthcoming. Reference to and via properties: A cross-linguistic perspective. In *Proceedings from the 52nd annual meeting of the Chicago Linguistic Society*.

Michaelis, L.A. 2003. Word meaning, sentence meaning and constructional meaning. In *Cognitive perspectives on lexical semantics*, ed. H. Cuyckens, R. Dirven, and J. Taylor, 163–210. Berlin: Mouton de Gruyter.

Milner, J.-C. 1989. *Introduction à une science du langage*. Paris: Seuil.

Pustejovsky, J. 1991. The generative lexicon. *Computational Linguistics* 17: 409–441.

Schwarze, Ch. 2012. *Le vert, les jeunes, l'important:* aspects sémantiques de la conversion adjectif-nom. *Scolia* 26: 153–170.

Sleeman, P. 2013. Deadjectival human nouns: Conversion, nominal ellipsis, or mixed category? *Revista de estudos linguísticos da Universidade do Porto* 8: 159–180.

Tribout, D. 2010. *Les conversions de nom à verbe et de verbe à nom en français*. PhD thesis, Université Paris Diderot.

———. 2012. Verbal stem space and verb to noun conversion in French. *Word Structure* 5: 109–128.

Winther, A. 1996. Un point de morpho-syntaxe: la formation des adjectifs substantivés en français. *L'Information Grammaticale* 68: 42–46.

The Construction Morphology Analysis of Chinese Word Formation

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Abstract The lexicon of Modern Chinese is characterised by a preponderance of multimorphemic words, which are typically built from lexical morphemes, either bound or free. Compounding, broadly understood as the combination of two or more lexical morphemes, is by far the most common word formation device in the modern language. While drawing a sharp boundary between compounding and derivation for Chinese has proven difficult, there are indeed a number of items which possess derivation-like features, including bound status, fixed position, and a stable, often bleached meaning. Moreover, bound items, sometimes without morphemic status, may acquire the meaning of a word as part of a construction, and generate new words and constructions with that acquired meaning. In this chapter, we will apply the principles of CxM to the analysis of Chinese complex words, showing how a constructional approach may best explain several phenomena which are characteristic of Chinese word formation, including the genesis of new meanings for lexical morphemes as part of word formation schemas, rather than in isolation. Also, we will show that the parameter of headedness in compounding may not be set for the language as a whole, but is rather specified in schemas.

Keywords Affixoids · Chinese · Compounding · Derivation · Subschemas

Traditional characters have been used as a default for Chinese; the romanisation system used is *Hanyu Pinyin*. The glosses follow the general guidelines of the Leipzig Glossing Rules; additional glosses include MOD 'modification'. For academic purposes, Giorgio F. Arcodia is responsible for Sects. 3, 3.1, 3.2, 4 and 6, and Bianca Basciano is responsible for Sects. 1, 2, 3.1.1 and 5.

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1 Introduction

Chinese is commonly regarded as one of the best examples of the isolating morphological type. Indeed, several features of Modern Chinese morphology do fit very well in the traditional characterisation of isolating languages: few (uncontroversial) affixes, no cumulative exponence, no or little blurring of morpheme boundaries, and no allomorphy or suppletion (see Packard 2006; Bickel and Nichols 2007). On the other hand, Modern Chinese is extremely rich in morphologically complex words, mostly regarded as compounds. Compound words were already attested in the lexicon of the Classical language (e.g. 天子 *tiān-zǐ* 'heaven-son, emperor'), with a notable increase in the Han period (206 BCE–220 CE; Feng 1998); in Modern Chinese, compound words might represent up to 80% of the lexicon (Xing 2006), and compounding is the norm in the creation of new words (Ceccagno and Basciano 2007). Hence, compounding is easily the most relevant phenomenon to investigate in the study of Modern Chinese word formation.

There are several interesting issues related to word formation in Chinese which are worth discussing, only some of which will be dealt with here due to space constraints. Firstly, given that the majority of Chinese lexical morphemes are bound (Packard 2000), there has been some debate as to whether both words made of free roots and words made of bound roots should be regarded as compounds, or represent constructions with different properties. Secondly, there is yet no consensus as to whether Chinese has productive derivation, neither on the (possible) borderline between derivation and compounding (see Arcodia 2011, 2012b): items as 人 *rén* 'person' are free words which, also, appear as the rightmost constituent in many words indicating provenance (e.g. 英國人 *Yīngguórén* 'Briton', 台灣人 *Táiwānrén* 'Taiwanese', 北京人 *Běijīngrén* 'person from Beijing'), showing some of the properties traditionally associated with derivation (see the analysis in Yip 2000: 60). Also, some constituents, including those without morphemic status, may acquire new meanings as part of complex words (e.g. 咖啡 *kāfēi* 'coffee' > 奶咖 *nǎi-kā* 'milk-coffee, latte'), often as the result of a process of abbreviation (Arcodia 2017). Lastly, Chinese compounds may be left- or right-headed, challenging the received idea of a headedness parameter that is set for a language as a whole (Bisetto and Scalise 2002).

In this article, we argue that a CxM analysis can be fruitfully applied to deepen our understanding of the above mentioned issues. The existence of several hierarchical levels of generalisation in compound schemas allows us to account for derivation-like productive patterns, acquisition of new meanings within constructions, word-class assignment for ambiguous items, splits in headedness, etc. For instance, the borderline between derivation and compounding may be argued to be of limited significance for Chinese, a language in which meaning change seldom correlates with formal change (Bisang 1996, 2004, 2008); word formation elements with lexical meaning of their own occurring with a different meaning as part of compounds might be understood as 'affixoids', as we shall see below (Booij 2005, 2007, 2010; Arcodia 2011, 2012b).

This article is organised as follows. We will first introduce the peculiarities of some basic notions of word formation, namely morpheme, root and word, as applied to Chinese (Sect. 2). We will then tackle essential issues related to compounding, including their definition and classification, the problem of headedness, and the genesis of new morphemes within compound words (Sect. 3). In Sect. 4, we will deal with the borderline between derivation and compounding, while in Sect. 5 we will propose an in-depth case study of a lexical morpheme developing a new meaning in word formation, namely the morpheme 客 *kè* 'guest > person'. Lastly, in Sect. 6 we will summarise the main points of this chapter. Due to space constraints, we will discuss only data from Standard Mandarin Chinese.

2 Morpheme, Root and Word in Chinese

One notable typological feature of Chinese is that, in the overwhelming majority of cases, a syllable represents a morpheme, which in turn corresponds to a character in writing (Yang 2003); that is, there is often a 1:1:1 correspondence between phonological units, morphological units and writing units:

(1)

火	去	快
huǒ	*qù*	*kuài*
'fire'	'go'	'fast'

To describe such a strong correspondence between characters, units of speech and units of meaning, DeFrancis (1984: 125) uses the term 'morphosyllabic': "[. . .] morphosyllabic is intended to suggest that each character is pronounced as a single syllable and represents a single morpheme". There are indeed morphemes which are made of more than one syllable(/character), but this is uncommon and mostly limited to loanwords. See the examples below:

(2)

葡萄	玻璃	麥克風
pútao	*bōli*	*màikèfēng*
'grape'	'glass'	'microphone'

However, as said above, the majority of words in the Modern Chinese lexicon are multimorphemic, most often *bi*morphemic:

(3)

電話	眼光	吹風機
diàn-huà	*yǎn-guāng*	*chuī-fēng-jī*
electric-talk	eye-light	blow-wind-machine
'telephone'	'vision'	'hairdryer'

While most multimorphemic words may be quite straightforwardly analysed as compounds, we shall see below that this is far from uncontroversial for many items (Sect. 4).

Note that the morphemes in (1) are all free forms, and hence correspond to (syntactic) words, i.e. they may be used in isolation and occupy a syntactic slot. However, this is not the dominant trend: as said before, most lexical morphemes (about 70%; Packard 2000) in modern Chinese are bound. For example, 衣 *yī* 'clothing, clothes' cannot be used by itself in a sentence (cf. the corresponding free form, 衣服 *yīfu*), but it is commonly found as a constituent in complex words, such as 大衣 *dà-yī* 'big-clothes, overcoat, topcoat', 雨衣 *yǔ-yī* 'rain-clothes, raincoat', 衣櫃 *yī-guì* 'clothes-cupboard, wardrobe', 衣鉤 *yī-gōu* 'clothes-hook, clothes hook'. Free lexical morphemes may be termed 'free roots', and bound lexical morphemes may be termed 'bound roots' (see Packard 2000; Basciano and Ceccagno 2009). Note that grammatical morphemes as well may be free (e.g. 嗎 *ma* 'Q', 和 *hé* 'and') or bound (著 *-zhe* 'DUR', 們 *-men* 'PL'), just as in English.

However, the distinction between bound and free roots is not always clear-cut, also because there are no formal differences between the two: in point of fact, some bound roots may sometimes be used as free roots. Firstly, some morphemes which are normally bound may be used as independent words in the written language (Yang 2003; Packard 2015). Secondly, some bound roots do enjoy free status in specific contexts or constructions. For instance, while the root 鴨 *yā* 'duck' is normally used only as a constituent in complex words, e.g. 鴨子 *yā-zi* 'duck-NMLZ, duck' or 烤鴨 *kǎo-yā* 'roast-duck, roast duck', sometimes it may occupy the syntactic slot of a noun, as in the following example (Basciano and Ceccagno 2009: 116):

(4) 一隻鴨
yī *zhī yā*
one CLF duck
'a duck'

These have been termed 'semi-free morphemes' (半自由語素 *bànzìyóu yǔsù*; Dong 2004: 45), since they can act as free forms in specific syntactic constructions: here, a numeral-classifier construction. Packard (2015: 264) speaks of "different degrees of "free"" for Chinese morphemes.

A related issue is that of word class identity. While in many languages inflectional (and derivational) morphology may be used to distinguish word classes on the basis of the shape of the word, this is obviously not possible in Chinese, a language in which words and roots have no category-specific morphology or phonological features (Basciano 2017). Generally speaking, Chinese lexemes tend to be rather 'flexible' in terms of the syntactic slot they may appear in, if compared e.g. to English and other European languages. For instance, occasionally some verbs (5) or some adjectives (6) may be used as nouns:

(5) 他的來使大家很高興。

tā	*de*	*lái*	*shǐ*	*dàjiā*	*hěn*	*gāoxìng*
3SG.M	MOD	come	CAUS	everybody	very	happy

'his arrival made everybody very happy' (Guo 2002b: 66)

(6) 她的漂亮
tā *de* *piàoliang*
3SG.F MOD beautiful
'her beauty' (Steffen Chung 2014: 620)

While this is generally regarded as innovative, non-codified use (Kwong and Tsou 2003), some words are normally used e.g. both as verbs and noun, as for example 工作 *gōngzuò* 'to work; job/work', 畫 *huà* 'draw/paint; picture'. Some authors believe that these regularly ambiguous words belong to more than one lexical category (see e.g. Lü and Zhu 2005 [1951]: 10; Guo 2002b). According to others, they are different words expressing different meanings (Zhu 1982, Lu 1994), possibly related by means of conversion/zero derivation (Tai 1997, Steffen Chung 2014).

In order to account for the multi-functionality of words in Chinese, different approaches have been proposed. According to some authors, words have a basic lexical category, which however may change according to its position in the sentence (see Guo 2002a; Liang and Feng 2006). According to others, words have no definite category and are assigned to a particular word class only on the basis of their position and function in the sentence (see Li 2001 [1924]; Guo 2002a; Yan 2007). Marosán (2006) argues that Chinese is a flexible language, where words are 'acategorial', i.e. their word class is manifested only in actual use. Yet other authors question the existence of word classes in Chinese all along (see Gao 1953; Guo 2002a); according to Xu (1994), the division into word classes is not necessary in Chinese, where there is no correspondence between lexical categories and syntactic functions (for an overview on word classes, see Basciano 2017).

If the word class of a free item is identified mostly on the basis of syntactic distribution, then what about bound roots, which do not normally appear in isolation in a sentence and thus do not occupy a syntactic slot (but cf. *supra*, Ex. 4)? Since their lexical category cannot be determined on the basis of syntactic distribution, it can only be said that semantically these roots are 'noun-like', 'verb-like', 'adjective-like', etc. Thus, one can say that, basically, part-of speech identity is not relevant for bound roots (see below, Sect. 3.1.1).

What about categorially ambiguous items appearing in complex words? Packard (2000) proposes that their word class is identifiable on the basis of the complex word they appear in. Hence, an item as the above mentioned 畫 *huà* 'draw/paint; picture' would be a verb in (7a), and a noun in (7b):

(7) a. 畫具
huà-jù
paint-utensil
'painter's paraphernalia'
b. 畫冊
huà-cè
picture-book
'picture album' (Packard 2000: 42)

The motivation behind the different interpretations of 畫 *huà* is that, according to Packard, in the first case the meaning of 畫 *huà* "is more related to the *act* of painting rather than to *the painted item as a finished product*", whereas in the latter "the meaning of the head noun 冊 *cè* 'book' has more to do with the *finished products* than with the *act of producing them per se*" (2000: 42; his italics). In yet other cases, more than one word class assignment is possible, and hence the identity of 畫 *huà* is left as "free to vary".

This analysis, however, relies heavily on semantic interpretation and, above all, is based on existing compounds, i.e. Packard starts from the meaning of the whole compound to determine the lexical category of ambiguous items. But what about novel compound formation? If we are to analyse a new compound without knowing its meaning, how can we determine the lexical category of ambiguous items? If, say, a complex word has a noun as the righthand constituent, and an ambiguous verb/noun item as the lefthand constituent, will it be interpreted as a noun-noun right-headed compound, or as a verb-object compound (Ceccagno and Basciano 2009: 86)? While in some cases it is the structure of the compound which imposes a certain categorial interpretation of its constituents, in yet other cases, as (7a–b), one can apparently only rely on the semantic aspects of the relation between the constituents (Ceccagno and Basciano 2009). We will get back to this in Sect. 3.1.1.

The peculiarities of the Chinese lexicon and morphology sketched above obviously have consequences for the application of the notion of 'word'. Given the frequent overlap of syllables, morphemes and characters described above, in the Chinese linguistic tradition the idea of 'word' mostly coincided with the 字 *zì*, the written character, whereas the scientific term for 'word', namely 詞 *cí*, was 'imported' from the West in the twentieth century (Duanmu 1998), and the character is arguably still preferred as the intuitive unit of the language for the layperson (see Chao 1968; Packard 2000). Note, also, that there are no evident signs of word boundaries in Chinese writing, which makes the notion of word even less intuitive.[1] It does not come as a surprise, then, that the issue of wordhood has been the object of much debate in Chinese linguistics (see e.g. Dai 1992, 1998; Duanmu 1998), and some scholars have even suggested that the notion of word might not be useful or relevant for Chinese (Lü 1981).

For the purposes of our analysis, we chose to adopt the syntactic definition of word, i.e. an item which can occupy a syntactic slot in isolation, as mentioned before.[2] Note that the Chinese term 詞 *cí*, in essence, corresponds to a syntactic word, hence making the two notions compatible for comparison. As pointed out by Dai (1998), in Chinese phonological, morphological and syntactical words mostly

[1]However, what is at issue here is the *metalinguistic* notion of 'word'; the psychological reality of multimorphemic words has been proven by a number of psycholinguistic studies (see Packard 2000: 16–18 and the references cited therein).

[2]A more detailed definition of the syntactic word in Chinese, including a number of tests for syntactic wordhood, may be found in Dai (1998). For a criticism of the notion of 'syntactic word', see Dixon and Aikhenvald (2002).

coincide, the exception being compounds made of two disyllabic words (i.e. two minimal prosodic words, see Feng 1998), as e.g. 玩具工廠 *wánjù-gōngchǎng* 'toy-factory, toy factory'. Thus, the syntactic word is arguably the best starting point for an analysis of Chinese word formation.

Lastly, a much-debated issue remains unsolved, namely the distinction between words and phrases. Compare:

(8) a. 新的書
xīn *de* *shū*
new MOD book
'new book'

b. 新書
xīn-shū
new-book
'new book'

(9) a. 紅的花
hóng *de* *huā*
red MOD flower
'red flower'

b. 紅花
hóng-huā
red-flower
'safflower, saffron'

Both (8b) and (9b) look like typical Chinese compounds: they are made of two morphemes, having no overt marker of modification (or else) between them, and have the same structure, namely $[[X]_{ADJi}\ [Y]_{Nj}]_{Nj.}$ However, they are made of free roots, which may be the input both of word formation and of syntax. Moreover, whereas (9b) has a non-compositional meaning and is hence clearly lexicalised, (8b) seems to be semantically transparent, and might be analysed as a phrase. In point of fact, if the marker of modification 的 *de* is inserted between the constituents, turning the construction into a *bona fide* syntactic phrase, the meaning changes for (9a) (any red flower, as opposed to safflower), while it apparently stays the same for (8a–b) ('new book'). However, it is unclear whether examples like (8a) and (8b) are actually identical in meaning. Zhu (1980 [1956]), for example, argues that these examples, and [ADJ N] vs. [ADJ 的 *de* N] in general, have different meanings. Sproat and Shih (1991) state that (8b) means 'new book', while (8a) means 'a book which is new'; actually, (8b) seems to refer more to an intrinsic property of the book (a 'brand new book', a 'completely new book', and also a 'just-published book'). According to some authors (e.g. Zhu 1980 [1956] and Dai 1992), [ADJ N] is a compound, while [ADJ 的 *de* N] is a phrase, even when there is no apparent semantic difference (e.g. 大樹 *dà shù* 'big tree' vs. 大的樹 *dà de shù* 'big tree').

Since items as (8b) are very common in Chinese, a number of tests have been designed to distinguish them from phrases, which will not be discussed here in

detail due to space constraints (see the overview in Duanmu 1998); to give but one example, whereas syntactic ADJ-N combinations may be modified by an adverb (10a), ADJ-N compounds may not, as shown by the ungrammaticality of (10b):

(10) a. 更新的書
gèng *xīn* *de* *shū*
more new MOD book
'newer book'

b. *更新書
**gèng* *xīn-shū*
more new-book
'newer book' (Duanmu 1998: 150)

According to Dai (1992), this may be explained by the principle of Lexical Integrity: if unmarked ADJ-N combinations are indeed compounds, hence words, the (non-head) adjectival constituent should be unaccessible for a syntactic modifier. The restrictions on visibility of the constituents by external modifiers may also explain why (11) is possible (just as its English equivalent), despite the apparent contradiction in the predication of two incompatible properties:

(11) 白的黑板
bái *de* *hēi-bǎn*
white MOD black-board
'white blackboard' (Duanmu 1998: 141)

Moreover, whenever at least one of the constituents is a bound root, then the construction is a word, as bound roots are generally not allowed to appear as such in a phrase (see above); also, whenever the combination of roots builds an exocentric structure, the latter is undoubtedly a word, as well-formed syntactic phrases should always be endocentric (Duanmu 1998).

Another much-debated class of constructions, as far as the distinction between words and phrases is concerned, are separable Verb-Object constructions (see below, Sect. 3.1) as 擔心 *dān-xīn* 'carry.on.shoulder-heart, worry':

(12) 你擔什麼心?
nǐ *dān* *shénme* *xīn*
2SG carry what heart
'What are you worrying about?'

These constructions are sometimes classified as Verb-Object compounds (e.g. Li and Thompson 1981), rather than phrases, despite their lack of structural integrity. The criteria used to classify them as compounds include having a lexicalised, non-compositional meaning, having a bound constituent, being exocentric, etc. (for an overview, see Packard 2000: 106–125); nevertheless, some items, as the above mentioned 擔心 *dānxīn*, defy any categorisation, in that they actually possess features both of words and of phrases. For instance, 擔心 *dānxīn* may have a

direct object, entailing that 心 *xīn* 'heart' is invisible to syntax, as predicted by Lexical Integrity, and hence the whole construction behaves as a word (Huang 1984); on the other hand, the lack of structural cohesion appears as incompatible with wordhood. While Huang (1984) argues that 擔心 *dānxīn* is basically a phrase, which can be reanalysed in some contexts as a word, Packard (2000) takes the opposite stance, namely that this type of constructions are stored in the lexicon, but may be reanalysed as phrases. Needless to say, a thorough discussion of this thorny issue is beyond the scope of the present chapter; moreover, in a CxM perspective both idiomatic lexicalised phrases and *bona fide* compounds may be represented in a similar fashion (Booij 2009), as long as their non-compositional properties (e.g. the ability to take an object) are specified in the constructional schema (see below, Sect. 3.1).

3 Compounding

As pointed out by Dai (1998: 125), "[c]ompound (. . .) is used as a cover term for a collection of related, but not necessarily identical, phenomena in the literature, ranging from a word composed of two or more bound stems to a word consisting of two or more existing words". While some have argued that a compound should be made of words, i.e. free items (Fabb 1998; Packard 2000, 2015), following Bauer (2006), we suggest that the basic units of compounding should be identified on an idiolinguistic basis, as the units which are most characteristic of the language at issue (Bauer's "subwords"; 2006: 719).

In the light of the discussion in the preceding section, we believe that the basic unit of compounding for Chinese should be the root, rather than the word. Packard argues that only words made of other words are *bona fide* compounds, while complex words containing at least one bound root should be termed "bound root words" (Packard 2000: 81), but this is based on the belief that one should adhere to the 'traditional' definition of compound (Packard 2015: 269). However, bound roots are not only formally identical to free roots (and, as said above, may have free status in specific contexts and registers), but are also 'active' in word formation in exactly the same way as words (Sproat and Shih 1996; Arcodia and Basciano 2017). Given that bound roots represent the majority of lexical morphemes in Modern Chinese, as said above, Dong (2004) actually suggests that compounding of bound roots is the most common pattern of word formation in the language (on the productivity of compounds of bound roots, see Sproat and Shih 1996). Note also that, just as in English, Chinese compounds too may have a phrasal constituent as a modifier (crucially, not as a head):

(13) 盜竊國寶犯
dàoqiè-guó-bǎo-fàn
steal-state-treasure-criminal
'thief of state treasures' (He 2004: 2)

Since 犯 *fàn* is a bound root, there is little doubt that (13) is a compound, rather than a phrase; on the other hand, 盜竊國寶 *dàoqiè guóbǎo* 'steal state treasures' is undoubtedly a phrase, as Verb-Object compounds productively formed in Chinese do not allow disyllabic verb roots (Ceccagno and Basciano 2009).

Another notoriously thorny issue related to the definition of compounding is the borderline with derivation, as mentioned in Sect. 1. In essence, the difference between compounding and derivation is that in the former lexemes are combined, whereas in the latter one or more affixes are added to a root or word. Since in Chinese most lexical roots are anyway bound, just as affixes, drawing a distinction boils down to determining what an 'affix' is in Chinese. We defer the discussion of this issue to Sect. 4.

In the remainder of this section, we shall show how a CxM analysis may help us gain a better understanding of the regularities and subregularities in the domain of compounding in Chinese, focussing on the following main topics: the classification of compounds, word-class assignment and headedness (Sect. 3.1), and the genesis of new meanings for morphemic and submorphemic constituents as 'abbreviations' of existing compounds (Sect. 3.2).

3.1 The Classification of Compounds, Headedness and Feature Assignment

Mandarin compounds can be classified according to different criteria, considering different kinds of relations between the constituents (for an overview, see Packard 2000). One widely adopted classification of compounds in Chinese linguistics considers the surface syntactic relation between the constituents (see e.g. the one proposed in Chao 1968), as e.g. "subject-predicate compounds" (頭疼 *tóu-téng* 'head-painful, headache'), "coordinate compounds" (書報 *shū-bào* 'book-newspaper, books and newspapers'), etc. Since this kind of classification is not really satisfying, as it does not take into account the whole set of categorial, functional and semantic aspects of compounding (Ceccagno and Scalise 2006), Ceccagno and Basciano (2007) propose a new scheme for the classification of compounds, based on Bisetto and Scalise's taxonomy (2005).

In a nutshell, compounds may belong to three different semantic macro-types, namely subordinate (i.e. having a head-argument relation between the constituents)[3], attributive (i.e. having a head-modifier relation between the

[3]Subordinate compounds entail a relation of complementation between the head and the non-head, as in the case of compounds with a deverbal head constituent, as Eng. *truck-driver*. A similar relation can be found in compounds that do not have a deverbal head too, as e.g. in [N + N] compounds where the constituents are typically linked by what may be called an 'of-relation', as in *doorknob* ('knob of a door'). The head of these compounds, e.g. *leg* in *table leg*, according to Lieber (2009: 88), has two arguments: the typical 'R' argument of a noun, which establishes referentiality (see Higginbotham 1985), and an additional argument (e.g. leg of the table). In

Table 1 The classification of Chinese compounds according to Ceccagno and Basciano's (2007) taxonomy

Compound type	Headedness	Example
Subordinate	Endocentric	雞毛 *jī-máo* 'chicken-feather, chicken feather'
	Exocentric	鎮紙 *zhèn-zhǐ* 'press-paper, paperweight'
Attributive	Endocentric	斑馬魚 *bānmǎ-yú* 'zebra-fish, zebrafish'
	Exocentric	花心 *huā-xīn* 'false-heart, unfaithful'
Coordinate	Endocentric	酸辣 *suān-là* 'hot-sour, hot and sour'
	Exocentric	長短 *cháng-duǎn* 'long-short, length'

constituents)[4], and coordinate (i.e. having a relation of coordination between the constituents); each of those types may in turn be divided into endocentric (headed) and exocentric (non-headed) compounds. Below (Table 1) is a simplified representation of Ceccagno and Basciano's (2007) taxonomy:

Each of the six categories includes several types of attested combinations: for instance, attributive compounds with a nominal or verbal righthand constituent may have either a noun, an adjective or a phrase as the lefthand modifier. Moreover, even items within the same compound type and with the same input material may differ as to headedness status, as in the following pair of $[[X]_V\ [Y]_N]_V$ compounds (and see Exx. 19a–c):

(14) a. 動電
dòng-diàn
move-electricity
'dynamic electricity' (endocentric)

b. 流標
liú-biāo
flow-label
'fail to sell at an auction because of no bids' (exocentric; Ceccagno and Basciano 2007: 214)

We argue that the various patterns of compound formation are best understood as a family of constructions, with hierarchically ordered subschemas of different levels of generalisation.

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this kind of compounds, the non-head constituent satisfies the 'non-R' argument of the head (see Basciano 2010: 17).

[4]In attributive compounds the constituents are linked by a relation of attribution. The prototypical case involves compounds in which the modifier is an adjective, as in *high school*, but other structural types are found too, as e.g. [N + N] compounds, in which the non-head is used as a metaphoric attribute of the head, as in *swordfish* ('fish with a sword-like snout'). This type of compounds includes many of the compounds which are generally termed 'root compounds' in the literature (see Lieber 2009). Head constituents can belong to any lexical category, as e.g. Eng. *snow-white.*

In Booij (2013), the schema generalising over English right-headed compounds is represented as such:

(15) $[X_i\ Y_j]_{Yk} \leftrightarrow [SEM_j \text{ with relation R to } SEM_i]_k$

The same schema may be applied to Chinese right-headed compounds. Then, one would need another schema for left-headed compounds (16), and one for exocentric compounds (17):

(16) $[V_i\ Y_j]_{Vk} \leftrightarrow [SEM_i \text{ with relation argument to } SEM_j]_k$

(17) $[X_i\ Y_j]_{Zk} \leftrightarrow [SEM_k \text{ with relation } R_a \text{ to } [SEM_i \text{ with relation } R_b \text{ to } SEM_j]]_k$

The schema in (16) is not merely a left-headed variant of the schema in (15), but has more specifications, since Chinese left-headed compounds are all subordinate verbs (Ceccagno and Basciano 2007; we will get back to this below). The schema in (17) is significantly different from both (15) and (16), in that the whole structure has a different category label from the constituents, indicating that it does not inherit it from them, but, rather, it belongs to the construction (although it may coincide with the category of one of the constituent); moreover, the semantic relation between the constituents (i.e. R_b), and that between the compound as a whole and the constituent themselves (R_a), are independent variables, and must be independently specified in the schemas (compare Booij 2013). However, as shown by the bracketing, the two relationships are not on the same level; the relationship between the constituents is embedded in that of the whole compound.

Furthermore, a fourth schema is needed, namely that for endocentric coordinate compounds, in which the identity of word class between the constituents themselves, and between the constituents and the compound, is specified:

(18) $[X_i\ X_j]_{Xk} \leftrightarrow [SEM_i \text{ and } SEM_j]_k$

The first two schemas, (15) and (16), dominate two other schemas in which the semantic relation is subordination or attribution; (17) generalises over three schemas, each of which contains one of the three basic semantic relations of Bisetto and Scalise's (2005) classification; (18) is required for endocentric coordinate compounds only. Then, in turn, below the second-tier schemas one would have as many subschemas as needed for each case. In Fig. 1, we give as an example the schemas dominated by (15), i.e. right-headed compounds; for ease of presentation, we will not include the whole range of subschemas:

Note that in the second-tier schema for subordinating compounds, the word class identity of the constituents is already specified, since all right-headed subordinating compounds in Chinese are made of nouns; this is obviously not the case for attributive compounds, as shown in Fig. 1.

The advantage of a CxM analysis for Chinese compounding is that it allows us to understand and illustrate how apparently identical constructions take on different meanings and interpretations. For instance, compare the following Verb-Noun compounds (and see Exx. 14a–b above):

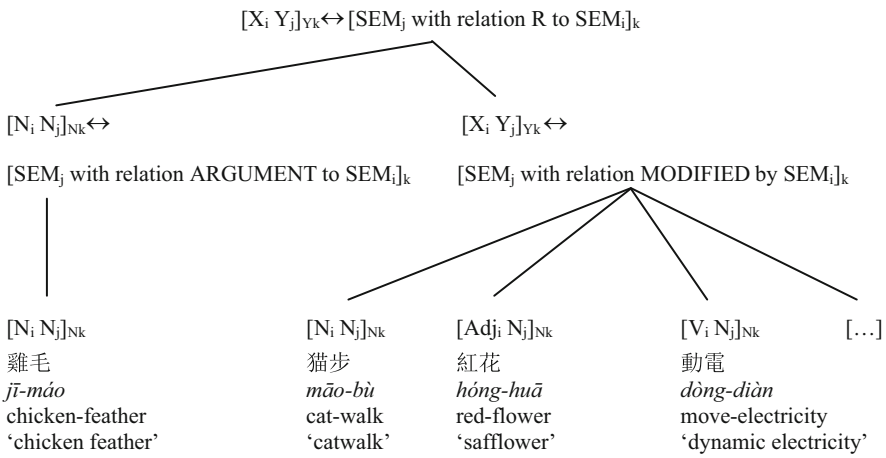

Fig. 1 Constructional schemas for Chinese right-headed compounds

(19) a. 鎮紙
zhèn-zhǐ
press-paper
'paperweight'
b. 開班
kāi-bān
open-class
'open a class; offer a course'
c. 割肉
gē-ròu
cut-meat
'sell at a lower price' (Ceccagno and Basciano 2007: 214)

Example (19a) is an exocentric noun, (19b) is a left-headed verb, and (19c) is an exocentric verb (with non-compositional semantics); however, in terms of the syntactic relationship between the constituents, they all have a Verb-Object structure. Following our analysis, the difference among these three compound types lies in that they represent the instantiations of different schemas, which in turn inherit their properties (semantic relationship between the constituents, headedness, etc.) from higher nodes in the constructional hierarchy. We propose a simplified representation of this in Fig. 2:

The schemas in Fig. 2 provide a comprehensive account not only of how semantic and structural features of each type of compound emerge, but also of how these are connected among them.

The schema for 開班 *kāi-bān* 'open-class, open a class; offer a course' is an instantiation of the general schema for left-headed subordinate compounds, in which

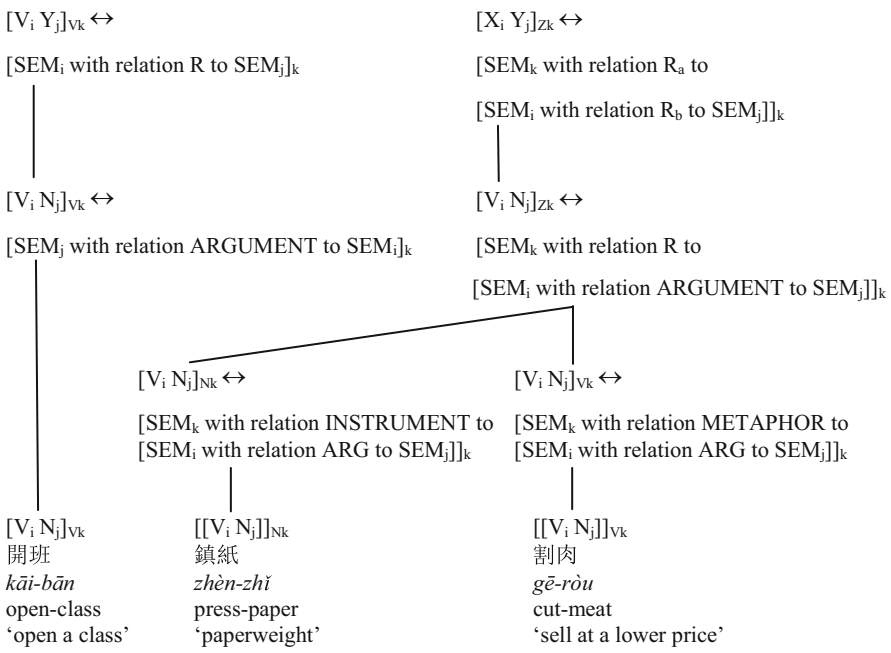

Fig. 2 Schemas for verb-object compounds in Chinese

the additional specification is that the non-head constituent is a noun; under the same general schema, one finds another subschema, not represented in the figure for the sake of readability, in which the non-head constituent is an adjective, as e.g. 攀高 *pān-gāo* 'climb-high, climb up, rise' (Ceccagno and Basciano 2007: 220). A large class of left-headed verbal compounds is formed by so-called resultative compounds, formed by two verbs[5] in an action-result relation, which are similar to English resultative constructions: V_1 brings about the result state specified by V_2, as e.g. 踢破 *tī-pò* 'kick-break, break by kicking', 搖醒 *yáo-xǐng* 'shake-wake.up, shake awake', 打斷 *dǎ-duàn* 'hit-break, break by kicking', 騎累 *qí-lèi* 'ride-tired, become tired by riding'. These compounds can take unselected objects too, since the occurrence of objects is licensed by the resultative construction as a whole (Goldberg 1995):

[5] Actually, V_2 is mostly an adjectival lexeme; however, since these items may be used as change of state verbs too, they are often considered verbs (see e.g. Basciano 2010).

(20) a. 我看花了眼睛。
wǒ *kàn-huā* *le* *yǎnjīng*
1SG read-blurred PFV eye
'I read and as a result my eyes got blurred.'

b. 我哭濕了枕頭。
wǒ *kū-shī* *le* *zhěntou*
1SG cry-wet PFV pillow
'I cried and as a result the pillow got wet.'

In (20a), we have a transitive verb, but the object is not selected by V_1, it is the object of the whole construction (i.e. the element the result is predicated of). In (20b), V_1 is an intransitive verb, thus it cannot take an object; the occurrence of the object, again, is licensed by the construction as a whole.

Booij (2013) notes that, as in the case of the English resultative construction, the resultative meaning is not derivable from one of the constituents, but is rather evoked by the Verb-Verb compound as such. Booij proposes a constructional schema for those compounds with the resultative meaning specified; the result specified by V_2 is brought about by the event specified by V_1:

(21) $[V_i\ V_j]_{Vk} \leftrightarrow [SEM_i\ CAUSE\ [SEM_j]]_k$

As mentioned above (Sect. 2), left-headed verb-object compounds pose several problems in the analysis of Chinese word formation, as they may have properties both of words and phrases, hence being ambiguous between lexical and syntactic items. We already cited the form 擔心 *dān-xīn* 'carry.on.shoulder-heart, worry', which may have an object and is fully separable, with time expressions and question words appearing between the constituents (Ex. 12). In few cases, verb-object compounds are not separable at all, as e.g. 關心 *guān-xīn* 'concern-heart, be concerned about'; in other cases, as e.g. 投資 *tóu-zī* 'invest', the constituents may be separated by an aspect marker. Yet other constructions, as 騎馬 *qí-mǎ* 'ride-horse, ride a horse' may not have an object, but may still be separated e.g. by a verb classifier (騎了兩次馬 *qí le liǎng cì mǎ* ride PFV two time.CLF horse 'went horse-riding twice').[6] Perhaps unsurprisingly, a number of subclasses of

[6]As for 騎馬 *qí-mǎ* 'ride-horse, ride a horse', one could wonder, as pointed out by a reviewer, why should we treat it as a compound and not as a phrase like 騎自行車 *qí zìxíngchē* 'ride a bike'. Here the difference lies mainly in the referentiality of the object. In 騎馬 *qí-mǎ* 'ride-horse, ride a horse', the object 'horse' is not necessarily referential, but can be simply interpreted as part of the verb meaning 'ride a horse, ride, be on horseback', like dummy objects (as e.g. 吃飯 *chī-fàn* 'eat-rice, eat', where 'rice' is a dummy object). Consider the following sentence, containing a resultative compound:

我騎累了馬。
wǒ *qí-lèi* *le* *mǎ*
1SG ride-tired PFV horse
'I rode the horse tired'

Verb-Object compounds have been identified depending on their features, with a focus on the identification of a borderline between morphology and syntax (see Chao 1968; Li and Thompson 1981; Packard 2000); in our approach, on the other hand, we can remain agnostic as to the word-phrase borderline, and we interpret the different properties of Verb-Object compounds as constructional features, i.e. as specifications contained in different subschemas.

The two other compound types are instantiations of the schema for exocentric Verb-Noun compounds, which in turn is hierarchically subordinated to the schema for any exocentric compound; below the second-tier schema one finds two separate schemas for exocentric Verb-Noun compounds (in which the nominal constituent is an argument of the verb constituent) with nominal and verbal output. Moreover, below the schema for $[V_i\ N_j]_{Nk}$ exocentric compounds one finds other schemas for compounds with interpretations other than the instrumental one, as e.g. 管家 *guǎn-jiā* 'manage-home, housekeeper', which follows the schema $[SEM_k$ with relation AGENT to $[SEM_i$ with relation ARGUMENT to $SEM_j]]_k$. As to the schema for 割肉 *gē-ròu* 'cut-meat, sell at a lower price', we characterise the relation between the compound as a whole and the constituents as METAPHOR, for lack of a more precise term; what we mean is that, in these compounds, the construction as a whole expresses a meaning which, typically, is not easily recoverable from the literal meaning of its constituents. As in this case, often the state of affairs described by the Verb-Object combination is metaphorically reinterpreted and lexicalised in the compound

It can have two interpretations: the preferred one is that according to which the horse is tired (I rode and as a result the horse got tired), since when a resultative compounds is followed by an object, the result should be predicated of the object; in this case, the 'horse' is interpreted as referential. However, another interpretation is possible too, i.e. the one according to which 'I' got tired. This can be explained considering 'horse' as a non-referential object, part of the verb meaning, i.e. 'I got tired by riding'. For the same reason, the sentence in a. below is ungrammatical, while b. is acceptable:

a. *我騎累了自行車
wǒ *qí-lèi* *le* *zìxíngchē*
1SG ride-tired PFV bike
'I rode the bike tired'

b. 我開累了車
wǒ *kāi-lèi* *le* *chē*
1SG drive-tired PFV car
'I drove myself tired.'

In the first example, 'bike' is a referential object, thus the result should be predicated of the object; however the result 'tired' cannot be predicated of a non-animated object, and thus the sentence is ungrammatical. In contrast, the object of the second example, 'car', can be considered as a non-referential object, part of the verb 開車 *kāi-chē* 'drive or start a car, train, etc.; set a machine in motion'; 'car' thus is not a real object and, as such, the sentence can have a subject-oriented reading. Indeed, if we replace the object 車 *chē* 'car' with a car name, e.g. 'BMW', the sentence becomes ungrammatical (for an overview of the issue, see Basciano 2010).

('to cut into meat' > 'to sell at a lower price than the one the stock was purchased for to prevent further losses'; see also the examples in Basciano et al. 2011: 233).

The same line of reasoning applies to coordinating compounds, traditionally viewed as a main subdivision of compounding (see the overview in Bisetto and Scalise 2005). Following Bisetto and Scalise's (2005) classification, as said above, coordinating compounds may be either endocentric or exocentric; in our analysis, they are instantiations of different constructions, even though they might have the same surface structure. Compare, for instance:

(22) a. 酸辣
suān-là
sour-spicy
'hot and sour'

b. 長短
cháng-duǎn
long-short
'length'

Example (22a) is a two-headed endocentric compound, while (22b) is an exocentric compound; however, they are both made of two adjectives in a relation of coordination. We propose the following word formation schemas for these two types of Adjective-Adjective compounds:

(23) a. $[ADJ_i\ ADJ_j]_{ADJk} \leftrightarrow [SEM_i \text{ and } SEM_j]_k$

b. $[ADJ_i\ ADJ_j]_{Nk} \leftrightarrow [\text{Property } SEM_k \text{ with } SEM_i \text{ and } SEM_j \text{ as poles}]_k$

The schema in (23a) simply states that two adjectives are combined to refer to the same entity (e.g. food that is hot and sour at the same time). The schema in (23b), on the other hand, specifies that the whole compound designates a noun indicating a property which has the two adjectival constituents as extreme poles ("scalar compounds" in Wälchli 2005); other examples include 大小 *dà-xiǎo* 'large-small, size', 輕重 *qīng-zhòng* 'light-heavy, weight, seriousness', etc. Needless to say, the semantic specifications act as restrictions on the input: only adjectives which can be understood as representing two opposite poles along the same scale may be chosen to instantiate the schema in (23b); conversely, incompatible properties (like being long and short) will normally be rejected by the schema in (23a), as they are unsuitable for simultaneous predication (see Arcodia forthcoming).

Thus, to sum up, in a CxM analysis features of a compound as word class, headedness, and general semantic features all belong to the word formation schema itself, and are inherited by the individual complex words. Thus, compound creation and interpretation are dependent on the limits imposed by the existing word formation schemas, and novel forms are not coined randomly, but rather inherit their structure and features from the schema they derive from. In the case of ambiguous items, the context will guide the hearer in the identification of the pattern the item is an instantiation of; much of what one needs to know about a new compound comes from the constructional schema.

Lastly, as to the different positions for the head in Chinese compounds, while this may be a theoretical embarassment for parametric approaches (see Ceccagno and Basciano 2007: 227 and the references cited therein), it is easily accounted for in a CxM analysis: since the specification as to which constituent is co-indexed with the whole compound (for meaning, word class, etc.) is part of the schema, 'split headedness' is easily captured by positing different constructions for different compound types, as shown above. For instance, the construction in (16) specifies that only verbs with a relation of subordination with the righthand constituent may be left-headed; no further rule (as e.g. Williams's 1981 "Righthand Head Rule") or parameter setting is required (Arcodia 2012a).

3.1.1 Compounds with Bound Root Constituents

In the previous section, we limited our analysis (almost) only to compounds whose constituents are free forms, i.e. words, which can be assigned to a particular word class. But what about those compounds formed with at least one bound root? Such compounds are very common in Modern Chinese and bound roots are very active in word formation processes. Bound roots cannot be assigned to a word class, unless we assume semantic criteria to distinguish word classes. In this sense, we might hypothesize that they enter word formation schemas on the basis of their semantics: e.g. roots which have noun-like properties can occupy the position of the nominal constituent in the schema, while a verb-like root can be placed in schemas with a verb constituent, etc. However, the semantic criterion clearly proves to be inadequate to distinguish word classes, as has been shown in the relevant literature. For example, Dixon (2004) observes that even though kinship terms like 'mother' or 'father' are nouns in most languages, they are verbs in some languages, e.g. 'be the mother of'. Moreover, it can be observed that very similar words from the point of view of meaning can have a different syntactic behaviour. Take for example the words 突然 *tūrán* and 忽然 *hūrán* in Chinese; they both mean 'suddenly'. However, while 突然 *tūrán* may act both as a predicative adjective and as an adverb, 忽然 *hūrán* can only be an adverb (see Basciano 2017).

Another possibility would be to consider these bound roots appearing in compounding as the truncated forms of complex words. Take for example, a compound like 畫冊 *huà-cè* 'picture-book, picture album' introduced earlier (Ex. 7b), which Packard (2000) analyzes as a a [N N] compound. The constituent 冊 *cè* 'book' is a bound root, and hence it cannot be assigned to a *syntactic* word class; therefore either the word class is assigned on a semantic basis, or we could make reference to the word 冊子 *cèzi* 'booklet', thus considering it a truncated form. In the same way, in 躺椅 *tǎng-yǐ* 'recline-chair, reclining chair', 椅 *yǐ* stays for 椅子 *yǐzi* 'chair'; 桌 *zhuō* in 桌布 *zhuō-bù* 'table-cloth, tablecloth' is assigned the nominal lexical category of 桌 *zhuōzi* 'table'; 販 *fàn*'vendor' in 毒販 *dú-fàn* 'poison-vendor, drug trafficker' corresponds to 小販 *xiǎo-fàn* 'small-vendor, vendor' and it is thus assigned to the nominal category. Given that their meaning is the same as the one of free forms to which they belong, these bound roots can be assigned to the word class of the corresponding free form (word).

However, what seems to emerge is that, in Chinese compounding, root meanings rather than word classes are crucial, and thus we might question the necessity of word class assignment all along. We might therefore put forward the hypothesis that, in Chinese compounding, word formation schemas are specified only for semantics and for the lexical category of the whole compound word: any element, free or bound can enter the schema as long a its semantics is compatible with it. In other words, the lexical category of the compound constituents is not specified, as e.g. (24a) for nominal right-headed compounds and (24b) for left-headed verb-object compounds (cf. Figs. 1 and 2):

(24) a. $[X_i\ Y_j]_{Nk} \leftrightarrow [SEM_j \text{ with relation R to } SEM_i]_k$
b. $[X_i\ Y_j]_{Vk} \leftrightarrow [SEM_i \text{ with relation R to } SEM_j]_k$

The constituents X and Y can be in principle any root, free or bound, or any other word type chosen only by virtue of their semantics and inserted as such in the schemas.

In this view, issues such as the status of roots (compound constituents) with an ambiguous word class identity, which we mentioned in Sect. 1, are solved, since word classes actually do not play a significant role. For instance, a compound as 畫冊 *huà-cè* 'picture-book, picture album' introduced earlier (Ex. 7b) would be interpreted as a right-headed subordinate compound made of a free root and a bound root, as the instantiation of the schema $[X_i\ Y_j]_{Nk} \leftrightarrow [SEM_j \text{ with argument } SEM_i]_k$. While the first constituent, being a free root, could be assigned to a word class (either verbal or nominal, as seen above), the second constituent, being a bound root, cannot, unless we assign to it a category on the basis of semantics alone, or as the truncated form of the noun 冊子 *cèzi* 'booklet', as seen above.[7] What is important, however, is not the word class of the first constituent but its meaning, i.e. if it is interpreted as an action (to paint) or as the final product (picture). In principle, the item could be associated with other constructions, as the attributive one ($[SEM_j \text{ modified by } SEM_i]_k$), or the one for left-headed verbs seen above (16): in the former case, the meaning could be 'album about paintings; in the latter, 'paint an album' (possibly with a lexicalized, non-compositional meaning). In such cases, we believe that a speaker who does not know the meaning of the compound might plausibly assign it to any compatible construction; however, since compounds are commonly learned in a context, the syntactic environment will most often guide the interpretation.

As to newly coined forms, again, the user might derive them from any compatible schema (i.e. based on generalisations over existing complex words), and the hearer/reader will typically deduce from the context the pattern it belongs to. Once the individual item is matched to a constructional schema, features as word class

[7] In this case, then, it would be interpreted as a right-headed subordinate compound made of two nominal constituents, as the instantiation of the schema seen above (Fig. 1), i.e. $[N_i\ N_j]N_k \leftrightarrow [SEM_j \text{ with relation ARGUMENT to } SEM_i]_k$.

assignment for constituents do not appear to be relevant, as what matters most to the language user are the properties of the construction as a whole.

If this analysis is correct, it might be extended also to compounds consisting of two (or more) free roots, i.e. words. However, given that in CxM lexical categories are normally assumed to be part of the information a word carries into a schema, we chose to indicate word classes anyway (see above). We leave open the question of a possible uniformation of the model to all types of compounds.

3.2 Compound Constituents as Abbreviations

The (quasi-)perfect correspondence between syllable and morpheme in Chinese (*supra*, Sect. 2) sometimes leads to a process by which a syllable forming a disyllabic or polysyllabic morpheme is reanalyzed as a morpheme in complex words (see Basciano and Ceccagno 2009: 109–112). Take, for instance, the disyllabic morpheme 咖啡 *kāfēi* 'coffee', a loanword (*supra*, Sect. 1): 咖 *kā* is a meaningless syllable, thus it is not a morpheme. However, we find some neologisms in which 咖 *kā* appears as a morpheme meaning 'coffee', thus "absorbing" the meaning of 咖啡 *kāfēi* 'coffee': e.g. 奶咖 *nǎi-kā* 'milk-coffee, latte', 清咖 *qīng-kā* 'pure-coffee, black (sugarless) coffee', 冰咖 *bīng-kā* 'ice-coffee, ice coffee', 熱咖 *rè-kā* 'hot-coffee, hot coffee'. Another example is the meaningless syllable 啤 *pí*, which is part of the loanword 啤酒 *píjiǔ* 'beer', a hybrid where 啤 *pí* is the adaptation of the English *beer*, while 酒 *jiǔ* 'alcoholic beverage' clarifies the broad semantics of the compound. However, 啤 *pí* can be found as a constituent in complex words with the meaning of 啤酒 *píjiǔ* 'beer': e.g. 扎啤 *zhā-pí* 'prick-beer, draft beer', 生啤 *shēng-pí* 'raw-beer, draft beer', 淡啤 *dàn-pí* 'light-beer, light beer' (see Basciano and Ceccagno 2009: 112; see also Packard 2000: 268–283). These constituents may be analysed as abbreviations, especially when they did not have morphemic status, originally (Arcodia 2017).

New morphemes can also be created through meaning extension by a process similar to the one described above (Packard 2000: 275–280). One example provided by Packard is 麵 *miàn* 'flour, dough, noodles'; this morpheme has acquired a new meaning, i.e. that of 'van' in words like 麵的 *miàn-dí* 'van-taxi (compare 的士 *díshì* 'taxi'), taxi van', 微麵 *wēi-miàn* 'tiny-van, minivan'. This new meaning of 麵 *miàn* derives from the word 麵包車 *miànbāo-chē* 'bread-vehicle, van', i.e. a vehicle that looks like a loaf of bread (麵包 *miàn-bāo* 'flour-wrap, bread') through a process of abbreviation/combination (Packard 2000: 275–278).

In a CxM perspective, the genesis of new meanings for morphemes happens within a construction: for instance, 咖 *kā* may take on the meaning of 咖啡 *kāfēi* 'coffee' only as part of a word formation schema (see below, Sect. 4). In the case of abbreviations, in principle the schema should be understood only by making reference to the underlying constructions: see Fig. 3 below.

However, as for analogical word formation, it may well be the case that, in time, the connection with the original word is lost (see Booij 2010 on English *-gate*). In

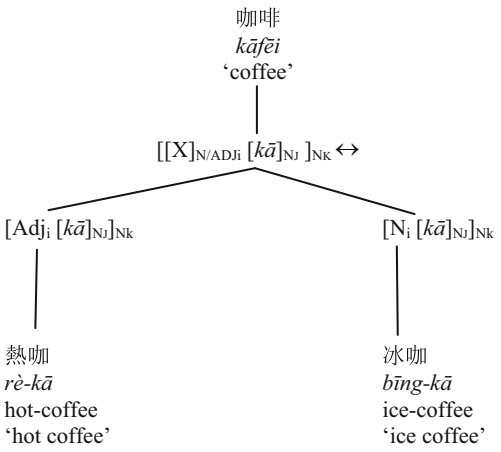

Fig. 3 The genesis of abbreviations in constructional networks: 咖 *kā* 'coffee'

fact, since all the semantic and categorial information required to process words is encoded in constructions, as soon as a word formation schema is established, reference to the original word is no longer required. The association may still be present, but not required for processing, and hence may become blurred, or even lost (also depending on the speaker). Thus, 咖 *kā* may be said to have acquired morphemic status, but in fact this is visible only within a construction.

A related phenomenon is that of "metacompounding" (Ceccagno and Basciano 2007: 225), in which "at least one of the constituents refers to an underlying compound that does not appear on the surface"; in this case too, the meaning and structure of the (meta)compound may be understood only by making reference to the underlying words, and the word class and semantic features of the new constituents are those of the original words.

Thus, to sum up, any item, including a non-morphemic constituent, may be chosen as the abbreviation of an existing word;[8] compounds formed with that constituent, in turn, form new compounds. The new meaning for the constituent is acquired as part of its original construction, and it is available only as part of other word formation schemas, but never in isolation.

4 Derivation

The status of derivation is one of the most debated issues in research on Chinese word formation, as hinted at above. At present, there is no general consensus either on what constitutes a 'genuine' derivational affix in Modern Chinese, or on whether

[8]The choice of the constituent to stand for the whole compound does not follow strict principles, and is hence fairly unpredictable (for some tendencies, see Ceccagno and Basciano 2009).

productive derivation exists at all in Chinese, and whether it is a significant word formation process (for an overview, see Pan et al. 2004; Arcodia 2012b).

As said earlier, the combination of bound roots to create new words is the rule in present-day Chinese word formation, and the majority of lexical roots are actually bound; hence, the definition of derivational affixes as bound word formation constituents (see e.g. Naumann and Vogel 2000; Haspelmath and Sims 2010; Ralli 2010) is obviously inadequate. Moreover, sometimes even roots which may be used as free items appear as bound word formation elements, with a fixed position and a regular meaning, creating a 'family' of paradigmatically related words. In the introduction, we mentioned the case of 人 *rén* 'person', a free root which appears as the right-hand constituent in a family of complex words indicating geographic or ethnic affiliation, and may be productively employed to build any noun with that meaning when the need arises (e.g. 利默里克人 *lìmòlǐkè-rén* 'Limerick-person, Limerickian'). Another good example is that of the root 學 *xué* 'to study':

(25) 我學德語
wǒ *xué* *Dé-yǔ*
1SG study German-language
'I study German'

(26) a. 動物學
dòngwù-xué
animal-study
'zoology'
b. 漢學
Hàn-xué
Chinese-study
'Chinese studies, sinology'

Whereas in (25) 學 *xué* behaves as a free word endowed with verbal meaning, in (26a–b) it is a bound root located to the right of the complex word, with a nominal meaning and forming words designating fields of learning, just as the neoclassical constituent *-logy* in English. Given that in this usage 學 *xué* is fully productive, has a fixed position and a stable function and meaning, should we treat it as an affix? Phonology and prosody cannot help us here, since, as said before (Sect. 1), in Chinese (and, generally speaking, in languages of the East and Southeast Asian *Sprachbund*) semantic shift, as in the grammaticalisation of derivational affixes from lexical morphemes, does not often correlate with sound change (reduction, fusion, etc.; Bisang 1996, 2004, 2008). More to the point, differently from inflection, there is no real consensus on what kind of meaning may be expressed derivationally (Bauer 2002), and as to how 'abstract' the meaning of a morpheme has to be to qualify as derivational. Haspelmath and Sims (2010: 94)

point out that "many derivational meanings are quite concrete (...) [b]ut there are also derivational meanings that are just as abstract as inflectional meanings".[9]

Hence, besides the 'standard' analysis as compound constituents, some defined 學 *xué* and similar items as 'true' affixes, while some others chose the term 'affixoid' (Chinese 類詞綴 *lèicízhuì* or 準詞綴 *zhǔncízhuì*), as well as other related terms (see Arcodia 2012b: 89–94 and the references cited therein), to indicate their 'hybrid' nature; moreover, approaches to the issue vary wildly, with no commonly accepted criteria and no clear borderline. In fact, the very small number of items which are mostly accepted as affixes in the literature either have lost their tone (and hence differ from their lexical counterparts) and most of their meaning (as 子 *-zi* 'empty nominal suffix', e.g. in 擦子 *cā-zi* 'rub-NMLZ, eraser', from 子 *zǐ* 'child'),[10] or translate Standard Average European suffixes (as 化 *-huà* '-ise, -ify', e.g. in 工業化 *gōngyèhuà* 'industrialisation'; see Ma 1995; Pan et al. 2004). These are obviously not very good criteria: derivational affixes are not necessarily expected to be semantically empty, as said above, and correspondence with European affixes is hardly an appropriate criterion.

Needless to say, while these issues are particularly problematic for Chinese, they are met also in the analysis of many other languages, including well-studied ones as English, French, etc., and the term 'affixoid' (or 'pseudoaffix') has been applied to controversial cases as well (Naumann and Vogel 2000). Take, for instance, the French preposition *sur* 'on, over', which, is also used as a bound word formation element, e.g. in *surcharge* 'overload', with a distinct meaning, i.e. 'excessively, in excess' (Amiot 2005: 187; Bauer 2005: 106). A number of authors (Amiot 2005; Bauer 2005; Booij 2005, 2009) pointed out that, in order to qualify as a derivational affix, an item with a lexemic counterpart should develop a different meaning and/or different distribution; following these criteria, then, an item as *sur-* may be regarded as a derivational prefix, grammaticalised from the preposition *sur*. In Booij (2005: 114), "affixoids" are defined as "morphemes which look like parts of compounds, and do occur as lexemes, but have a specific and more restricted meaning when used as part of a compound"; following the tenets of CxM, the 'affixoidal' meaning is part of the construction, rather than of the item itself, and as such it is available only in its use within a specific word formation schema. The difference between affixoids and affixes proper, in this perspective, is that the former bear a word class, as they still have an obvious connection with a lexeme of the language, whereas affixes do not have a word class of their own, as "they only exist as parts of complex words, and as parts of abstract schemas for these complex words" (Booij 2007: 34).

[9]Some interesting differences between compounding and derivation become apparent if one looks at the selectional properties of compound constituents and of derivational affixes: see Scalise et al. (2005: 142–146) for an overview.

[10]Note that loss/bleaching of meaning is crucial here, as loss of tone for the second constituent in a complex word *per se* is a diagnostic for lexicalisation of a compound, rather than grammaticalisation into an affix: compare 打手 *dǎ shǒu* 'to hit the hand' and 打手 *dǎshou* 'thug' (Anderson 1985: 42–43).

Moreover, if derivational affixes are indeed the product of the grammaticalisation of lexemes, they should be expected to have a more 'abstract' meaning than their lexical equivalents, as said above; abstraction, here, is understood either as a reduction in intensional meaning ("generalising abstraction" or "isolating abstraction"), or as a metaphorical shift in meaning ("metaphorical abstraction"; Heine et al. 1991). A case in point is the Chinese bound root 吧 *bā* 'bar'. This item entered the Chinese lexicon through a 'hybrid' word, 酒吧 *jiǔ-bā* 'alcohol-bar, bar', with a native lexeme 酒 *jiǔ* 'alcoholic beverage' and the English loan 吧 *bā* 'bar'; from the Eighties on, many words have been created by analogy to indicate different types of 'bars', as e.g. 水吧 *shǔi-bā*, 'water-bar, a bar where soft drinks are served', 網吧 *wǎng-bā*, 'net-bar, internet café'. However, many more 吧 *-bā* neologisms have little obvious connections with a 'bar', as e.g. 貼吧 *tiē-bā* 'post-bar, online forum', or 嚼吧 *jué-bā* 'chew-bar, room offering free chewing gum to office workers complaining of high pressure in high-end office complexes' (Arcodia 2011: 122). It appears that the lexical meaning of 吧 *bā* 'bar' has evolved into a more 'bleached', general meaning, by stripping away semantic features as e.g. <premises where drinks are served>, and by metaphorically extending its meaning to include any place (also virtual) where some service or information is offered. This may qualify as an instance of grammaticalisation, from lexeme to derivational affix (Arcodia 2011, 2012b).

However, while such an analysis is surely relevant both for cross-linguistic comparison (e.g., can derivation be defined in a cross-linguistically valid fashion?) and for diachronic research on the evolution of Chinese word formation, a clear distinction between affixes proper and affixoids could be argued to be of limited significance for the language user, and for the synchronic analysis of word formation in the language. For instance, the schema for complex 吧 *-bā* words may be represented as such (Arcodia 2014: 133):

(27) $[[X]_{N/V/ADJi}\ [bā]_{NJ}\ ]_{NK} \leftrightarrow$
[place where a service/information related to SEM_i is offered/exchanged]$_k$

If 吧 *-bā* is to be understood as a true affix, given the semantic shift it has undergone, we should remove the brackets and its word class tag in the schema. However, we want to stress the point that, for a CxM analysis, the distinction between affixoids and affixes is relatively unimportant: what matters most, in our opinion, is that both affixoids and affixes with a lexemic origin undergo similar processes of semantic evolution and, above all, they do so within a construction, based on generalisations over a set of paradigmatically related words; while affixoids have a word-level equivalent, they do not exist *as such* outside a word formation schema, just as ordinary affixes. Moreover, the distinction is even less relevant for a language as Chinese, in which, as said above, formal evolution does not often follow semantic evolution, and hence the connection between lexical and grammatical morphemes

is rarely (if ever) lost (Arcodia 2011, 2012b).[11] Such an analysis is in line with *continuum* approaches to the boundary between compounding and derivation (see Ralli 2010 and the references cited therein), since productive compounding schemas may also have much semantic and categorial information specified in the schema, as seen above for $[[V_i\ N_j]]_{Nk}$ exocentric compounds (Sect. 3.1, Fig. 2). On the other hand, we would like to stress a non-trivial difference between productive compounding schemas, on the one hand, and schemas for affixoids and affixes: while the former always have variable slots for all constituents, the latter have at least a fixed slot, namely that occupied by the affix or affixoid, and are dependent on the paradigmatic relations which support their existence.

Going back to the case of 吧 *-bā*, the constructionst approach allows us to account also for the synchronic polysemy of 吧 *-bā*; following Booij (2010), the subsets of words productively formed with 吧 *-bā* may be seen as the instantiation of subschemas, hierarchically subordinated to (26), as shown in Fig. 4 (adapted from Arcodia 2014: 133):

Note that this is not meant to reflect the diachronic processes of meaning extension for 吧(-)*bā*; rather, it should represent the speaker's knowledge of the range of meanings of 吧 *-bā* complex words, based on sets of existing words (Booij 2010; Arcodia 2014).

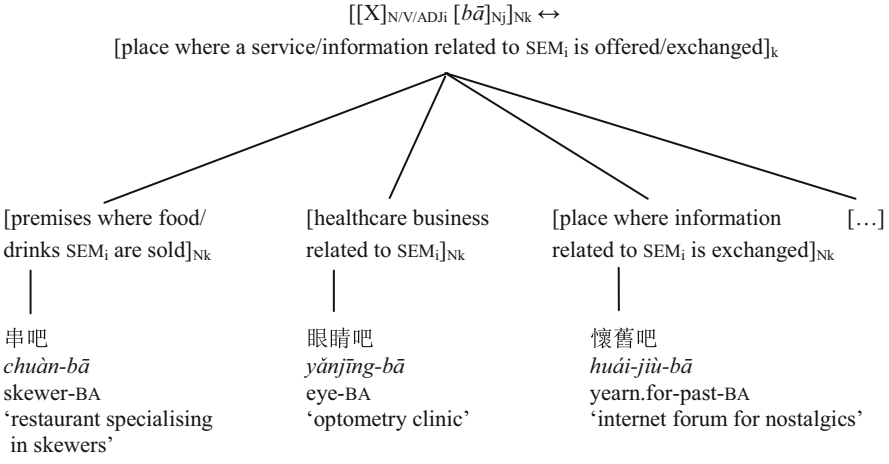

Fig. 4 A constructional representation for the polysemy of 吧 *-bā*

[11] Note that, in this connection, the writing system plays a role too. For instance, the perfective marker 了 *le*, deriving from the verb 了 *liǎo* 'to finish', while having developed a reduced sound shape, not obviously related to the verb, is still written with the same character, which makes the connection look rather obvious, at least for literate speakers.

Lastly, a constructional approach proves useful also in the analysis of prefix-like elements, which sometimes have a puzzling behaviour as to headedness and feature assignment. See the following examples (Arcodia 2012b: 192–195):

(28) a. [[*líng*]$_{Ni}$ [X]$_{Nj}$]$_{ADJk}$ ↔ [lacking SEM$_j$]$_k$
零風險
líng-fēngxiǎn
zero-risk
'zero risk'

b. [[*duō*]$_{ADJi}$ [X]$_{Nj}$]$_{ADJk}$ ↔ [having many SEM$_j$]$_k$
多功能
duō-gōngnéng
many-function
'multifunctional'

c. [[*kě*]$_{Vi}$ [X]$_{N/Vj}$]$_{ADJk}$ ↔ [which may be SEM$_j$]$_k$
可吃
kě-chī
can-eat
'edible'

What all these schemas have in common is that they form adjectives (with some exceptions; see Arcodia 2012b: 195) from nouns (28a–c) or verbs (28c only), but the lefthand constituent is a noun for (28a), an adjective in (28b) and a verb in (28c). Now, the head for productively formed compound adjectives is said to be on the right in Chinese (Ceccagno and Basciano 2007), which is consistent with the modifier-head order of Chinese syntax (and morphology); one could argue that (28a–c) are just exocentric compounds. However, we believe that such an analysis overlooks a rather obvious feature of these constructions, namely the fact that the left-hand constituent shapes the meaning of the complex word in a regular and predictable way. This apparent inconsistency may be best accounted for, in our opinion, by treating the left-hand constituents as prefixes/prefixoids, and by leaving word-class assignment to the construction itself (see Arcodia 2012b). Again, while the affix(oid)al meaning of 零 *líng* 'zero', 多 *duō* 'much, many' and 可 *kě* 'can' is clearly related to their lexical meaning, there is both a semantic and a distributional difference between the two 'identities' of these items, and the affix(oid)al meaning is available only as part of the word formation schemas seen above.

To conclude, in this section we argued that a CxM approach may account for several problematic issues related to derivation in Chinese, defending the position that the distinction between affixes and affixoids, polysemy and word-class assignment are all easily solved if items and patterns are seen as belonging to a network of paradigmatically related words, inheriting properties from the constructions they instantiate. In what follows, we will deal with a concrete case of a lexical root developing new meanings in word formation: namely the morpheme 客 *kè* 'guest > person'.

5 The Morpheme 客 *kè* 'Guest > Person'

In recent years, many complex words containing the morpheme 客 *kè* 'guest' as the righthand constituent have been coined, indicating 'a person doing a certain activity', or 'a person with certain characteristics'. The most popular one, arguably, is the word 黑客 *hēi-kè* 'black-guest, hacker', which entered the Chinese lexicon in the late '90s as a phonetic-semantic adaptation of the English *hacker*: the word approximately recalls the pronunciation of the source word and, at the same time, the modifier 黑 *hēi* 'black, shady, illegal' conveys the negative meaning of the term (compare 黑車 *hēi-chē* 'black-vehicle, unlicensed taxi'). Starting from the beginning of the twenty-first century, under the influence of foreign languages and Netspeak, many more words containing this morpheme have been coined. The 新世纪新词语大词典 *Xin Shiji Xinciyu Da Cidian* 'New Century Comprehensive Dictionary of Neologisms' (Kang and Liu 2015, henceforth: *Xinciyu*), which collects neologisms coined in the period 2000–2015, lists 25 new words formed with 客 *kè* as the righthand constituent, indicating specific types of persons; in the *Buzzwords* section of the *Shanghai Daily* (henceforth: SD)[12] we found 31 words of this type. In total we singled out 47 neologisms.[13] Along with words indicating different kinds of 'hackers' (29), we found neologisms indicating persons engaged in different kinds of activities (30):

(29) a. 白客
bái-kè
white-guest
'online security guard; hacker-fighter'

b. 紅客
hóng-kè
red-guest
'patriotic hacker, defending the security of domestic networks and fending off attacks'

c. 灰客
huī-kè
grey-guest
'unskilled hacker'

[12] http://buzzword.shanghaidaily.com/ (last access: 6/2/2017).

[13] We excluded words in which 客 *kè* bears the meaning 'guest' or 'client', as e.g. 顧客 *gùkè* 'customer', and compounds in which the righthand constituent is a 客 *kè* neologism, as 心理黑客 *xīnlǐ-hēikè* 'psychology-hacker, a person who helps others solve psychological issues'.

(30) a. 换客
huàn-kè
exchange-guest
'one who sells/exchanges goods online'

b. 切客
qiē-kè
cut-guest
'fan of location-based services who regularly checks in to keep friends and relatives posted on her/his whereabouts' (cf. Eng. *check in*)

c. 粉飛客
fěn-fēi-kè
fan[14]-fly-guest
'fanfictioner, fan who likes to write sequels or change plots of TV series to express her/his ideas, passions, etc.' (cf. Eng. *fanfic*)

Of the 47 word analysed, 27 belong to the domains of technology and the web; this means that Internet has had an important role in the development of this word-formation pattern. According to Zhang and Xu (2008), this word-formation pattern is typical of Netspeak, and was then extended to the media in general and to daily life too (used mainly by young people). A number of these words are phonetic adaptations from English, as in the case of 'hacker' seen above, or 極客 *jí-kè* 'extremely-guest, geek';[15] nevertheless, for most of them the derivational meaning of the morpheme 客 *kè* emerges clearly. Take, for instance, 切客 *qiē-kè* (30b): it is a (partial) phonetic adaptation of English *check-in*, but the Chinese word indicates a 'person', and this meaning is borne by the morpheme 客 *kè*. The same can be said of 粉飛客 *fěn-fēi-kè* (30c), which, as mentioned above, is a phonetic adaptation of *fanfic*; 客 *kè*, besides rendering the pronunciation of the last part of the word, contributes the meaning of 'person' (cf. *fanfictioner*). Sometimes, we find calques or hybrid forms to render English words, as e.g. in the case of 創客 *chuàng-kè* 'create-guest, maker'[16]: 創 *chuàng* translates *make*, while 客 *kè* is the equivalent of the suffix *-er*, recalling the pronunciation of the last part of the word *maker* as well. A similar example is 追客 *zhuī-kè* 'follow-guest', which refers to those who regularly refresh web pages to follow the latest updates of online series, TV series, bloggers or podcasts: this seems to be a calque of *follower*.

Neologisms with 客 *kè* are not limited to loans and words connected to the Internet and new technologies. Among new coinages we find 'persons' involved in all sorts of different activities or having certain characteristics, as e.g.:

[14]粉 *fěn* (literally, 'powder') here stands for 粉絲 *fěnsī*, a phonetic adaptation of Eng. *fan*.

[15]The Chinese term refers to a person who does not dress fashionably but is addicted to and good at computers.

[16]It refers to the *maker culture*, which represents a technology-based extension of the DIY (*do-it-yourself*) culture.

(31) a. 必剩客
bì-shèng-kè
certainly-remain-guest
'person above the typical marriage age but still single; considered to be doomed to remain unmarried'

b. 代掃客
dài-sǎo-kè
take.the.place.of-sweep-guest
'those who offer a service consisting in visiting tombs (sweeping and offering sacrifices) during the Qingming festival (or Tomb-Sweeping Day)'

c. 排客
pái-kè
line.up-guest
'people paid to stand in a queue for others'

Thus, the morpheme 客 *kè* (to the right of the word) has apparently acquired a more general meaning, appearing in a fixed position, becoming an affixoid in a family of words indicating various kind of persons, with a function comparable to that of English *–er*. The word formation schema according to which the neologisms in (30–31) have been formed may be represented as follows:

(32) $[[X]_{N/V/ADJi}\ [kè]_{NJ}]_{NK} \leftrightarrow$ [person related to $SEM_i]_k$

For a simplified representation of the network of constructions with 客 *-kè* 'person' as the head, see Fig. 5 below:

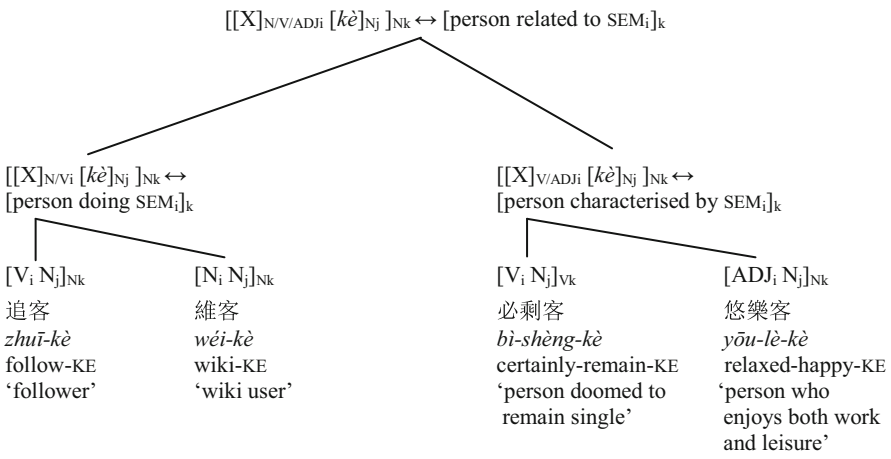

Fig. 5 Constructional network for 客 *-kè* complex words

However, the various 'hackers' mentioned above do not seem to fit in the schema in (32); they are best analysed, in our opinion, as analogical formations (see Booij 2010) from 黑客 *hēi-kè*, in which the modifier is invariably a colour term. A feature of this family of words, which is also acquired by analogy, is that the colour term is always understood in a metaphorical, rather than literal sense. Also, neologisms where the whole 客 *–kè* word is a phonetic adaptation of an English word not indicating a person (see Exx. 30b–c) pose some problems, as they do not fit well in the scheme above. Here the whole word, as seen above, is a phonetic adaptation, as *check-in* in (30b), but it indicates a person involved in an activity connected to the semantic of the phonetic adaptation as a whole (X-*kè*); thus, the role of 客 *–kè* is not only phonetic, but contributes the meaning of 'person' too. Hence, we believe that they may be understood as special cases of the 客 *–kè* construction.

As mentioned earlier, the basic meaning of 客 *kè* is 'guest, visitor', and this meaning is commonly found in compound words, as e.g. 旅客 *lǚ-kè* 'travel-guest, hotel guest/traveller', 船客 *chuán-kè* 'ship-guest, passengers of a ship', 請客 *qǐng-kè* 'invite-guest, invite/entertain guests'. However, if we look at the meanings of this morpheme in Classical Chinese, we also find 'person specialised in a certain activity', as e.g. 俠客 *xiá-kè* 'chivalrous-guest, knight errant', 掮客 *qián-kè* 'serve.as.broker-guest, broker', 劍客 *jiàn-kè* 'sword-guest, swordsman'. It could be argued that the pseudo-affixal use of the morpheme 客 *kè* is the result of the generalisation of this meaning. If we look at historical data, we see that at some point 客 *kè* began to be used with a more bleached meaning, indicating a kind of person with certain characteristics, as e.g. 瘦客 *shòu-kè* 'thin-guest, emaciated', 醉客 *zuì-kè* 'drunk-guest, drunkard', or involved in some activity, as 刺客 *cì-kè* 'assassinate-guest, assassin', 説客 *shuō-kè* 'speak-guest, persuasive talker'. The development to the pseudo-affixal use of this morpheme, thus, can be tentatively characterised as follows:

(33) $[[X]_{N/V/ADJi}\ [kè]_{NJ}]_{NK} \leftrightarrow$ [person specialised in an activity related to $SEM_i]_k$ > [person related to $SEM_i]_k$

Thus, it appears that the influence of English and Netspeak gave an impulse to the development of an already existing pattern, rather than leading to the creation of a new one.

We suggest that, despite being the instantiation of a different construction, with a distinct meaning, even 'hacker' words may have had a role in reinforcing the word formation schema at issue here, given their basic agentive meaning. Also, the choice of 客 *kè* 'guest' as a phonetic rendering of the second syllable in Eng. *hacker*, among many other morphemes with the same segments which are commonly used in Modern Chinese for phonetic adaptations in loanwords (e.g. 克 *kè* 'overcome', 科 *kē* 'department', etc.), could be argued to have been motivated (also?) by the meaning which 客 *kè* already had in word formation. Both hypotheses, however, remain speculative at present.

6 Summary and Conclusions

In this article, we have shown that many thorny issues met in the analysis of Chinese word formation may be easily accounted for in a constructionist perspective.

The application of the standard definitions and categories of morphology, as e.g. root, word, affix, derivation, compounding, etc., may not be straightforward even for the familiar Indo-European languages spoken in Europe; in research on Chinese morphology, this has generated endless controversies, as emphasised in this chapter. The advantage of a CxM analysis lies in the centrality of the constructions themselves, which provide a template for any process of word formation, allowing us to remain agnostic as to some of the most problematic distinctions. Thus, for instance, much-debated issues as the borderline between derivation and compounding, or between compounds and (idiomatic) phrases, the nature of roots, etc. are not crucial for a constructional analysis: what really matters is to account for how words are created and understood.

This means that cross-linguistic comparison may be carried out on the basis of actual constructions, rather than on categories which, often, may not be applied in a consistent way to typologically distant languages. For instance, if the distinction between affix proper and affixoid may be argued to be more relevant e.g. for European languages than for Chinese (see above, Sect. 4), constructions in which a lexeme develops a new meaning in word formation, and may convey that meaning only as part of a specific construction, may be easily compared in different languages, even when their morphologies are very different. Hence, in a CxM analysis the focus is on how word formation in different languages actually *functions*, rather than on the (often arbitrary) application of pre-existing categories such as root, compound, and affix.

Also, constructions may be understood as blueprints for the coinage and interpretation of words, and any non-compositional property of a set of complex words is assigned to the construction itself: this entails that, for instance, one can easily account for regular patterns, even when they defy generalisations e.g. about the order of head and modifier in a language (see Exx. 28a–c). Even the polysemy of a word formation schema may be understood as sets of semantic and structural subregularities, connected to a general schema encompassing them (see Fig. 4); while, traditionally, research on polysemy has focussed on the diachronic side of the issue, here what is crucial is the representation of the speakers' knowledge about word formation and the lexicon in their own language. This approach has the advantage of presenting things, in a sense, from the perspective of the speaker, rather than that of the linguist.

Several more interesting issues concerning Chinese word formation could not be tackled here due to lack of space; in particular, reduplication, a very rich and productive phenomenon in Sinitic languages, could benefit from a constructional analysis, highlighting the systematic correlations between meaning and form which are apparent in this domain (see Arcodia et al. 2015). We leave this for further research.

References

Amiot, D. 2005. Between compounding and derivation – Elements of word-formation corresponding to prepositions. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O.E. Pfeiffer, and F. Rainer, 183–195. Amsterdam/Philadelphia: John Benjamins.

Anderson, S. 1985. Typological distinctions in word formation. In *Language typology and syntactic description*, ed. T. Shopen, vol. 3, 3–56. Cambridge: Cambridge University Press.

Arcodia, G.F. 2011. A construction morphology account of derivation in Mandarin Chinese. *Morphology* 21: 89–130.

———. 2012a. Constructions and headedness in derivation and compounding. *Morphology* 22: 365–397.

———. 2012b. *Lexical derivation in Mandarin Chinese*. Taipei: Crane.

———. 2014. Diachrony and the polysemy of derivational affixes. In *Morphology and meaning*, ed. F. Rainer, F. Gardani, H.C. Luschützky, and W.U. Dressler, 127–140. Amsterdam/Philadelphia: John Benjamins.

———. 2017. Abbreviations, acronyms, initialisms. In *Encyclopedia of Chinese language and linguistics*, ed. R. Sybesma, W. Behr, Y. Gu, Z. Handel, J.C.-T. Huang, and J. Myers, vol. 1, 1–5. Leiden: Brill.

———. forthcoming. Coordinating nominal compounds: Universal vs. areal tendencies. *Linguistics*.

Arcodia, G.F., and B. Basciano. 2017. Morphology, Modern. In *Encyclopedia of Chinese language and linguistics*, ed. R. Sybesma, W. Behr, Y. Gu, Z. Handel, J.C.-T. Huang, and J. Myers, vol. 3, 104–118. Leiden: Brill.

Arcodia, G.F., B. Basciano, and C. Melloni. 2015. Areal perspectives on total reduplication of verbs in Sinitic. *Studies in Language* 39 (4): 836–872.

Basciano, B. 2010. *Verbal compounding and causativity in Mandarin Chinese*. Ph.D. thesis. University of Verona.

———. 2017. Word classes, Modern. In *Encyclopedia of Chinese language and linguistics*, ed. R. Sybesma, W. Behr, Y. Gu, Z. Handel, J.C.-T. Huang, and J. Myers, vol. 4, 554–566. Leiden: Brill.

Basciano, B., and A. Ceccagno. 2009. The Chinese language and some notions from Western linguistics. *Lingue e Linguaggio* 8 (1): 105–135.

Basciano, B., N. Kula, and Chiara Melloni. 2011. Modes of compounding in Bantu, Romance and Chinese. *Italian Journal of Linguistics* 23 (2): 203–249.

Bauer, L. 2002. What can you do with derivational morphology. In *Morphology 2000. Selected papers from the 9th Morphology Meeting*, ed. S. Bendjaballah, W.U. Dressler, O.E. Pfeiffer, and M.D. Voeikova, 37–49. Amsterdam/Philadelphia: John Benjamins.

———. 2005. The borderline between derivation and compounding. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O.E. Pfeiffer, and F. Rainer, 97–108. Amsterdam/Philadelphia: John Benjamins.

———. 2006. Compound. In *Encyclopedia of language & linguistics*, ed. K. Brown, R.E. Asher, and J.M.Y. Simpson, 2nd ed., 719–726. London: Elsevier.

Bickel, B., and J. Nichols. 2007. Inflectional morphology. In *Language typology and syntactic description*, ed. T. Shopen, vol. 3, 169–240. Cambridge: Cambridge University Press.

Bisang, W. 1996. Areal typology and grammaticalization: Processes of grammaticalization based on nouns and verbs in East and Mainland South East Asian languages. *Studies in Language* 20 (3): 519–597.

———. 2004. Grammaticalization without coevolution of form and meaning: The case of tense-aspect-modality in East and Mainland Southeast Asia. In *What makes grammaticalization? A look from its fringes and its components*, ed. W. Bisang, N.P. Himmelmann, and B. Wiemer, 109–138. Berlin/New York: Mouton de Gruyter.

———. 2008. Grammaticalization and the areal factor – The perspective of East and Mainland South East Asian languages. In *Rethinking grammaticalization*, ed. M.J. López-Cousa and E. Seoane, 15–35. Amsterdam/Philadelphia: John Benjamins.

Bisetto, A., and S. Scalise. 2002. Trasferimento di costrutti sintattici in morfologia. *Lingue e Linguaggio* 1 (2): 237–261.

———. 2005. The classification of compounds. *Lingue e Linguaggio* 4 (2): 319–332.

Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O.E. Pfeiffer, and F. Rainer, 109–132. Amsterdam/Philadelphia: John Benjamins.

———. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th Décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 33–44. Somerville: Cascadilla Proceedings Project.

———. 2009. Compounding and construction morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2013. Morphology in construction grammar. In *The Oxford handbook of construction grammar*, ed. T. Hoffmann and G. Trousdale, 255–273. Oxford: Oxford University Press.

Ceccagno, A., and B. Basciano. 2007. Compound headedness in Chinese: An analysis of neologisms. *Morphology* 17: 207–231.

———. 2009. *Shuobuchulai: la formazione delle parole in cinese*. Bologna: Serendipità.

Ceccagno, A., and S. Scalise. 2006. Classification, structure and headedness of Chinese compounds. *Lingue e Linguaggio* 5 (2): 233–260.

Chao, Y.-R. 1968. *A grammar of spoken Chinese*. Berkeley: University of California Press.

Dai, J.X.-L. 1992. *Chinese morphology and its interface with the syntax*. PhD thesis. Ohio State University.

———. 1998. Syntactical, phonological and morphological words in Chinese. In *New approaches to Chinese word formation*, ed. J.L. Packard, 103–133. Berlin/New York: Mouton de Gruyter.

DeFrancis, J. 1984. *The Chinese language: Facts and fantasy*. Honolulu: University of Hawaii Press.

Dixon, Robert M.W. 2004. Adjective classes in typological perspective. In *Adjective classes: A cross-linguistic typology*, ed. R.M.W. Dixon and A.Y. Aikhenvald, 1–49. Oxford: Oxford University Press.

Dixon, R.M.W., and A.Y. Aikhenvald. 2002. Word: A typological framework. In *Word: A cross-linguistic typology*, ed. R.M.W. Dixon and A.Y. Aikhenvald, 1–41. Cambridge: Cambridge University Press.

Dong, X. [董秀芳]. 2004. *Hanyu de ciku yu cifa* 汉语的词库与词法 [Chinese lexicon and grammar]. Beijing: Beijing Daxue Chubanshe.

Duanmu, S. 1998. Wordhood in Chinese. In *New approaches to Chinese word formation*, ed. J.L. Packard, 135–195. Berlin/New York: Mouton de Gruyter.

Fabb, N. 1998. Compounding. In *Handbook of morphology*, ed. A. Spencer and A.M. Zwicky, 66–83. Oxford: Blackwell.

Feng, S. 1998. Prosodic structure and compound words in classical Chinese. In *New approaches to Chinese word formation*, ed. L. Packard, 196–259. Berlin/New York: Mouton de Gruyter.

Gao, M. [高名凯]. 1953. Guanyu Hanyu de cilei fenbie 关于汉语的词类分别 [On the division into word classes in Chinese]. *Zhongguo yuwen* 中国语文 10: 13–16.

Goldberg, A.E. 1995. *Constructions. A construction grammar approach to argument structure*. Chicago: The University of Chicago Press.

Guo, Rui [郭锐]. 2002a. Hanyu cilei yanjiu 汉语词类研究 [Studies of parts of speech in Chinese]. In *Ershi shiji Zhongguo xueshu dadian: yuyanxue* 20 世纪中国学术大典: 语言学 [The Chinese academic canon in the 20th century: linguistics], ed. Lin Tao [林焘], 65–71. Fuzhou: Fujian Jiaoyu Chubanshe.

———. 2002b. *Xiandai Hanyu cilei yanjiu* 现代汉语词类研究 [Research on word classes in modern Chinese]. Beijing: Shangwu Yinshuguan.

Haspelmath, M., and A. Sims. 2010. *Understanding morphology*. 2nd ed. London: Routledge.

He, Y. 2004. The word-and-rules theory: Evidence from Chinese morphology. *Taiwan Journal of Linguistics* 2: 1–26.

Heine, B., U. Claudi, and F. Hünnemeyer. 1991. *Grammaticalization: A conceptual framework*. Chicago: University of Chicago Press.

Higginbotham, J. 1985. On semantics. *Linguistic Inquiry* 16: 547–593.

Huang, J.C.-T. 1984. Phrase structure, lexical integrity, and Chinese compounds. *Journal of the Chinese Language Teachers Association* 19: 53–78.

Kang, S., and H. Liu. 2015. *Xin shiji xinciyu da cidian* 新世纪新词语大词典 [New Century comprehensive dictionary of neologisms]. Shanghai: Shanghai Cishu Chubanshe.

Kwong, O.Y., and B.K. Tsou. 2003. Categorial fluidity in Chinese and its implications for part-of-speech tagging. In *Proceedings of the 10th conference of the European chapter of the Association for Computational Linguistics*, 115–118. http://aclweb.org/anthology/E/E03/#1000. (last access: 31/01/2018).

Li, J. [黎锦熙]. 2001 [1924]. *Xinzhu guoyu wenfa* 新著国语文法 [A new grammar of the Chinese national language]. Beijing: The Commercial Press.

Li, C.N., and S. Thompson. 1981. *Mandarin Chinese: A functional reference grammar*. Berkeley: University of California Press.

Liang, D. [梁丹丹], and S. Feng [封世文]. 2006. Zai lun jianleici chuli — bing yi shenjing yuyanxue yanjiu wei zhengju 再论兼类词处理—并以神经语言学研究为证据 [Again on the treatment of multi-category words: Evidence from neurolinguistic research]. *Jiangxi Shehui Kexue* 江西社会科学 10: 230–237.

Lieber, R. 2009. A lexical semantic approach to compounding. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Stekauer, 78–104. Oxford: Oxford University Press.

Lu, J. [陆俭明]. 1994. Guanyu ci de jianlei wenti 关于词的兼类问题 [On the issue of the multi-categoriality of words]. *Zhongguo yuwen* 中国语文 1: 28–34.

Lü, S. [吕叔湘], and D. Zhū [朱德熙]. 2005 [1951]. *Yufa xiuci jianghua* 语法修辞讲话 [Lessons on grammar and rethoric]. Shenyang: Liaoning Jiaoyu Chubanshe.

Lü, S. [吕叔湘]. 1981. *Yuwen changtan* 语文常谈 [On the Chinese Language]. Beijing: Sanlian Shudian.

Ma, Q. [马 株]. 1995. Xiandai Hanyu cizhui de xingzhi, fanwei he fenlei 现代汉语词缀的性、范围和分类 [Nature, scope and classification of Modern Chinese affixes]. *Zhongguo Yuyanxuebao* 中 国语言学报 6: 101–137.

Marosán, L. 2006. *The meaning of word classes*. Bern: Peter Lang.

Naumann, B., and P.M. Vogel. 2000. Derivation. In *Morphologie-morphology*, ed. G. Booij, C. Lehmann, and J. Mugdan, 929–943. Berlin/New York: Mouton de Gruyter.

Packard, J.L. 2000. *The morphology of Chinese*. Cambridge: Cambridge University Press.

———. 2006. Chinese as an isolating language. In *Encyclopedia of language & linguistics*, ed. K. Brown, R.E. Asher, and J.M.Y. Simpson, 2nd ed., 355–359. London: Elsevier.

———. 2015. Morphology: Morphemes in Chinese. In *The Oxford handbook of Chinese linguistics*, ed. W. Wang and S. Chaofen, 263–273. Oxford: Oxford University Press.

Pan, W. [潘文国], B. Ye [叶步青], and Y. Han [韩洋]. (2004). *Hanyu de goucifa yanjiu* 汉语的构词法研究 [Research on word formation in Chinese]. Shanghai: Huadong Shifan Daxue chubanshe.

Ralli, A. 2010. Compounding versus derivation. In *Cross-disciplinary issues in compounding*, ed. S. Scalise and I. Vogel, 57–74. Amsterdam/Philadelphia: John Benjamins.

Scalise, S., A. Bisetto, and E. Guevara. 2005. Selection in compounding and derivation. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O.E. Pfeiffer, and F. Rainer, 133–150. Amsterdam/Philadelphia: John Benjamins.

Sproat, R., and C. Shih. 1991. The cross-linguistic distribution of adjective ordering restrictions. In *Interdisciplinary approaches to language: Essays in honor of S.-Y. Kuroda*, ed. G. Carol and R. Ishihara, 565–593. Dordrecht: Kluwer Academic Publishers.

———. 1996. A corpus-based analysis of Mandarin nominal root compounds. *Journal of East Asian Linguistics* 5: 49–71.

Steffen Chung, K. 2014. Sino-Tibetan: Chinese. In *The Oxford handbook of derivational morphology*, ed. R. Lieber and P. Štekauer, 609–620. Oxford: Oxford University Press.

Tai, J.H.-Y. 1997. Category shifts and word-formation redundancy rules in Chinese. In *Chinese language and linguistics III: Morphology and lexicon*, Symposium series of the Institute of History and Philology, ed. F.-F. Tsao and S.H. Wang, vol. 2, 435–468. Academia Sinica: Taipei.

Wälchli, B. 2005. *Co-compounds and natural coordination*. Oxford: Oxford University Press.

Williams, E. 1981. On the notions "lexically related" and "head of a word". *Linguistic Inquiry* 12: 245–274.

Xing, J.Z. 2006. *Teaching and learning Chinese as a foreign language: A pedagogical grammar*. Hong Kong: Hong Kong University Press.

Xu, T. [徐通锵]. 1994. "Zi" he Hanyu yanjiu de fangfalun——Jian ping Hanyu yanjiu zhong de "Yin-Ouyu de yanguang" "字"和汉语研究的方法论——兼评汉语研究中的"印欧语的眼光" [Characters and the methodology of Chinese research—And a critique of the "Indo-European outlook" in the research on Chinese]. *Shijie Hanyu jiaoxue* 世界汉语教学 3: 3–16.

Yan M. [颜迈]. 2007. Cilei huafen biaozhun de huigu he xuanze 词类划分标准的回顾和和选择 [Review of the criteria to classify parts of speech and their choice]. *Guizhou minzu xueyuan xuebao* 贵州民族院学报 1: 129–132.

Yang, X. 2003. *Hanyu yusu lun* 汉语语素论 [On Chinese morphemes]. Nanjing: Nanjing Daxue Chubanshe.

Yip, P.-C. 2000. *The Chinese lexicon. A comprehensive survey*. London/New York: Routledge.

Zhang, Y. [张谊生], and X. Xu [许歆媛]. 2008. Qianxi "X *kè*" cizu. Cihuihua he yufahua de guanxi xin tan 浅析"X 客"词族—词汇化和语法化的关系新探 [A preliminary analysis of the "X *kè*" word family. A new look at the relation between lexicalization and grammaticalization]. *Yuyan wenzi yingyong* 语言文字应用 4: 77–82.

Zhu, D. [朱德熙]. 1980 [1956]. Xiandai Hanyu xingrongci de yanjiu 现代汉语形容词的研究 [Research on Modern Chinese adjectives]. *Yuyan yanjiu* 语言研究 1: 83–112.

———. 1982. *Hanyu jiangyi* 语法讲义 [Lectures on grammar]. Beijing: Shangwu Yinshuguan.

Super-Complexity and the Status of 'Word' in Gunwinyguan Languages of Australia

Brett Baker

Abstract Construction Grammar is a model of grammar which makes a virtue out of treating morphological and syntactic constructions as varieties of essentially the same ontological type, which is also the type of words in general: a lexical entry. I argue that this kind of model is exactly what we need to describe the otherwise troublesome behaviour of polysynthetic languages. In particular, this model enables us to derive the kind of prosodic constituency and semantic interpretation which is otherwise completely unexpected for words.

Keywords Polysynthesis · Incorporation · Prosodic juncture · Compounding · Template morphology

1 Introduction[1]

Many Indigenous Australian languages allow words to be extremely complex, morphologically, a characteristic I call 'super-complexity', as in example (1). In this example, from the northern Australian language Wubuy we see a verb agreeing with its subject for gender, but also containing other elements that may be glossed with meanings appropriate to quantifiers and nouns (the first line shows the utterance as pronounced, the second line its underlying form) [2]:

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[2]Except where otherwise indicated, examples are taken from the author's fieldnotes. I use IPA to represent utterances, and Leipzig Glossing Rules (Bickel et al. 2008) with the following non-obvious additions: 1: 1st person exclusive; 12: 1st person inclusive; EVIT: evitative; FNEG: Future

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(1) waraŋukulmuŋcalciraa
wu-wara-ŋu-kulmuŋ-jalcir-aa
NEUT-MULT-Ø-fruit-be.hanging-PRES
'there are lots of fruits (there)'

Words in Wubuy can thus have most of the functions associated with propositions in non-polysynthetic languages and, as is common in such languages, the verb can constitute a proposition on its own. Indeed, verbs in these languages can express the kinds of propositions which would be impossible to express in a single word in most of the world's languages. These languages therefore raise the important and difficult questions (a) in what sense are examples like (1) 'words'? and (b) what is the difference between examples like (1) and, on the one hand, sentences, and on the other, words, in a language like English? In the following, I argue that in many respects—prosodic, semantic, psycholinguistic—such words are indeed 'phrasal'. These languages therefore have words, in the sense of syntactic terminal nodes, which have many 'syntactic' features. What I will ultimately conclude, however, is that there is no well-formed, *a priori*, distinction between 'words' and 'sentences' in Wubuy. Instead, we can speak of 'constructions' with particular constellations of propositional, lexico-semantic, morpho-syntactic, phonological and prosodic features. And, following Haspelmath (2011), it is along these particular constellations of features that we should be comparing constructions in Wubuy with, for instance, constructions in English.

Example (1) provides an analysis of the string in terms of morphological constituents—signalled by hyphens—associated with glosses providing lexical and grammatical information. Apart from our training as linguists, what is our evidence that this kind of structure has anything to do with the knowledge that speakers have? I discuss evidence from a range of sources—behavioural, psycholinguistic, as well as semantic and prosodic—that points to the conclusion that some parts of the structure of (1) are 'visible' to speakers while other parts are opaque. I discuss this evidence in Sects. 3 and 4.

Based on these differences in morphological visibility, I develop a model of the lexicon along Constructionist lines, in Sect. 5. Here, I tackle the fact that constructions such as (1) entail a relatively fixed order of types of morphemes, traditionally described with reference to a template of morpheme position classes ('template' for short). Until now, CxM has not dealt with the technical problems inherent in this kind of word structure, to my knowledge, and so this is an important test of the theory's usefulness as a descriptive, as well as theoretical,

Negative; FUT.P: Future Punctual; MULT: multiplicative; PC: Past Continuous; PP.: Past Punctual; NP: Non-Past. All the languages discussed here have systems of exhaustive noun classification into between 4 and 7 classes represented by the glosses FEM(inine/female), MASC(uline/male), NEUT(er), VEG(etable), ANIM(imate), COLL(ective). Due to the complexities of Wubuy phonology, the first line in some Wubuy examples indicates the surface phonology, the line underneath represents the underlying forms of morphemes. Where examples have a single language line, this is because the surface phonology doesn't depart radically from the underlying morphology.

tool. In addition, the prosodic and semantic facts of words in Wubuy entail a radical extension of the abilities of constructions to model this behaviour. I propose some ways in which we might think of these extensions. First, however, I provide some background on the languages in question and the relevant characteristics to be explored in subsequent sections.

2 What Makes a 'Word' a Word?

Wubuy (['wʊbʊI], a.k.a. 'Nunggubuyu': Heath 1984) is a language spoken in Eastern Arnhem Land in the Northern Territory, by perhaps 60 fluent L1 speakers with residence in or close affiliation to the remote settlement of Numbulwar on the Gulf of Carpentaria. Wubuy is also an L2/L3 for a number of speakers in adjacent communities in north-east Arnhem Land, but the precise number of speakers (L1/L2/L3) is difficult to assess. Like several other Gunwinyguan languages (Alpher et al. 2003), such as Bininj Gun-wok (Evans 2003) and Ngalakgan (Baker 2008a), Wubuy is a polysynthetic language which allows both prefixing and suffixing, as well as several types of incorporation.[3] As illustrated above in example (1), Wubuy words may be semantically very complex. Of course, this characterisation only holds if it can be maintained that the construct in (1) actually *is* a 'word', and not, in fact, a phrase of some kind, as its translation suggests.

The issue of whether constructs like (1) in polysynthetic languages are really 'words' or really 'phrases' is bound up with the broader issue of how to define the notion 'word' in some cross-linguistically valid way, an issue which has been problematized in recent work (e.g. Haspelmath 2011; Bickel and Zuñiga in press; Van Gijn and Zuñiga 2014). For a number of polysynthetic languages in particular, grammatical or orthographic words have been argued to consist of a multiple number of phonological words, and such phonological words may be regularly interrupted by pauses and parenthetical material or even phrases (see e.g. Russell 1999 on Cree; Evans et al. 2008 on Dalabon; Van Gijn and Zúñiga 2014 and papers therein; Baker and Bundgaard-Nielsen 2016 on Wubuy).

Here, I firstly point out that, if we regard phonological rules as an important criterion for word-hood, then the construct in (1) is a word, because a number of phonological rules apply within this structure, and none at all occur between structures of this type. In (1), for example, the verb *jalcira* 'be hanging' which begins underlyingly in a glide, is pronounced *calcira*, because the verb follows a preceding nasal, a process labelled 'hardening' in Heath (1984). Hardening is a highly prevalent process in Wubuy, affecting all morphemes which begin in the

[3]Incorporation is only a feature of the central and eastern Gunwinyguan languages: Bininj Gun-wok/Gunwinygu/Mayali, Dalabon, Rembarrnga, Ngalakgan, Ngandi, Wubuy/Nunggubuyu and Enindhilyakwa/Anindilyakwa. The western languages, such as Jawoyn and Warray, do not have productive incorporation or nominal compounding as described here.

continuants /w j ɻ l̪ r/ (this constitutes over 58% of the lexicon: Bundgaard-Nielsen & Baker 2014), including all case suffixes, when they follow a non-continuant (a nasal or stop) across a morpheme boundary. In a hardening environment, morpheme-initial continuants are pronounced as the homorganic stop, /p ∼ k c ʈ t̪ t/ respectively (/w/ maps to either /p/ or /k/, or in some instances both, depending on the morpheme in question).

The hardening process can be accounted for in terms of satisfaction of a constraint on sequences of non-continuants followed by continuant consonants across a syllable boundary, a kind of Syllable Contact Law in the tradition of Murray and Vennemann (1983). A constraint *[—cont][+cont, —syll] will have the desired effect not only of enforcing the absence of such sequences at morpheme boundaries but also within morphemes in the lexicon (Baker 2009). As far as I can determine, this constraint is never violated in Wubuy. Furthermore, there are numerous differences between constructs like (1) and a standard syntactic clause in English; for instance, the nominal and verbal constituents cannot be replaced by proforms, cannot be coordinated internally with other constituents of the same type, cannot be modified (except to a limited degree) or otherwise build more elaborate phrase structures.

Despite the fact that there are numerous phonological rules operating within sequences such as (1) (however we might define these), and none applying between such sequences, a number of other characteristics suggest nevertheless that constructs such as (1) do not constitute indivisible—word-like—units. At higher levels of phonology, in particular prosodic phrasing, constructs analogous to (1) can in fact constitute Prosodic or Intonational Phrases, as shown in work by Fletcher and colleagues for the related language Dalabon, another Gunwinyguan language spoken in central Arnhem Land (Fletcher et al. 2004; Evans et al. 2008; Fletcher 2014). The prosodic junctures between constituents of constructs like (1) are evident both in intonational boundary tones (Fletcher 2014) and in the presence of deliberate—as opposed to disfluent—pauses (Fletcher et al. 2004; Evans et al. 2008). Example (2) (from Evans et al. 2008) shows two naturally occurring super-complex 'words' produced by a speaker of Dalabon, where ellipses indicate pauses of more than 150 ms duration, and the hyphens represent morpheme boundaries[4]:

(2)	a.	ka?-…	ɻak-…	m+ijan	b.	ce?-…	cark-…	niŋ+ijan
		3sg/3sg-	wood-	get+FUT		12-	together-	sit+FUT
		'He will get firewood.'				'We will sit together.'		

The literature on deliberate pauses (e.g. Butcher 1981; Grosjean et al. 1979; Tauberer 2008) suggests that they primarily perform a speech planning function related either to prosodic phrasing of syntactic constituents or to planning the next

[4]I distinguish here, as do Fletcher et al. (2004), between 'deliberate' pauses and pauses indicative of speech disfluency. The two can be distinguished on intonational, and phonetic grounds, as well as in the occurrence of 'fillers' (see Levelt 1983; Shriberg 2001).

utterance or both. In languages such as English, these pauses occur only at the boundaries of syntactic constituents. Their occurrence word-internally, therefore, in super-complex words, is of considerable interest.

The significance of these examples for our understanding of word structure in such languages, and for morphological theory more generally, has not been fully examined to date. In a recent paper, Baker and Bundgaard-Nielsen (2016) demonstrate that a similar phenomenon occurs even in highly fluent speech in Wubuy, and further test speakers' preference for words with and without pauses at a range of morphological junctures. I return to discuss the results of these experiments in Sect. 4. In what follows, I discuss more fully the nature of, and differences among, the morphological relations to be found in these constructs, so as to understand the possible motivations for the behaviour exhibited in examples like (2).

3 Noun Incorporation into Adjectives and the Semantics of Polysynthesis

Examples like (2) (and similar examples discussed in the following section) raise questions about the nature of the internal relations among constituents of super-complex words. In particular, what determines the locations of potential pauses? In English, deliberate pauses are associated with the edges of syntactically complex phrases; this is one of the consequences of, and pieces of evidence for, the syntax-to-prosody mapping hypothesis in the extensive literature on Intonational Phonology (see e.g. Selkirk 1980; Jun 2006; Ladd 2008; Selkirk and Lee 2015). In the three languages where this phenomenon has been examined (Dalabon, Ngalakgan, and Wubuy), the pause sites are quite constrained (Fletcher et al. 2004; Baker 2008a; Baker and Bundgaard-Nielsen 2016). In essence, pause is possible at the boundaries between strings which are independently meaningful.

More generally, I argue in this section that there are important differences among the components of super-complex words. To illustrate the difference, I will focus on noun incorporation and compounding. Alongside the more familiar noun incorporation into verbs, Gunwinyguan languages also commonly incorporate nouns into adjectives, a formally distinct word class in these languages. In these languages, it is standard to modify nouns with an adjective through compounding, as in the examples in (3), from Ngalakgan.[5]

[5]Ngalakgan ['ŋalakkan], was formerly spoken in the Wilton River drainage basin of southern Arnhem Land in the Northern Territory, and the adjoining region of the Roper River valley. It is now effectively moribund. Data reported here comes from my own fieldwork on the language and (Baker 2008a).

(3) a. ceɲ-ŋolkko ‘big fish’
fish-big
b. kuɳʈu-joccoŋ ‘clear (not sacred) country’
country-clear
c. ⌊aŋka-kaɲaʔ ‘small waterhole’
waterhole-small

These compounds reveal interesting facts about the nature of interpretation of super-complex words in these languages, which cannot (as easily) be shown with verbs. They also impinge on some of the discussion of compounds which has already appeared in the CxM literature, in particular (Booij 2010).

I use the term ‘compound’ here in a pre-theoretical sense of ‘combination of lexical bases’, i.e. a schema of the form in (4), as suggested by (Booij 2010:17; slightly modified). This schema describes a construction of syntactic category ‘N’ consisting of two elements, of categories ‘X’ (N, V, Adj, P) and ‘N’, where the meaning of the construction is characterised very broadly as one where the content of N has some relation to the content of X.

(4) $[[a]_{Xk}\ [b]_{Ni}]_{Nj} \leftrightarrow [SEM_i$ with relation R to $SEM_k]_j$
where ‘SEM’ is the semantic content of X, N.

In (4), as discussed by Booij (2010:17), *a* and *b* are variables standing for phonological strings, and the indices *i, j, k* serve to coindex parts of the morpho-phonological, syntactic, and semantic representations which make up a lexical entry in Constructionist approaches.

For incorporation in Wubuy, we might propose the following:

(5) $[[a]_{Ni}\ [b]_{Xj}]_{Xk} \leftrightarrow [X_j$ with some relation R to $N_i]_k$

That is, a word of category ‘X’, where ‘X’ ranges over V and Adj, consisting of two further elements of categories N and X, where the meaning of X bears some relation to the meaning of N. The set of relations ‘R’ is in principle open in incorporation structures in Wubuy and Ngalakgan (Baker 2014), much as in compounding in English (c.f. Lees 1963, Gleitman and Gleitman 1970; Levi 1978; Lieber 2009, Jackendoff 2009). However, there are also differences between incorporation structures like those in (3) and other, similar, structures in Gunwinyguan languages which are more like compounds of the classic type.

The N position in N-Adj compounds like those in (3) is drawn from a subset of nouns with ‘generic’ or classifying functions. Apart from N-Adj compounds, we also find phrasal N + Adj combinations of the more familiar type, as in (6)[6]:

[6]Note that I am using the term ‘compound’ throughout this chapter in an agnostic fashion, interchangeably with ‘incorporation’, as a combination of two lexical roots or stems. However, as discussed briefly below, compounds in GN languages have different semantics to compounds in English, German and other languages (and see Baker 2008a, 2014 for more discussion). Verb stems in SMALL CAPS indicate the independent meanings of finite verbs when used in lexicalised

Wubuy

(6) ana-ciici macii,
NEUT.TOP-sore COND

pa-waŋa+kana **ana-ciici** **ana-ɻuŋkal**
2sg-hold+TAKE.PRES NEUT.TOP-sore NEUT.TOP-big
'If you have a sore, a big one that is...' [31/5/04]

Syntactic phrases like that in (6) are typical only where the noun is one which does not normally incorporate, as is true of *ciici* 'sore' in Wubuy. This is one of the nouns that has a suppletive bound form, *–l̪an*, and so incorporation of *ciici* is not possible. But where a noun is one of the incorporable type (body parts, parts of plants and parts of the landscape, and nouns with 'generic' meanings), incorporation is typical except under conditions of focus or contrast (Heath 1984:471; cf. also Evans 2003:177 on Bininj Gun-wok).

The class of nouns which may be compounded with adjectives is restricted to the same class that may be incorporated into verbs. For Wubuy, Heath (1984:471) notes that:

> Only certain nouns can occur as [N in both N-Adj or N-Verb compounds], either unchanged, with phonological changes, or with a suppletive replacement. In general, specific flora-fauna terms, specific implement terms, and NAdj ['adjectival nouns'] (including most human nouns) are not permitted as cpd. initial.

The same remarks apply to Ngalakgan and other Gunwinyguan languages such as Bininj Gun-wok (see Baker and Nordlinger 2008). In all three languages, the nominals that occur in N-Adj compounds include the special suppletive forms otherwise found only in verb incorporations, as with Wubuy *ciici* ~ *–l̪an* mentioned above (Heath 1984: 465 provides a list of 51 suppletive bound forms of incorporable nouns in Wubuy).

One of the striking differences between N-Adj compounds in Gunwinyguan languages, as opposed to Adj-N compounds in Germanic languages, is that the interpretations of most N-Adj compounds and many N-V compounds are 'phrasal', rather than lexical. In contrast to English and many other languages, for instance, N-Adj compounds in GN languages do not have interpretations as types or kinds (like 'blackbird', 'brown bear', etc.). Rather, compounds such as Wubuy *l̪aɲ-ŋu-duma-* firewood-Ø-black 'black wood' (Heath 1980: 23) only have strictly compositional interpretations, identical to the interpretation of a phrasal combination of the same adjective and noun (or their equivalents in English). We therefore do not find Bloomfield's (1949: 197) famous contrast between 'blackbird' and 'black bird' in GN languages. Most of the time, only the 'black bird' interpretation is possible.[7]

compounds (where the verb may or may not contribute compositionally to the meaning of the compound), as in *waŋa+kana* hold+TAKE.PRES 'have' in example (6).

[7]In formal terms, standard compounds of the English 'blackbird' kind would be of type 'e' (references to entities), while compounds in Gunwinyguan languages have a more complex type that could be expressed in lambda calculus as λx.px 'That referent (*x*) which has the attribute *p*'.

The interesting issue that such examples pose is that they also differ semantically from the 'syntactic compounds' discussed in Booij (2010: Ch7) and other authors, as shown in (7) (adapted from Booij 2010: 175–178):

	Dutch	
(7)	dikke darm	'lit. thick intestine, large intestine'
	dood spoor	'lit. dead trail, deadlock'
	hoge hoed	'lit. high hat [sic], top hat'
	magere yoghurt	'lit. lean yoghurt, fat-free yoghurt'
	zwarte dood	'black death, plague'

As is indicated in the glosses, these Dutch syntactic compounds, just like A+N compounds in English, name conventionalised concepts, types or, more broadly, 'kinds' (Allen 1978; Cruse 1986). That is, they illustrate the 'blackbird' phenomenon, in contrast to compounds in Ngalakgan and other GN languages, which are always of the 'black bird' type. This then raises the question of how we might model this difference, if both are to be analysed as 'syntactic compounds' of a kind.

Apart from these syntactic compounds, or incorporations, Ngalakgan, Wubuy, Bininj Gun-Wok and other GN languages also possess lexical compounds of the standard type, involving a concatenation of two roots with a conventionalised interpretation that ranges from relatively transparent to completely opaque, as in (8) (and (16) below). These are overwhelmingly of the verbal category.[8] Lexical compounds can be distinguished from syntactic compounds (i.e. incorporation) in these languages on a number of grounds. Firstly, unlike true, lexicalised compounds, incorporation appears to be 'optional' in general, and incorporation constructions generally allow a syntactic paraphrase. Lexicalised compounds do not have this option (as discussed for the related language Bininj Gun-Wok by Evans 2003: 338).[9] Example (8), from Ngalakgan, is a lexicalised compound of the noun for 'water'

[8]Ngalakgan has no lexicalised N+Adj compounds. Both Bininj Gun-wok and Wubuy, however, possess a small number of lexicalised (i.e. having unpredictable denotations) exocentric compounds referring to natural species, such as Wubuy *ŋuta-l̪ar̪t̪ark* 'King brown snake' (lit. 'midriff-rough'), *ɻapara-wuɭma* 'black whip snake' (*ɻapara* 'tail'; *wuɭma* does not otherwise occur). Such forms are rare. The main exception to the general semantic transparency of compounds in Gunwinyguan languages is constituted by names. In brief, placenames in Ngalakgan and many other Australian languages can consist of morphologically complex forms such as locative suffixed nouns, or inflected verbs, which have specific referents in the landscape and to individuals bearing those names as personal names (Baker 2002). Since these names are formed through a range of morphological means, including simple nouns, they do not diminish the point made here.

[9]However, a number of verbs and adjectives in Wubuy require a bodypart argument or else a 'dummy' incorporated stem to be incorporated; see Heath (1984: 469). For example, verbs such as *waja-* 'to be hurting' and *waɭka-* 'to be afflicted by' are normally produced by speakers either with a specific incorporated body part or else with the 'dummy' incorporated noun *wara-* which can have the meaning 'all over', or can simply stand for a lack of specification of a more specific on-the-body location. Similar behaviour has also been described for Bininj Gun-Wok (Evans 2003: 331) and the Southern Daly language Murrinh-Patha (Forshaw 2011).

plus a verb meaning 'die' which has the idiosyncratic interpretation 'to be thirsty'. This compound cannot be expressed phrasally, as in the (b) form.

Ngalakgan

(8) a. ŋu-**weʔ+ɲaɻʔ**-miɲ
1sg-water+die-PP
'I'm thirsty'

b. *weʔ ŋu-ɲaɻʔ-miɲ

Thus, the two kinds of compounds differ in terms of 'blocking': true incorporations are not blocked by their syntactic paraphrases and vice versa, while the existence of morphological compounds such as *weʔ-ɲaɻʔ* 'be thirsty' blocks a syntactic paraphrase. Booij (2010:19) suggests using blocking as a test of conventionality (i.e. listedness in the lexicon), and here we can infer that while lexicalised compounds such as *weʔ-ɲaɻʔ* 'be thirsty' are listed, true incorporation constructs are not; rather, they are produced 'on the fly' in the same way that syntactic expressions are, which similarly do not block and are not blocked by paraphrases.

Secondly, incorporated nouns are syntactically active for a number of processes. They can be externally modified by numerals (9), demonstratives (10), possessive determiners (11), and other modifiers.[10]

Wubuy

(9) ŋa-ni-**ɭanar**-wawajuwaa **na-wulawaa**
1sg-3MASC-nail-cut.PC MASC.TOP-two
'I cut two [toe]nails.'

(10) ŋaja **anaani** ŋa-**ɭanar**-wawajuwiini, ŋajacpac anaani
1sg NEUT.PROX 1sg-nail-cut.REFL.PC 1sg.FOC neut.prox
'I cut this/these [toe]nail(s).'

(11) na-ɭanar ŋajawiɲiɲuŋ ŋa-ni-ɭanar-wawajuwaa
MASC.TOP-nail 1SG.GEN 1SG-3MASC-nail-cut.PC
'I was cutting off my nails (MASC).'

[10] A reviewer questions whether it is indeed the incorporated noun being modified in such examples, drawing attention to the fact that incorporation could be regarded as a kind of copying rule (since quite often the same noun appears both incorporated and externally) and in that case, given the well-known characteristic of non-configurational languages that NPs may be covert, the modifier could then be regarded as modifying the covert NP instead. The second part of this proposal appears to be unfalsifiable, since it appeals to covert linguistic items which will leave no trace in the syntax. However, reasons to dismiss the first part (copying) are provided in Heath (1984: 464): (1) there are a number of suppletive pairs (as discussed above), or other morphological or semantic differences between independent and incorporated forms; (2) most nouns cannot be incorporated at all; (3) even when incorporation is possible, it is normally optional, so we still have to explain why/when it occurs; (4) there is no straightforward way of predicting which argument might incorporate or, conversely, what relation the incorporated noun has to the event structure (see Baker 2014).

Modification of the elements of lexical compounds, however, is completely impossible in Wubuy, as with compounds in English and other languages (see e.g. Lieber and Štekauer 2009). Evans (2003: 329) makes the same point with respect to Bininj Gun-Wok, providing these examples. In (12)a, we see an incorporated noun *yau* 'child' externally modified by the nominal form *daluk* 'woman; female', while in (12)b, we find that the noun *djol*, a constituent of the N+V compound *djol+ga+*'carry in pouch' cannot be externally modified by an adjective such as *gimuk* 'big'.[11]

Bininj Gun-wok

(12) a. *al-daluk* *gabi-yau-garrm-e*
FEM-female 3/3-child-have-NP
'She has a female child/a baby daughter.'

b. **an-gimuk* *ga-yau-djol + ga-n*
MASC-big 3-child-pouch + take-NP
'It is carrying a baby in its big pouch'

Perhaps more surprisingly, incorporated nouns in Wubuy can be coordinated with external nouns, as discussed in Baker et al. (2010); see also Evans (2003: 453) for examples in Bininj Gun-Wok. In (13), for example, the incorporated noun *wutu* 'liver' is coordinated overtly with a number of other body parts (and thereby violates Ross's (1967: 161) Coordinate Structure Constraint; see Baker 2014).[12]

Wubuy

(13) wiri-**wutu**-miŋ, **mari** **aṇṯiɻi**,
3pl/NEUT-liver-get.PP and heart

mari **pakaɭaŋ** wiri-ma-ŋarkiwaŋ
and eye 3pl-VEG-cut.out.PP
'They got the liver (NEUT), and heart (NEUT), and the eye (VEG) they cut out.'

In such constructions, as shown by Baker et al. (2010), all the coordinands must be at the same syntactic level. If the verb agrees with the incorporated noun, then all the external coordinated nouns must be in direct argument functions (subject or object). If the verb agrees with the possessor of the incorporated noun, then all the coordinated nouns must be in the 'relational' noun class form, which Baker et al. (2010) argue is a kind of oblique marking. In short, it is clear that incorporated nouns are 'visible' to syntax, in a way that bound morphemes are ordinarily expected not to be.

[11] Bininj Gun-Wok examples are presented in the orthography of the source (Evans 2003).

[12] Alternatively, the utterances initialised with *mari* 'and' could be regarded as a kind of afterthought construction akin to phrases with English 'and furthermore'. In practice, it is difficult to know which is the appropriate analysis for each case (see Heath 1984: 540).

For the Gunwinyguan languages, then, we are therefore dealing with both 'syntactic compounds' and 'lexical compounds' in Booij's (2010) sense, i.e. constructions of the forms in (14). In (14)a, the construction as a whole is of category A because its right-hand member is A.[13] It also has a constituent of category N. This constituent is 'visible' to syntactic procedures such as agreement, external modification/determination, and coordination. The semantics of this construction specify meanings for both the constituents as well as the construction as a whole. In (14)b, the whole compound is a V, but it has no internal constituents visible to syntax. The noun *we?* 'water' cannot be externally modified or coordinated with another constituent, nor can it be referred to, excorporated or deleted under identity. Here, the semantics is simple, not complex: there is no meaning associated with the (historical) components of the construction.

(14) a. $[[piɲi]_{Nk}{}^{0}[ŋolkko]_{Ai}{}^{0}]_{Aj}{}^{0}$ $[SEM_i$ with relation R to $SEM_k]_j$
'big water': Syntactic compound

b. $[[we?][ɲaɻ?]]_{Vj}{}^{0}$ $[SEM]_j$
'be thirsty': Lexical compound

Under CxM, both of these constructs are products of the lexicon; so, there is no sense in which (14)b is 'lexical' while (14)a is 'syntactic' (c.f. Baker 2014). Here, the difference between them is captured by the categorial signatures associated with the constituents, and by the interface between the morpho-phonological parts of the schema and the semantic interpretation. Since the compounded noun *we?* 'water' lacks a categorial signature in (14)b, it is not visible to constraints on syntax which apply to larger constructs in which it might appear, unlike *piɲi* in (14)a. Indeed, we could just as easily argue that the correct representation of (14)b is (15). Here, the compound lacks any internal structure, consistent with its semantics.

(15) $[we?ɲaɻ?]_{V}{}^{0}$ 'be thirsty'

A prediction of this representation is that we don't expect to find other compounds modelled on this one, where other nouns can occur in the place of *we?*, with meanings that we can relate to (15). This is true of Ngalakgan, and could be taken as an argument in favour of the 'unstructured' representation in (15). However, the prosodic structure of this word argues against this representation; this is discussed in what follows.

There are essentially two kinds of compounds in Ngalakgan, prosodically speaking. On the one hand there are those where each constituent functions as a

[13]The reasons for regarding N-Adj compounds in Gunwinyguan languages as category A, rather than category N, are discussed in Baker and Nordlinger (2008). In brief, in Bininj Gun-wok, which distinguishes between gender on heads and gender on modifiers, N-Adj compounds agree for gender like the corresponding adjective, rather than showing the gender appropriate to the corresponding noun. In addition, in all Gunwinyguan languages with incorporation, N-Adj can take verbal subject agreement and tense-aspect-mood morphology, which is not available to the kinds of nouns which can be incorporated. In short then, their morphological characteristics follow if they are treated as adjectives.

metrical domain, and there are those where the internal constituents are 'invisible' to metrical structure. Examples of each are provided in (16). I refer to compounds like those on the left (a–c) as 'root-level' compounds, and those on the right (d–f) as 'word-level compounds' (following Selkirk 1982; Borowsky 1986). The differences between them are both prosodic and semantic. Root-level compounds constitute a single metrical domain: they are stressed as if they had no internal constituents. Barring internal heavy syllables, root-level compounds receive a single stress on their initial syllable, like simple roots in Ngalakgan. Word-level compounds behave quite differently. Each constituent of a word-level compound behaves as a separate metrical domain, receives a stress accent on the initial syllable, and, if an open monosyllable, undergoes vowel lengthening (as in examples d and e) to meet word minimality requirements.

(16) Ngalakgan

a. [gɔ̰ŋan]
/koʔ+ŋa+n/
have+SEE+PRES
'have (Present)'

b. [gɔ̰ŋaniɲ]
/koʔ+ŋan+iɲ/
have+SEE+PC
'have (Past Contin.)'

c. [míɲɟɪppʊn]
/miɲci+ppu+n/
remember+HIT+PRES
'remember (Present)'

d. [wɛ̀ɛ̰máa̰]
/weʔ-maʔ/
water-good
'good water'

e. [ŋɔ̀ɔ̰ˀmáŋiɲ]
/ŋoʔ-maŋ+iɲ/
guts-get+PC
'get guts (Past Contin.)'

f. [mɛ̀lḛŋán]
/meleʔ-ŋa+n/
lest-see+PRES
'might see (Present)'

In addition, the interpretation of root-level compounds is idiosyncratic. The examples in (16)a–c are all 'coverb' compounds: compounds of an inflecting finite verb root (to the right), of which there are around 30 in Ngalakgan, together with one of the hundreds of uninflecting 'coverb' roots (to the left) which can typically not occur in any other function, and which often have a meaning that is specific to the compound in which they occur. The semantic contribution of the finite root is also typically not compositional, as can be seen from these examples. There is no sense in which, for example, the meaning of 'have' includes the meaning of 'see'. The majority of verbs in Ngalakgan are formations like those in (16)a–c. The semantics of the word-level compounds in (d–f) is fully compositional, as described for the incorporation structures above, of which (d–e) are further examples. Therefore, root-level compounds are always 'lexical compounds', in Booij's (2010) sense, while word-level compounds are typically 'syntactic compounds', with a class of exceptions to be discussed below.

If the constituents of the word-level compounds in (d–f) are regarded as Prosodic Words, then from this follows their other prosodic characteristics (constituting a

metrical domain, and requiring word minimality)(Baker 2008a). The fact that these constituents are Prosodic Words in turn follows from two things: firstly, the fact that each constituent of a word-level compound/incorporation is listed separately in the lexicon (as part of a schema containing open variables) and, secondly, a constraint in the grammar that says that 'Morphological Words' should correspond to (be prosodified as) Prosodic Words, where 'Morphological Word' is a stem associated with one of the three major lexical categories of Ngalakgan (Noun, Verb or Adjective), and a 'stem' is a morphological form which is capable of being an independent word or which can compound with another stem at the word-level (i.e. can feed a productive word-level morphological process of some kind: this is formalised in Sect. 5). This requirement is a version of the general 'MCat ≈ PCat' templatic constraints of McCarthy and Prince (1993,139). In terms of Booij (2010), word-level compounds therefore are licensed by schemas like that in (17), for the incorporable noun *piɲi* 'water'. The schema captures the fact that the string *piɲi* contributes a consistent semantics and is consistently realised as a Prosodic Word in the phonology of the compound. It is a Morphological Word in virtue of the fact that it is coindexed with a major lexical category (N), and can unify with other Prosodic Words (represented by the open variable X), of category Adj; it therefore forms compounds of the 'syntactic' type productively.

(17) $<[[\text{piɲi}]_{\text{i-}\omega}\ X_{\text{j-}\omega}]_{\text{k-}\omega} \longleftrightarrow [[N]_i\ Adj_j]_{Ak} \longleftrightarrow [Qual_j\ ([_{Entity}\ \text{water}]_i)]>$

The individual constituents of the root-level compounds, by contrast, need not be listed, as in the discussion of *we?-ɲaɻ?* 'thirsty', above at (15), although I informally assume referral rules to account for the fact that the finite verb compound of root-level compounds always inflects in an identical fashion to the related independent finite verb.[14]

As argued above, *we?-ɲaɻ?* is like the root-level compounds in (16)a–c in that its interpretation is non-compositional (idiosyncratic) and, like them, it is also an unproductive formation. However, unlike them the prosodic structure of this compound is of the word-level type, like (16)d–f. This is therefore an instance of a type characterised by Baker and Harvey (2003) as 'word-level and unproductive': words with internal prosodic constituency, but having idiosyncratic morphological relations. These kinds of structures are not uncommon in Australian languages, particularly in the case of compounds and lexicalised reduplication structures.

We therefore have at least the following kinds of compounds, broadly speaking, in Gunwinyguan languages (see Table 1). Word-level compounds—incorporation constructions—are compositionally interpreted, have constituents which are separate PrWds, and which are visible to syntax. Root-level compounds are not (necessarily) compositionally interpreted, and have constituents which are not visible to syntax. Whether or not the constituents constitute separate Prosodic

[14]This behaviour could be captured in terms of the largely unproductive constructional schemas suggested by Booij and Audring (this volume) which, as in (15), associate a whole word form with a single meaning.

Table 1 Kinds of compound/incorporation structures in Gunwinyguan languages

	Root-level	Word-level
Compositional	No	Yes
Separate PrWds	Yes/no	Yes
Syntactically visible	No	Yes

Words is lexically determined: part of a compound's lexical entry. To some extent this appears to depend on whether each constituent exists as an independent element of the lexicon. Coverbs commonly have no existence independent of the lexical compounds in which they occur, as in (16)a–c, while other kinds of lexical compounds, such as *we?-ɲaɻ?* 'water-die' may consist of elements which do occur independently or in other combinations, but which happen not to have their usual interpretations in some instances, and which therefore must be lexically specified.[15] Table 1 sets out these broad characteristics.

In Sect. 5, I consider how we might model these structures in the lexicon, but first, I discuss the evidence for this morphological distinction in the behaviour of speakers.

4 The Word-Level/Root-Level Distinction in Psycholinguistic Behaviour

What evidence do we have for the 'root-level' vs 'word-level' difference in morphological relations? Apart from prosodic characteristics, and semantic interpretation differences, there is also the behaviour of speakers, both their spontaneous productions, and their judgements of linguistic forms. In (18) are two examples of the kinds of utterances that speakers produce when asked to 'speak slowly' for the benefit of linguists, children and other linguistically deficient interlocutors. In these 'pedagogical' productions, super-complex words are broken up into a series of individual 'word-like' pieces typically separated by audible pauses. Such productions are common, and are produced by all speakers of all Australian languages with whom I have worked.[16]

These pedagogical forms reveal some very interesting properties of super-complex words. Firstly, note that the word 'pieces' correspond to morphemes in

[15]Except that coverbs belonging to the largest verb class, the open conjugation taking *mi-* as a finite verb, appear to have a high degree of salience, in that their meanings can be discussed by speakers, they always constitute Prosodic Words, and they can sometimes be 'excorporated' from the complex verb and occur preposed, or even independently; see (Baker and Harvey 2003).

[16]These languages principally include Ngalakgan, Ngandi, Marra, and Wubuy. All except Marra are incorporating, polysynthetic and probable members of the Gunwinyguan family. Note that this behaviour cannot be attributed to literacy: the majority of the speakers of these languages are functionally illiterate. Only a small number of Wubuy speakers have acquired literacy in the language.

the linguistic analysis, and not necessarily to single syllables, nor to metrical feet or stressed positions in the normal speech form presented underneath each example. Secondly, note that not all morphological constituents that a standard linguistic analysis would identify are separated by speakers. In particular, the root-level compound *woc+ma* 'steal' and the inflected finite verb form *ŋa+n-cci* 'see+EVIT-NEG' are not internally divided by speakers, even though each is disyllabic. Thirdly, note that word-level, productive morphemes such as the inflectional prefixes are also separated, even though they do *not* constitute metrical domains in these word forms (Baker 2008a).

		Ngalakgan	
(18)	a.	/jiriŋ-pi-pak-woc+ma/	[jírɨŋ]^[biː]^[bak]^[wɔ́cma]
		1pO-3p-APPL-steal+GET.PRES	'they always steal from us'
		fluent speech: [jirɨŋbibakwɔ́cma]	
	b.	/ŋur-ku-kamala-ŋa+n-cci/	[ŋʊr]^[guː]^[gámala]^[nánɟi]
		12pS-NEUT-sky-see+EVIT-FNEG	'we can't see the view (NEUT)'
		fluent speech: [ŋʊrgugàmalaŋánɟi]	

When morphemes are thus separately pronounced, they are pronounced as minimal words, and receive a stress accent on their initial syllable (if they are polysyllabic), and undergo vowel lengthening if they are subminimal, as is the case with the prefixes *pi-* and *ku-* in (18). They thus satisfy the criteria for Prosodic Word in Ngalakgan discussed in the previous section.

Such behaviour constitutes powerful evidence for the view of morphology espoused here, that speakers have access to the internal structure of words in Ngalakgan and Wubuy, and that they address this structure when producing forms such as (18). More specifically, this pausing behaviour argues also for a distinction in the minds of speakers between transparent, productive, 'word-level' morphology and opaque, unproductive 'root-level' morphology. It is only the former which provides suitable positions for pauses.[17]

We find further evidence for this approach from the judgements of speakers when presented with word forms like those in (18) under experimental conditions. In Baker and Bundgaard-Nielsen (2016), 12 Wubuy speakers were presented with super-complex words in a two-alternate forced choice paradigm. Each aural presentation contained a pair of words which were morphologically identical. The pairs were of two types: a 'natural' (fluent) form and the same form containing an artificially inserted period of 500 ms of silence, designed to imitate pause, or two morphologically identical forms with 500 ms of artificially inserted silence at different positions in the word. The stimulus examples are shown in Table 2. Pauses were inserted in one of four positions:

[17] I am aware of no research which specifically targets 'pedagogic' productions of this kind, so at this stage I can only speculate about what it tells us.

Table 2 Stimulus list in Wubuy with translations

Natural speech	Legal breaks	Illegal breaks
ŋa-ˌɻuluc-kulˈt̪aŋi	ŋa-ˌɻuluc-#kulˈt̪aŋi	ŋa-ˌɻuluc-kul#ˈt̪aŋi
1sg-shade-cut.through.PC		
'I cut the bough shade'		
a-ˌjina-ŋu-cuˈɻang	a-ˌjina-#ŋu-cuˈɻang	
1/2sg.IRR-head-Ø-push.FUT.P	a-ˌjina-ŋu-#cuˈɻang	
'I'll push your head'		
ŋan-ˌcina-kaˈlaɭic	ŋan-ˌcina-#kaˈlaɭic	ŋan-ˌci#na-kaˈlaɭic
1sg.IRR-head-wet	ŋan-#ˌcina-kaˈlaɭic	
'My head will get wet'		
ŋani-ˌjina-ŋu-ˌkucukuˈcaani	ŋani-ˌjina-#ŋu-ˌkucukuˈcaani	ŋani-ˌjina-ŋu-ˌkucu#kuˈcaani
3masc/1sg-head-Ø-tickle.PC	ŋani-ˌjina-ŋu-#ˌkucukucaani	
'He tickled my head'	ŋani-#jina-ŋu-ˌkucukucaani	

From Baker and Bundgaard-Nielsen (2016)
'#' indicates location of inserted pause of 500 ms

(A) between an incorporated noun and a verb stem, or between an inflectional prefix and an incorporated noun;
(B) between the two halves of a frozen reduplicated verb stem;
(C) between the coverb and finite verb root in a root-level compound; or
(D) within a morpheme (such as *jinak* 'head').

We regard the first type (A), as a 'legal' pause boundary, because the relationship between the parts of the word thus separated is transparent in the sense discussed in Sect. 3, i.e. is a word-level boundary, and types (B, C, D) as 'illegal' pause boundaries, reflecting differences in semantic and morphological transparency of each of the parts. Note that when an utterance is so divided, neither part constitutes a licit word in Wubuy in this context, regardless of the type of boundary.

The utterance order was counter-balanced, and trial order pseudo-randomised. Participants were asked to indicate, for each pair, which word was 'better'. Instructions were given in both English and Wubuy.

Type A is illustrated by example (1), as discussed above. Type B is illustrated in Table 2. While verbs reduplicate productively in Wubuy to indicate distribution in time, space or participants (Heath 1984), there also exist many lexemes in the language which are 'inherently' reduplicated. These lexemes do not occur in an unreduplicated form, and do not have the meanings associated with productive reduplication. For example, the verb /kucukuca-/ 'tickle', in Table 2, only ever occurs in this inherently reduplicated form 'and furthermore, it doesn't have the form predicted by the regular reduplication rule (Heath 1984: 37), which would be /kukuca-/. We therefore infer that the parts of this verb are not independently meaningful for speakers, and /kuca/ is not a word of Wubuy. Type C is illustrated by the verb form /wulṯa-/ 'cut'; which in our stimulus list always occurs in the 'hardened' form /kulṯa-/ (because it is in a hardening environment in all examples). This verb can be analysed historically as consisting of a coverb /wul(g)-/ and a

finite verb root /ṯa/, but synchronically neither of these elements is independently meaningful in Wubuy: it is a lexicalised coverb compound like those discussed above for Ngalakgan at (16). Unlike the Type A situation then, all three of Types B, C, D present speakers with word parts, separated by pause, which (we hypothesised) carry no independent meaning. The final relationship tested was that between the meaningless string *ŋu-*, also illustrated in (1), and a preceding or following stem. This string has no meaning in Wubuy: it is inserted by morpho-phonological rule and precedes all stems beginning in underlying stops when in a specific phonological or morphological environment; it is glossed as 'Ø' in Table 2. We hypothesised that the occurrence of *ŋu-* on either side of a pause would have no effect on participant judgements of pause legality (and thus these examples were also categorised as Type A).

We inserted 500 ms of silence to ensure that the artificially generated pause is on par with (or longer) than the majority of the pauses identified between lexical morphemes in an acoustic analysis of the stimulus items provided by a native Wubuy speaker (see Baker and Bundgaard-Nielsen 2016). This is also close to the average found across deliberate pauses in a recent study of French and German speakers (Trouvain et al. 2016).

Mean results for the 10 participants who completed the task are presented in Fig. 1. One-sample *t*-tests against chance (50%) show that Natural (N) (i.e. unmodified) utterances are preferred over illegal (IL) pause-inserted utterances (79%; $p < 0.001$), and Legal (L) pause-inserted utterances are also preferred over illegal (IL) pause-inserted utterances (85%; $p < 0.001$). Interestingly, the preference pattern for natural utterances (N) over legally modified utterances (L) did not differ from chance (61%; $p = 0.068$).

To test the hypothesis that natural (N) and legal (L) utterances are preferred over illegal (IL) utterances, we also conducted a one-way ANOVA. Results indicated that the participants did indeed respond differentially to the N > IL, L > IL, and N > L conditions ($F(2, 27) = 6.352$, $p = 0.005$). Bonferroni-corrected post-hoc

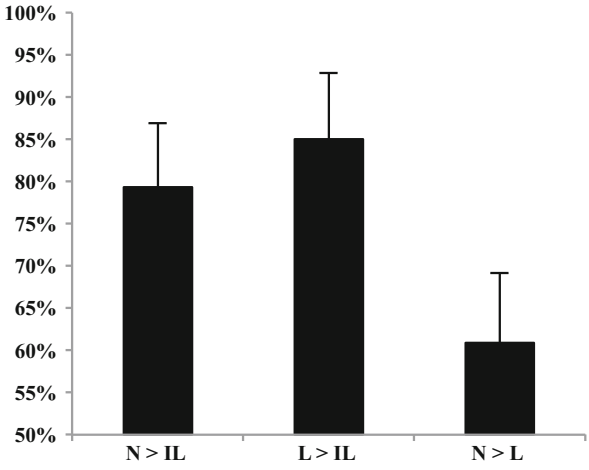


Fig. 1 Mean preferences for each pair type. N = natural utterance; L = pause inserted at a 'legal' boundary; IL = pause inserted at an illegal boundary. Error bars indicate positive SD (Baker and Bundgaard-Nielsen 2016)

comparisons revealed that the preference pattern for N > L differed from the preference pattern for both N > IL ($p = 0.044$) and L > IL ($p = 0.006$). The preference pattern for N > IL and L > IL did *not* differ ($p = 1.000$), indicating that the strength of the preference for N and L utterances (over IL) was comparable.

We also examined individual preference results, which differed for the L > N utterances: seven participants preferred the natural utterances (N > L), while three listeners preferred the legal utterances (i.e. with artificially inserted pause) over the natural ones. This suggests that speakers might in fact prefer complex words to have internal pauses, because they are easier to process, as has also been suggested for English utterances (MacGregor et al. 2010).

Therefore, the existing psycholinguistic evidence suggests that speakers of languages with super-complex words have access to the internal structure of words, sufficient to allow them to make judgements of acceptability in the locations of deliberate pauses within these constructs. Moreover, there is no evidence that word-internal pauses are dis-preferred (the preference for Natural over Legal did not differ significantly from chance); on the contrary, some speakers appear to favour them. Importantly, we find evidence that not all morphological boundaries are equally salient or capable of hosting a prosodic break: it is just those boundaries which divide meaningful constituents which are usable for this purpose. Only word-level boundaries have this characteristic.[18]

This last result both backs up the difference between 'word' and 'root'-level morphology proposed here and also points to processing as the key to understanding this behaviour. Pause judgements and pedagogical productions both carve up the word at its word-level joints, never at root-level junctures. Word-level junctures are therefore 'visible' for both these purposes in a way that root-level junctures consistently are not. The literature on pause (to the extent that it is understood at all) points to a function in speech planning, mapping of utterances to prosody or both. I have used 'processing' in this broad sense.

Judging by the pause results, then, Wubuy speakers appear to be processing words in a similar fashion to the way in which complex phrases are processed and produced by speakers of English. This then raises the question of what kind of lexicon is responsible for this processing behaviour. In the next section, then, I turn to a consideration of how to model the behaviour of speakers in a Constructionist grammar.

[18]The only position where pauses are dispreferred but where the constituents on each side might be said to carry meaning is that between a verb root and its inflection. There are notable differences, however, between this juncture and the 'legal' junctures described here: tense inflection never functions as a metrical domain in Wubuy or the other languages described here; the root or stem to which tense inflections attach never occurs on its own (without overt tense morphology) in Wubuy; and the tense inflections themselves are highly specific to particular conjugations of verbs (of which there are around 26 identified by Heath 1984: 407ff). All of these factors conspire to make verb roots/stems rather opaque in Wubuy and in many other Australian languages (see Baker and Harvey 2003).

5 Modelling Super-Complexity in the Lexicon

In this section I consider a formal description of super-complexity. For the most part, I will follow previous models of morphology in this theory, such as Jackendoff (2002), Baker (2008a), and Booij (2010). However, there are special problems raised by these kinds of languages which to date are yet to be addressed satisfactorily, in my view. Firstly, there is the relatively technical problem of representing templatic structure using schemata, something which turns out to not have a trivial solution. More importantly perhaps, there is the issue of how to capture the kind of behaviour reported in the preceding sections: the nature of interpretation of super-complex words, and the fact that they appear to allow for internal prosodic junctures at higher levels of the prosodic hierarchy such as Intonation Phrase (Fletcher 2014).

One way to model the structure of super-complex words in GN languages is via the schema mechanism, as in (14), repeated below as (19) (following Booij 2010: 17). (19) represents a pair of specific instances of constructs. (20) represents the 'schema' in the lexicon which abstracts over these instances, and which licenses the creation of new instances of the same kind in the case of syntactic compounds like (19)a, but not in the case of morphological compounds such as (19)b because in this case there is no relationship between the parts and any individual meanings.

(19) a. $[[piŋi]_N{}^0[ŋolkko]_A{}^0]_A{}^0$ 'big water' Syntactic compound
b. $[[weʔ][ŋaɻʔ]]_V{}^0$ 'lit. water die; be thirsty' Morphological compound

(20) a. $[[X]_{Nk}{}^0[Y]_{Ai}{}^0]_{Aj}{}^0$ $[SEM_i$ with relation R to $SEM_k]_j$
b. $[[X][Y]]_{Vj}{}^0$ $[SEM]_j$

However, such schemas have until now been used to model rather simple structures, consisting of just a few elements, as in the schema for Greek relational adjectives with a compound base, such as *psixr-o-polem-ikos* (cold-LINKR-war-ADJZR) 'cold-war-like' (Booij 2010: 182).

(21) $[[A\text{-}o\text{-}N]_N$ *-ik-os*$]_A$

It is by no means clear how we could apply such a model to the super-complex words of Gunwinyguan languages. For one thing, each potential 'slot' in the template would require its *own* schema, since all of these slots can be combined productively with elements of the right type. Take an affixed noun in Ngalakgan, for example. The template in (22) presents the maximal structure and order of morphemes in words of nominal category in Ngalakgan, whose nominals are particularly complex (closely related Rembarrnga—McKay 1975—is similarly complex). I present this template, pre-theoretically, simply as a statement about type and order of form classes in the word. I discuss below how we might implement this word structure in terms of lexical schemas. Nominals in Ngalakgan begin in a noun class, which is optional, as in Wubuy. Depending on the type of nominal head, a compounded or incorporated stem may precede the head noun root (see

below). Following the obligatory head, there are three distinct slots for three separate paradigms of functions: pronominal possessors (expressed by a paradigm of Dative pronouns), number, and case. An example of a word expressing all these slots (except the bound stem) is shown in (23).

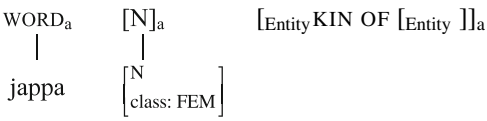
(22) [(NC-) (Bound stem-) N (-Dative pronoun) (-Number) (-Case)]$_N$

(23) cu-jappa-ŋki-ppulu-kka?
FEM-sister-2mDAT-PL-LOC
'at your (sg.) sisters'

Where the head is a body part noun, it is possible to compound these with other body part nouns to form derived part terms such as *mo-mol* 'knee-sore; a sore on the knee'.[19] However, if the nominal construction is headed by an adjective (rather than a noun, as in (22)), then the full range of incorporated nouns can occur in the 'bound stem' position, as well as the full set of case-marking, number, possession, and noun class morphology. This is because adjectives can function either as predicates (verbs) or as referential items (nouns).

The template in (22) stipulates linear order of each of the slots in a maximal expansion of the word. The slots cannot be rearranged, and so the order must be stipulated somehow. However, because of this complexity, the usual means of deriving complex forms—schema unification (as in Booij 2010: 46)—will not produce the right result in this case. Suppose that each of the word-level morphemes in (22) has its own entry as part of a schema in the lexicon (Baker 2008a: 108ff). For Ngalakgan nouns, then, we would have entries such as these, corresponding to the example in (23). (24) is an entry for the noun head 'sister'. (25), (26), and (27) are the entries for the pronominal possessor, number, and case suffixes, respectively. Each entry, apart from the free morpheme *jappa* 'sister', specifies a subcategorisation requirement in terms of morpho-syntactic categories and phonological/prosodic constituents, as well as linear order and hierarchical inheritenance, as is standard in this approach.[20]

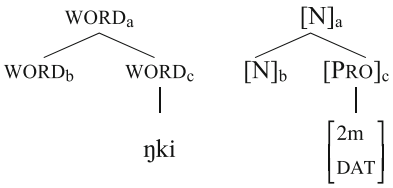
(24)



[19]The noun *mol* 'a sore, pustule' counts as a bodypart for this purpose, as in Bininj Gun-wok. Similarly with other nouns having denotations that are classified as parts of humans such as 'shadow', 'name', 'footprint' and so on.

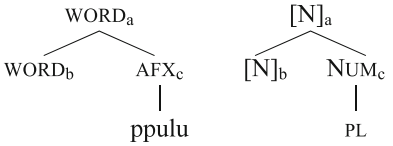
[20]I have used tree diagrams rather than labelled brackets here simply for ease of visualisation, but as usual these are translateable into the labelled bracket notation used in Booij (2010).

(25)



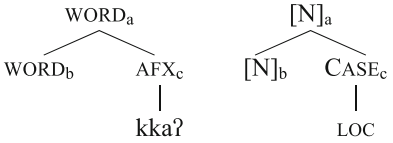
[Entity b OF/FOR ([Entity 2 min])c]a

(26)



[Entity PLURc ([Entity SEM])b]a

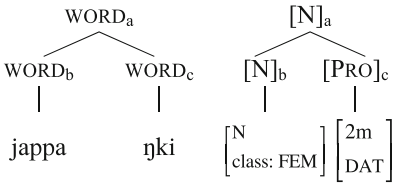
(27)



[State BE ATc ([Entity SEM])b]a

Ordinarily, multiple schemata such as these should be able to unify, provided their subcategorisation requirements are met (following general proposals for Tree Adjoining Grammar formalisms: Joshi and Schabes 1997). Hence, merging (24) with (25) produces (28). Here, the N of (24) *jappa* has merged at the empty N place in the syntactic representation of (25) *-ŋki*, with concomitant fill-in of the associated phonological and semantic features.

(28)



[Entity KINb OF ([Entity 2 min])c]a

The same process will build the word in (23), from the entries listed above; but, by itself, this will over-generate possible word forms. While the entries in (24)–(27) *can* unify to produce a form such as (23), by incrementally applying unification to stems created by unifying other entries, we can also produce such forms as those in (29), which are *not* possible word forms of Ngalakgan (or any other Gunwinyguan language), because they violate the linear order of morpheme classes specified in the template in (22). Since all of the entries for the bound morphemes in (25)–(27) have the same subcategorisation requirements (that they attach to a constituent of type 'word', which is of category 'N') then by themselves the entries cannot enforce a particular order, so non-existing examples like (29)a are also generated by

these entries. By themselves, lexical entries plus unification will not even prevent multiple attachment of bound morphemes, as in (29)b, without further restrictions on the grammar of some kind.

(29) a. *jappa-ppulu-kka?-ŋki, *jappa-kka?-ŋki-ppulu, *jappa-kka?-ppulu-ŋki ...
b. *jappa-ppulu-ppulu, *jappa-ppulu-ppulu-ppulu, *jappa-ppulu-ppulu-ppulu-ppulu ...

Therefore, it seems that the simple combination of lexical entries and unification is insufficient to derive the characteristics of super-complex words in languages like Ngalakgan and Wubuy. We also need to constrain the order of these morphemes somehow.

One way to do this is to assume that all word configurations (abstractions over the order of template positions) are also listed in the lexicon. If we use a hierarchical model of the lexicon, then we would need sub-templates—schemata—in the lexicon to model the correspondences between all possible expansions of the six slots, where one of these is obligatory and the others are all optional. This gives us $2 \times 2 \times 2 \times 2 \times 2 = 2^5 = 32$ possible word configurations.[21] This is without taking into account any kind of hierarchical dependence between the slots. A subset of these correspondences is shown in (30).

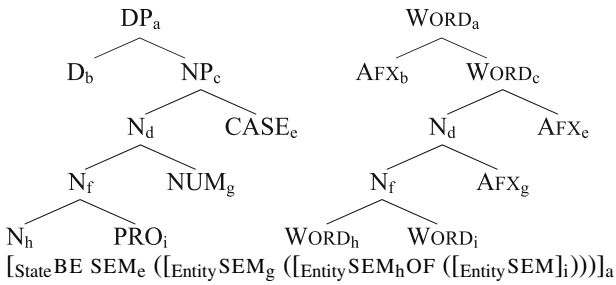
(30) [NC-Bound stem-N-Dative pronoun-Number-Case] ⟷ [Bound stem-N-Dative pronoun-Number-Case] ⟷ [NC-N-Dative pronoun-Number-Case] ⟷ [N-Dative pronoun-Number-Case] ⟷ [NC-Bound stem-N-Number-Case] ⟷ [NC-Bound stem-N-Dative pronoun-Case] ⟷ [NC-Bound stem-N-Dative pronoun-Number] ⟷ [NC-Bound stem-N-Dative pronoun-Number-Case] ⟷ [NC-Bound stem-N-Dative pronoun-Number-Case] ...

This is probably the preferred solution within Constructionist models. However, the schemata in (30) are entirely abstract (not linked to any phonological substance), and also elaborately inter-linked. One wonders how valid this can be as a representation of the cognitive process behind the production and processing of complex words in these languages.

Alternatively, we could assume that the template itself was a lexical entry (like the lexical entries for clauses and NPs proposed in Jackendoff 2002), constraining the possible word configurations which lexical entries could attain through unification. (31) represents a template—*qua* lexical schema—for kin nouns in Ngalakgan, following Baker (2008a:122), with 'SEM' representing the content of the morphemes involved, as in Booij (2010).

[21] Thanks to Thomas Britz for discussion on this point. More generally, we can say that a word with n optionally filled slots in its template will have 2^n possible word template configurations.

(31)

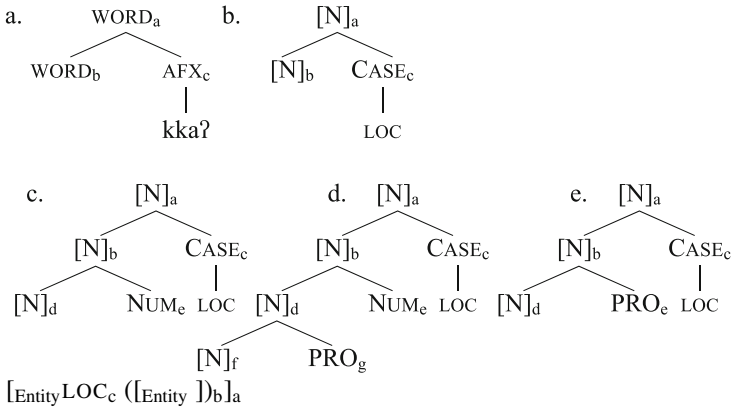


The only difference between (31) and the classical template in (22) is that the tree in (31) has hierarchical structure, with the implication that there are scope and headedness differences among the positions in the template. There are also syntactic labels associated with the positions, implying that noun classes are somewhat like determiners, and that nouns with prefixed noun classes behave like DPs (Baker 2008b). Note that the bound morphemes—except the prefix—do not behave as heads for the structure. This is appropriate for GN languages. All three of these bound morpheme types (pronominal possessors, number, and case) can attach promiscuously to lexical roots of all types (nouns, adjectives and verbs), so they cannot determine the head of the word. The syntactic category of the word is determined by the rightmost lexical root (Baker 2008a; Baker and Nordlinger 2008), and this in turn determines such things as which paradigm of inflectional prefixes is licensed for the word. Apart from these differences, the structure in (31) is like a template in that it is purely stipulative however. It also has other undesirable features. It lacks a substantive (phonological) lexical entry, violating some versions of Constructionism (e.g. Goldberg 1995) although not Jackendoff's (2002) model. It also requires that, for instance, the lack of an overt number, case or possessor morpheme still has associated with it a substantive interpretation. Since number in Ngalakgan, Wubuy and other Gunwinyguan languages is in general limited to nouns with human denotations, it seems more valid to assume that many nouns genuinely lack the grammatical category 'number' altogether. But even human nouns can be ambiguous in this regard, so it is not possible simply to suggest alternative templates depending on noun sub-category.

The third possibility, suggested to me by Mark Steedman (p.c.), is that the lexical entries involving bound morphemes specify all of the possible environments in which they may occur; this is the general approach both in Tree Adjoining Grammar (e.g. Joshi and Schabes 1997) and in Combinatory Categorial Grammar (e.g. Steedman and Baldridge 2011). The entry for a case suffix like *-kka?* LOC for instance would include the information in (32). Here, the morpho-phonological component of the lexical entry hasn't changed: *-kka?* is still specified as an entry of type 'Affix' which combines with an entry of type 'Word' to form a complex entry of type 'Word'. What has changed here, compared to (27), is the morpho-syntactic specifications. Along with the simple specification, carried over from (27), that attachment of *-kka?* results in a noun with the meaning 'Locative', we also have more elaborate specifications telling us that attachment of *-kka?* can also result in a

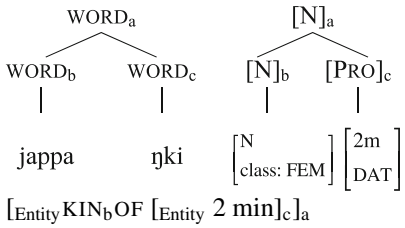
morpho-syntactic array that includes 'Number' and/or 'PRO' as lower categories in the tree, where these are in turn licensed by the occurrence of morphological strings associated with these features. That is, the syntactic array in (d) for instance is licensed just if the node labelled 'PRO' with index 'g' actually finds a phonological 'word' with the semantics of a pronominal possessor in the coindexed parts of the complex word that is the result of the tree-adjoining process. I presume that failing such correspondence, the derivation 'crashes' (in other words, is uninterpretable).

(32)

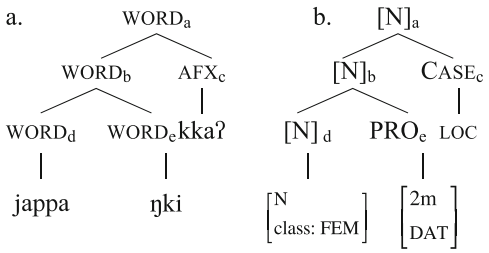


Given this approach, the array in (32)e for example will license a complex word ending in *-kkaʔ* which contains an inner bound stem dominated by 'Pro' and having the meaning 'Possessor'; that is, an entry like (28), repeated here as (33). (33) can unify with (32)e by matching the $[N]_b$ node of (32)e with the $[N]_a$ node of (33), and filling in the concomitant information as usual. The result is (34):

(33)



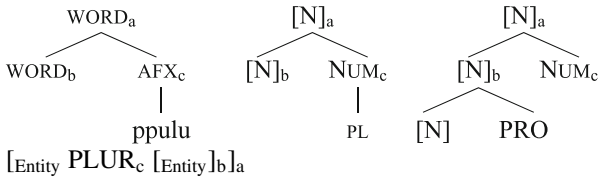
(34)



With these kinds of additional specifications, Locative-affixed nouns are licensed to create more elaborate words than either Number affixes or Dative

pronouns/possessors, as is fitting given their wide-scope functions in the complex noun. The entry for Dative pronouns will be the same as in (25), which means that Dative pronouns will not allow any bound morphemes to occur between them and the Word corresponding to the head of the complex noun. The entry for Number affixes will contain not just the information specified in (26), but also contain a further array licensing a bound Dative pronoun between the Number affix and the head of the noun, as shown in (35).

(35)



This new way of modelling super-complexity allows us to capture the differences in the hierarchical relations amongst the morphemic slots in the template, as well as the productivity differences. For example, Bybee (1985: 33–34) notes:

> Greenberg 1963 reports that when both number and case are present on the same side of the noun base, "the expression of number almost always comes between the noun base and the expression of case" (Greenberg 1963: 112). We would interpret this as having a principled basis: namely that the expression of number occurs closer to the noun base because it is more relevant to the meaning of the noun. Number has a direct effect on the entity or entities referred to by the noun. Case, on the other hand, has no effect on what entity is being referred to, but rather only changes the relation of that same entity to other elements in the clause.

I have not addressed the potential influence of scope on morpheme order in this chapter, because I am not convinced that it has a synchronic influence on the acquisition of grammar; but see e.g. (Bybee 1985; Manova and Aronoff 2010; Nordlinger 2010; Rice 2000) for further discussion.[22]

Like other productive morphology (Jackendoff 2002), all three of the affixal/bound stem positions following nouns specify only that they attach to words of a particular syntactic category, with the desirable result that their distribution is unconstrained except by the principles restricting order discussed above. That is, productivity is directly derivable from lexical entries themselves. Moreover, the independence of these schemata in the lexicon means that we are not required to use the full-listing approach for super-complex words. In addition, this approach

[22] One possible reflection of the scope differences among nominal inflections is their distribution in agreement. For Australian languages with gender systems, which are by far the minority, agreement for gender amongst constituents of NPs is the norm. Case agreement is also very common, though not especially among Non-Pama-Nyungan languages (see Dench and Evans 1988). Number agreement seems to be less common, although I am aware of no survey on this. I am aware of no instances of agreement for pronominal possessors (beyond the noun indicating possession itself) among Australian languages. These agreement differences reflect the relative scope differences among these elements captured schematically in (31), and deserve further scrutiny than can be afforded them here.

allows us to limit the occurrence of bound morphology to just those tokens where it is realised overtly (i.e. phonologically); we are not required to assume multiple 'zero' morphemes along with the well-known attendant problems that this brings (see Anderson 1992: 50).

Apart from the issue of templatic form, which is not limited to languages with super-complexity, there are at least two further issues which should be accounted for in this model of the lexicon. If we take seriously the results of the previous two sections—that there may be "word"-internal prosodic boundaries equivalent to Intonational Phrase, and that the interpretations of incorporation are always phrasal, rather than lexical—then this presents significant challenges to our current understanding of how words are listed. Furthermore, and in conflict with the preceding, we also need to account for the fact that "word"-internally, segments are subject to phonological rules which may apply across these IP boundaries, as well as other morpheme boundaries.

Consider an example such as (36), repeated here from Table 2. This word consists of an initial inflectional agreement prefix, an incorporated noun, and a verb.

(36) a ɟinakŋucuˈɻaŋ
wa-jinak-ŋu-cuɻaŋ
1/2sg.IRR-head-Ø-push.FUT.P
'I'll push your head'

In production (described in the preceding section), this word was consistently produced with a silent period between the incorporated noun /jinak/ 'head' and the following verb form /ŋu-cuɻaŋ/ 'push', as shown in the following representative screen shot from Praat (Fig. 2).

We can observe from productions like this that there is a high boundary tone associated with the final syllable of /jinak/, which can only come from an intonational phrase boundary of some kind: it is the first syllable, not the second syllable, which is stressed, so the peak in F0 in the second syllable of /jinak/ is not due to a pitch accent. The same syllable also appears to undergo lengthening, compared to the first syllable; this too can be attributed to its final position in

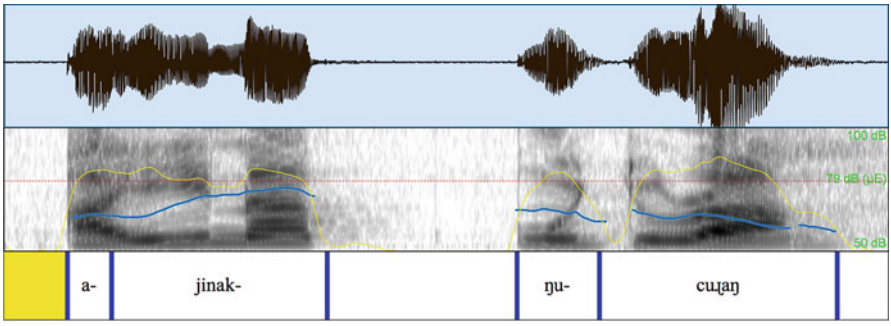


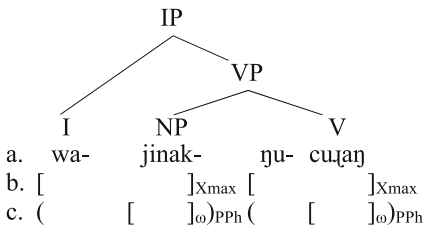
Fig. 2 Production of *a-jina(k)-ŋu-cuɻaŋ*

the intonational phrase (phrase-final lengthening). Both these characteristics of IPs are demonstrated also for the related language Dalabon, by Fletcher (2014). The silent period between the /k/ at the end of /jinak/ and the initial segment of /ŋu/ is 455 ms. So there is in addition a significant junctural pause associated with this boundary.

As discussed earlier, higher levels of prosodic constituency are normally associated with syntactic structure, in particular the edges of phrases (i.e. XPs). The standard model of Prosodic Phonology as first presented in, for example, Selkirk (1980) and in a number of works since (for a recent overview, see Selkirk and Lee 2015), maps the edges of prosodic constituents such as Phonological Phrase to the edges of syntax constituents such as PP (Prepositional Phrase) and VP (Verb Phrase), and the edges of lexical content words to the edges of Prosodic Word, according to preferences for left/right-edge specified in each language. This in turn suggests that the existence of word-internal prosodic boundaries associated with Accentual Phrase or Intonational Phrase (Fletcher 2014) in languages such as Wubuy and Dalabon might point to a word-internal structure which is, if not identical to, then at least commensurate with syntactic structure in other languages. Indeed, CxM predicts the existence of this kind of mismatch.

According to this model then, the prosodic phrasing of (36) might be as in (37):

(37)



According to this model of the prosodic phrasing of words in Wubuy, verb-internal nouns constitute the equivalent of the maximal projection of N in other languages, here represented simply as 'NP'. This N plus its governing V together constitute the maximal projection of V. The right edges of both these constituents are associated with the right edge of both a Prosodic Word and a Phonological Phrase constituent.

This model has a number of implications. Firstly, it enables us to derive the phrasal interpretations of incorporation structures without further stipulation: the interpretation simply follows from the fact that an incorporation structure combines a predicate with an argument and the rule-to-rule hypothesis (Bach 1976).[23] This applies equally to both incorporation into verbs and incorporation into adjectives.

[23]The rule-to-rule hypothesis can simply be characterised like so: "for every syntactic rule within the grammar, a corresponding semantic rule must be stated which specifies how structures of the sort analyzed by that rule are to be interpreted" (Gazdar 1985: 206). In this case, we would say that whatever produces the characteristic interpretations of nouns modified by adjectives in English (e.g. McNally and Kennedy 2008), something similar must also apply to the interpretation of N-Adj compounds in Ngalakgan and Wubuy.

In turn, the fact that incorporation structures are interpreted phrasally predicts that they should not also have a typical compound interpretion (of the 'X is a kind of Y' type: Allen 1978).

The surprising thing about this finding is that, rather than a syntactic phrase marker, it is a construct of type 'word' which is being mapped to prosodic phrasing. But in fact, this is exactly what we should expect from a Constructionist point of view. If it is the case that both morphological and syntactic constructions are 'listed' in some sense, then both might be available for this mapping process, *a priori*. What determines whether or not a morphological constituent is available is presumably its relationship with syntax and in particular, I suggest, the interpretation of the construction. A phrasal interpretation predicts phrasal phonological behaviour. Words in most languages characteristically do *not* have this kind of interpretation; therein, I suggest, lies the essential difference. The strong link between prosody and interpretation which is reflected in work on, for instance, the location of focal accent in intonational phonology, suggests that perhaps in these languages, prosody is signaling interpretation directly.

There are also difficulties associated with (37) however. If *jinak* is projected to a category akin to NP then it is unlike NPs in other languages, as already noted. It cannot be modified, replaced or coordinated internally; only externally to the verb are these configurations possible. Clearly, understanding what governs the mapping of prosody to supercomplex words is an issue of some complexity, and it is not an issue that we are at present equipped to deal with except in a very rudimentary way.

Likewise, the existence of word-internal Phonological Phrase boundaries also has implications for our understanding of the segmental phonology. As in Ngalakgan, the productive phonological alternations apply only at WORD-level boundaries in Wubuy, and may thus be considered to be post-lexical. The rule that deletes /k/ before any other consonant, for instance, described as categorical by Heath (1984: 72), should have affected the final /k/ of *jinak* in (36), but in fact, /k/ often survives in our data, particularly it seems before pause. At this point however, the interaction between prosodic phrasing and the application of phonological rules remains a tantalising but largely unexplored issue in our understanding of these languages.

6 Discussion and Further Issues

Australian languages of the type discussed in this chapter provide some special opportunities, and challenges, for our understanding of the nature of morphological complexity in the minds of speakers. Many aspects of these super-complex words appear to be 'syntactic', in that they may be structures which are (a) rule-governed, (b) compositionally and phrasally-interpreted, and (c) phrasal at the prosodic level. Nevertheless, the segmental phonology suggests domains which are word-like in the usual sense, and the tight restrictions on movement, substitution and coordination of the constituents of these constructs likewise suggest 'word' rather than 'clause'. I have argued that CxM provides a straightforward way of describing this apparent

conflict in domain levels, because of its lack of a strict morphology/syntax division. Indeed, CxM would specifically predict the existence of languages such as Wubuy and Ngalakgan, where syntactic meaning is expressed in word structure.

In other approaches to morphology, and syntax, we would need to determine whether constructs such as (1) belong to the ontological category 'word' or whether they represent phrase markers of some kind, because this decision in turn has implications for the behaviour of, on the one hand, the word in the utterance or, on the other, the internal behaviour of the parts of the phrase. Such a decision also has ramifications for language processing. By contrast, in a CxM account, there is little at stake with respect to the question of whether constructs such as (1) are 'words' or 'phrases', because both of these constructs can have lexical entries of the same kind in a CxM constructicon. The fact that constructs such as (1) do not participate in phrases of a larger kind (such as VPs) is simply due to the absence of such an entry in the lexicons of Wubuy speakers. And conversely, the fact that (1) can have such complex prosodic, semantic, and phonological behaviour is due to the fact that its entry has a level of complexity which is *normally* associated with phrases at the level of, say, IP in a language such as English. On a CxM view, whether we label (1) a 'word' or a 'phrase' is in essence immaterial.

On this view, then, we go some way towards answering Haspelmath's (2011) point that there are no universally valid criteria for defining the linguistic notion 'word'. Instead of asking the question, 'What is a word?' in Wubuy, we can instead ask questions such as: "What does the domain of Prosodic Word or IP correspond to in the lexicon?" "What is the domain of the set of phonological rules {x, y, z, … n}?" "What is the extent of the projection of V?" and, perhaps most interestingly, "What is the target of lexical access?". I suggest that these kinds of questions can more fruitfully be answered, and provide a greater insight into the behaviour of speakers of languages such as those considered here.

To conclude, languages such as Wubuy present a number of significant challenges to our current theoretical models of the interaction between the lexicon, word-formation, phonology and prosody, as well as language processing and psycholinguistics. It is conceivable that such languages require a radically different approach to the question of how these aspects of grammatical representation interact.

References

Allen, M. 1978. *Morphological investigations.* PhD dissertation, University of Connecticut.

Alpher, B., N. Evans, and M. Harvey. 2003. Proto-Gunwinyguan verbal suffixes. In *The non-Pama-Nyungan languages of northern Australia: Comparative studies of the continent's most linguistically complex region*, ed. N. Evans, 305–352. Canberra: Pacific Linguistics.

Anderson, S. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.

Bach, E. 1976. An extension of classical transformational grammar. In *Problems in linguistic metatheory*, Proceedings of the 1976 conference, 183–224. East Lansing: Michigan State University.

Baker, B. 2002. I'm going to where-her-brisket-is: Placenames in the Roper. In *The land is a map: Placenames of Indigenous origin in Australia*, ed. L. Hercus, F. Hodges, and J. Simpson, 103–130. Canberra: Pandanus Books/Pacific Linguistics.

Baker, B. 2008a. *Word structure in Ngalakgan*. Stanford: CSLI.

———. 2008b. The interpretation of complex nominal expressions in Southeast Arnhem Land languages. In *Discourse and grammar in Australian languages*, Studies in Language Companion Series, 104, ed. I. Mushin and B. Baker, 135–166. Amsterdam/Philadelphia: John Benjamins.

———. 2009. *Two opaque processes in Wubuy: Issues in learnability and the lexicon*. Paper presented at OzPhon, UNSW Sydney, 4 December.

———. 2014. Incorporation in Wubuy. In *Selected papers from the 44th conference of the Australian Linguistic Society, 2013*, ed. L. Gawne and J. Vaughan, 231–260. Melbourne: University of Melbourne. Published electronically: http://bit.ly/ALS2013Proceedings.

Baker, B., and R. Bundgaard-Nielsen. 2016. Pause acceptability is predicted by morphological transparency in Wubuy. In *Proceedings of the sixteenth Australasian international conference on speech science and technology*, ed. C. Carignan and M.D. Tyler, 197–200. Sydney, Australia, 7–9 December 2016, Australasian Speech Science and Technology Australia (ASSTA), Sydney.

Baker, B., and M. Harvey. 2003. Word structure in Australian languages. *Australian Journal of Linguistics* 23: 3–33.

Baker, B., and R. Nordlinger. 2008. Noun-adjective compounds in Gunwinyguan languages. In *Proceedings of the LFG08 conference*, ed. M. Butt and T. Holloway King. Stanford: CSLI. http://csli-publications.stanford.edu/.

Baker, B., K. Horrack, R. Nordlinger, and S. Sadler. 2010. Putting it all together: Agreement, incorporation, coordination and external possession in Wubuy (Australia). In *Proceedings of the LFG10 conference, Carleton, Canada*, ed. M. Butt and T. Holloway King. Stanford: CSLI. http://csli-publications.stanford.edu/.

Bickel, B., and F. Zúñiga. in press. The word in polysynthetic languages: Phonological and morphological challenges. In *The Oxford handbook of polysynthesis*, ed. M. Fortescue, M. Mithun, and N. Evans. Oxford: Oxford University Press.

Bickel, B., B. Comrie, and M. Haspelmath. 2008. *The Leipzig glossing rules. Conventions for interlinear morpheme by morpheme glosses*. Leipzig: Max Planck Institute for Evolutionary Anthropology. Revised version of February 2008.

Bloomfield, L. 1949. A set of postulates for the science of language. *International Journal of American Linguistics* 15 (4): 195–202.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

Booij, G., and J. Audring. This volume. *Partial motivation, multiple motivation: The role of output schemas in morphology.*

Borowsky, T.J. 1986. *Topics in the lexical phonology of English*. New York: Garland.

Butcher, A. 1981. *Aspects of the speech pause: Phonetic correlates and communication functions.* PhD thesis, University of Kiel.

Bybee, J.L. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam/Philadelphia: John Benjamins Publishing.

Cruse, D. 1986. *Lexical semantics*. Cambridge: Cambridge University Press.

Dench, A., and N. Evans. 1988. Multiple case-marking in Australian languages. *Australian Journal of Linguistics* 8 (1): 1–47.

Evans, N. 2003. *Bininj Gun-wok: A pan-dialectal grammar of Mayali, Kunwinjku and Kune*. Canberra: Pacific Linguistics.

Evans, N., J. Fletcher, and B. Ross. 2008. Big words, small phrases. *Linguistics* 46: 89–129.

Fletcher, J. 2014. Intonation and prosody in Dalabon. In *Prosodic typology II*, ed. S.-A. Jun, 257–272. Oxford: Oxford University Press.

Fletcher, J., N. Evans, and B. Ross. 2004. Pausing strategies and prosodic boundaries in Dalabon. In *Proceedings of the tenth speech science & technology conference, Sydney*, 436–439. Sydney: Australasian Speech Science and Technology Association.

Forshaw, W. 2011. *A continuum of incorporation: Noun incorporation in Murrinh-Patha*. Honours thesis, University of Melbourne, Melbourne.

Gazdar, G. 1985. *Generalized phrase structure grammar*. Harvard: Harvard University Press.
Gleitman, L.R., and H. Gleitman. 1970. *Phrase and paraphrase: Some innovative uses of language*. New York: W. W. Norton.
Goldberg, A.E. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: University of Chicago Press.
Greenberg, J.H. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In *Universals of language: Report of a conference held at Dobbs Ferry, New York, April 13–15, 1961*, ed. J.H. Greenberg, 73–113. Cambridge MA: MIT Press.
Grosjean, F., L. Grosjean, and H. Lane. 1979. The patterns of silence: Performance structures in sentence production. *Cognitive Psychology* 11: 58–81.
Haspelmath, M. 2011. The indeterminacy of word segmentation and the nature of morphology and syntax. *Folia Linguistica* 45: 31–80.
———. 1984. *Functional grammar of Nunggubuyu*. Canberra: AIAS.
———. 2002. *Foundations of language*. Oxford: Oxford University Press.
———. 2009. Compounding in the parallel architecture and conceptual semantics. In *The oxford handbook of compounding*, ed. Rochelle Lieber and Pavol Štekauer, 105–128. Oxford: Oxford University Press.
Joshi, A., and Y. Schabes. 1997. Tree-adjoining grammars. In *Handbook of formal languages: Volume 3 beyond words*, ed. G. Rozenberg and A. Salomaa, 69–123. Berlin Heidelberg: Springer.
Jun, S.A., ed. 2006. *Prosodic typology: The phonology of intonation and phrasing*. Vol. 1. Oxford: Oxford University Press.
Ladd, D.R. 2008. *Intonational phonology*. Cambridge: Cambridge University Press.
Lees, R.D. 1963. *The grammar of English nominalizations*. Bloomington/The Hague: Indiana University.
Levelt, W.J.M. 1983. Monitoring and self-repair in speech. *Cognition* 14: 41–104.
Levi, J.N. 1978. *The syntax and semantics of complex nominals*. New York: Academic Press.
Lieber, R. 2009. A lexical semantic approach to compounding. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 78–104. Oxford: Oxford University Press.
Lieber, R. and P. Štekauer. 2009. *Introduction: Status and definition of compounding* (Lieber & Štekauer, ed., 1–18).
MacGregor, L.J., M. Corley, and D.I. Donaldson. 2010. Listening to the sound of silence: Disfluent silent pauses in speech have consequences for listeners. *Neuropsychologia* 48 (14): 3982–3992.
Manova, S., and M. Aronoff. 2010. Modeling affix order. *Morphology* 20: 109–131.
McCarthy, J.J., and A. Prince. 1993. Generalized alignment. In *Yearbook of morphology 1993*, ed. G. Booij and J. van Marle, 79–153. Dordrecht: Kluwer.
McKay, G. 1975. *Rembarrnga*. PhD thesis, Australian National University, Canberra.
McNally, L., and C. Kennedy, eds. 2008. *Adjectives and adverbs: Syntax, semantics, and discourse*. Oxford: Oxford University Press.
Murray, R.W., and T. Vennemann. 1983. Sound change and syllable structure in Germanic phonology. *Language* 59: 514–528.
Nordlinger, R. 2010. Verbal morphology in Murrinh-Patha: Evidence for templates. *Morphology* 20 (2): 321–341.
Rice, K. 2000. *Morpheme order and semantic scope: Word formation in the Athapaskan verb*. Cambridge: Cambridge University Press.
Ross, J. R. 1967. Constraints on variables in syntax. MIT PhD dissertation.
Russell, K. 1999. The 'word' in two polysynthetic languages. In *Studies on the phonological word*, ed. T.A. Hall and U. Kleinhenz, 203–221. Amsterdam/Philadelphia: Benjamins.
Selkirk, E.O. 1980. *On prosodic structure and its relation to syntactic structure*. Bloomington: Indiana University Linguistics Club.
Selkirk, E. 1982. *The syntax of words*, Linguistic Inquiry Monograph, 7. Cambridge, MA: MIT Press.
Selkirk, E.O., and S.J. Lee. 2015. Constituency in sentence phonology: An introduction. *Phonology* 32(1): 1–18.

Shriberg, E. 2001. To 'errrr' is human: Ecology and acoustics of speech disfluencies. *Journal of the International Phonetic Association* 31 (1): 153–164.

Steedman, M., and J. Baldridge. 2011. Combinatory categorial grammar. In *Non-transformational syntax: A guide to current models*, ed. R. Borsley and K. Börjars, 181–224. Oxford: Blackwell.

Tauberer, J. 2008. Predicting intrasentential pauses: Is syntactic structure useful? In *Proceedings of the speech prosody 2008 conference,* 405–408

Trouvain, J., C. Fauth, and B. Möbius 2016. Breath and non-breath pauses in fluent and disfluent phases of German and French L1 and L2 read speech. In *Proceedings of the speech prosody 2016 conference,* 31–35.

Van Gijn, R., and F. Zúñiga. 2014. Word and the Americanist perspective. *Morphology* 24 (3): 135–160.

Phrasal Names in Polish: A+N, N+A and N+N Units

Bożena Cetnarowska

Abstract This chapter discusses multi-word expressions in Polish which consist of a noun accompanied by an adjective (in any order), e.g. *boża krówka* (lit. God.A cow.DIM) 'ladybird' and *dział finansowy* (lit. department financial) 'financial department', as well as those in which a head noun is followed by another noun in the genitive case, as in *prawo pracy* (lit. law.NOM work.GEN) 'labour law'. Such units are phrasal lexemes, that is, expressions which contain fully inflected constituents but resemble derivatives in having a naming function. Their syntactic fixedness, semantic compositionality and their interaction with word-formation is discussed. Although some phrasal nouns are not (fully) compositional semantically, the majority of such multi-word units need not be treated as idioms. Phrasal schemas function both as redundancy statements with respect to lexicalized multi-word units, as well as templates for creating novel phrasal nouns in Polish. Construction Grammar and Construction Morphology provide an adequate grammatical model for a proper account of these phrasal nouns.

Keywords Compounds · Multi-word units · Polish · Phrasal lexemes · Relational adjectives

1 Introduction: A+N, N+A and N+N-GEN Units in Polish

The aim of the present article is to investigate multi-word expressions in Polish which are at the crossroads of syntax and the lexicon. I will discuss combinations which consist of a noun or adjective (in any order) or a noun followed by another

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noun in the genitive case.[1] Relevant examples of the three types of units under investigation are provided in (1)–(3) below.

The idiomatic A+N units in (1) contain a head noun modified by a prenominal adjective, which is either denominal relational (e.g. *koński* 'horse.A' in 1a), denominal qualifying (e.g. *kwaśny* 'acid.A' in 1b) or non-derived (e.g *głuchy* 'deaf' in 1d).

(1) Adjective + Noun

a.	*koń-sk-i*[2]	*ogon*
	[[horse]$_N$-sk-M.NOM.SG]$_A$	tail[M.NOM.SG]
	'pony tail'	
b.	*kwaś-n-y*	*deszcz*
	[[acid]$_N$-n-M.NOM.SG]$_A$	rain[M.NOM.SG]
	'acid rain'	
c.	*lwi-a*[3]	*paszcz-a*
	[[lion]$_N$-F.NOM.SG]$_A$	jaw-F.NOM.SG
	'snapdragon'	
d.	*głuch-y*	*telefon*
	deaf-M.NOM.SG	phone[M.NOM.SG]
	'(children's game of) Chinese whispers'	

The multi-word expressions in (2) contain a post-head adjective which is often referred to as a "classifying attribute" since it indicates a class or a subtype of what it denoted by the head noun. Classifying adjectival attributes are usually denominal relational adjectives (whose meaning can be paraphrased as 'relating to what is denoted by the base noun'). For instance, the adjective *finansowy* 'financial' in (2b) is derived from the noun *finanse* 'finances' by means of the suffix *–ow*, which is followed by the vocalic inflectional ending *–y* (as a marker of nominative singular case and masculine gender). However, classifying adjectives can also be non-derived (e.g. *wielka* 'big.F.NOM.SG' in 2c) or participial (e.g. *śpiewające* 'singing.NOM.PL' in 2d).

[1] In the Polish literature on the subject (e.g. Nagórko 1996: 189–191), the noun in the genitive case which follows the head noun is referred to as a "genitive attribute" (Pol. *przydawka dopełniaczowa*).

[2] In glosses provided for Polish examples in this paper I supply English translations for roots or derivational bases, e.g. *koń* 'horse', while affixes are represented in their orthographic form, e.g. *-sk-, -n-*. Alternatively, I could have used English equivalents for Polish suffixes (such as *-nik* '-er') or I could have employed appropriate abbreviations to signal their morphosyntactic function, e.g. NMLZ 'nominalizer', ADJR 'adjectivalizer'. The suffixes *–sk(i)* and *–n(y)* in (1a) and (1b) are adjectivizing suffixes, as is the suffix *–ow(y)* exemplified in (2a) and (2b). The inflectional ending in the adjective is separated by a hyphen in the Polish examples given in this chapter, as in *kwaś-n-y* 'acid' in (1b), or placed in brackets, e.g. *–n(y).*

[3] The adjective *lwi(a)* 'relating to lion(s)' is derived from the noun *lew* 'lion' by means of the paradigmatic formative (also referred to as a zero affix) which causes the palatalization of the stem-final consonant, i.e. [v] ∼ [v′] (see Grzegorczykowa 1981: 68, Szymanek 2010: 93).

(2) Noun + Adjective

a.	*nazw-a*	*handl-ow-a*
	name-F.NOM.SG	[[trade]$_N$-ow-F.NOM.SG]$_A$
	‘trade name’	
b.	*dział*	*finans-ow-y*
	department[M.NOM.SG]	[[finance]$_N$-ow-M.NOM.SG]$_A$
	‘financial department’	
c.	*pand-a*	*wielk-a*
	panda-F.NOM.SG	big-F.NOM.SG
	‘great panda’	
d.	*ptak-i*	*śpiew-aj-ąc-e*[4]
	bird-NOM.PL	[[sing]$_V$–TH-PRS.PTCP-NOM.PL]$_A$
	‘singing birds’	
e.	*niedźwiedź*	*brunatn-y*
	bear[M.NOM.SG]	brown-M.NOM.SG
	‘brown bear’	

The third group of multi-word expressions to be discussed here include N+N units, in which the left-hand noun functions as the (semantic and syntactic) head whereas the right-hand constituent is a genitive attribute.

(3) Noun + Noun-GEN

a.	*dzień*	*dzieck-a*
	day[M.NOM.SG]	child-N.GEN.SG
	‘Children’s Day’	
b.	*dom*	*student-a*
	house[M.NOM.SG]	student-M.GEN.SG
	‘dormitory, student hall of residence’	
c.	*nerwic-a*	*serc-a*
	neurosis-F.NOM.SG	heart-N.GEN.SG
	‘cardiac neurosis, cardioneurosis’	
d.	*czap-k-a*	*gór-nik-a*[5]
	[[cap]$_N$-k-F.NOM.SG]$_N$	[[mountain]$_N$-nik-M.GEN.SG]$_N$
	‘miner’s cap, miner’s shako’	

[4]The abbreviation “TH” stands for “thematic suffix” (i.e. verbalizing suffix) and “PRS.PTCP” for “present participle”. The difference between virile nouns (i.e. masculine personal nouns) and non-virile nouns is not reflected in the glosses.

[5]The suffix *–nik* is an agentive suffix. The suffix *–k(a)* shows many functions, one of them being the diminutivizing one. The representations of the internal structure of Polish words are occasionally simplified, e.g. the lexeme *nerwica* in (3c), glossed above as ‘neurosis’, contains the suffix *–ic(a)*

The multi-word units in (1)–(3) consist of two lexemes which are fully inflected, and the adjectives in (1) and (2) agree in gender, number, and case with the head noun. Therefore, they are often treated as syntactic objects, i.e. noun phrases which are products of syntactic rules (see, for instance Rutkowski and Progovac 2005; Szymanek 2010; Willim 2001). At the same time, N+A, A+N and N+N-GEN units function as names for concepts, in which they resemble affixal derivatives and compounds. Consequently, some Polish researchers, among others Grzegorczykowa (1981) and Topolińska (1984), regard them as a subtype of compounds, referred to as juxtapositions (Pol. *zestawienia*).

Juxtapositions include also N+N combinations consisting of constituents which agree in case (cf. Szymanek 2010: 226; Cetnarowska 2015a). Such combinations can either be interpreted as coordinate structures, e.g. *kelner-barman* 'waiter bartender' and *trawler-przetwórnia* (lit. trawler + processing plant) 'factory trawler', or as attributive ones, as in *pisarz widmo* 'ghost writer' and *kobieta guma* (lit. woman+rubber) 'female contortionist'. Yet another type of multi-word units in Polish, recognized by Grzegorczykowa (1981) as juxtapositions, are N+PP combinations, such as *maszyna do szycia* (lit. machine for sewing) 'sewing machine', *dziurka od klucza* (lit. hole from key) 'keyhole', *kosz na śmieci* (lit. bucket for trash) 'wastepaper bin', *krem na dzień* (lit. cream for day) 'day cream', *skok o tyczce* (lit. jump with pole) 'pole-vault', and *wiedza o kulturze* (lit. knowledge about culture) 'culture studies'. Coordinate or attributive N+N juxtapositions and N+PP combinations will not be given much attention in this chapter, mainly for reasons of space.[6]

Juxtapositions are distinct from compounds proper, which in Polish consist of two stems usually linked by a vocalic interfix (Grzegorczykowa 1981; Szymanek 2010). Compounds proper[7] are right-headed and the inflectional affix is attached only to the right-hand stem.[8]

attached to the root *nerw* 'nerve'. Moreover, stems of prefixed verbs are not split into roots and prefixes, since this would complicate the glosses (given that prefix+root combinations are often non-compositional).

[6]N+N coordinate and attributive juxtapositions are analysed by Kallas (1980), who treats them as noun phrases in appositions, and by Willim (2001), who regards them as constructs. The status of N+PP combinations calls for more in-depth discussion. While ten Hacken and Kwiatek (2013) regard Polish N+N-GEN, N+A and A+N multi-word units as nominal compounds, they decide not to treat N+PP combinations as a type of compounds.

[7]Booij (2010) refers to compounds proper as "morphological compounds".

[8]Alternatively, it can be argued that the inflectional affix attaches to the complex stem of the whole compound, i.e. *kursokonferencj-* in (4a).

(4) N + N compounds
   a. *kurs-o-konferencj-a*
      training+Int(erfix)+conference-F.NOM.SG
      'training conference'
   b. *ogni-o-mistrz-em*
      fire+Int+master-M.INS.SG
      'artillery sergeant'
   c. *dw-u-boj-u*
      two+Int+fight+M.GEN.SG
      'biathlon'

A+N, N+A and N+N-GEN units in Polish can be regarded as subtypes of phrasal lexemes, i.e. phrasal nouns. Phrasal lexemes are defined as multi-word expressions[9] which follow syntactic patterns of a given language, yet "they clearly have a lexical, naming function and, furthermore, they are more restricted compared to canonical phrases" (Masini 2009: 254).

Section 2 of this chapter focuses on syntactic properties of A+N, N+A and N+N-GEN units, in order to discuss their similarity to syntactic objects as well as to morphological objects. Special attention will be given to restrictions on their syntactic complexity. In Sect. 3 semantic compositionality of phrasal nouns in Polish is investigated. Section 4 presents examples of interaction between A+N, N+A or N+N-Gen juxtapositions and selected word-formation processes. In Sect. 5 phrasal schemas are postulated which can be employed in order to create novel phrasal nouns in Polish and to interpret the institutionalized ones. Conclusions are given in Sect. 6.

2 Syntactic Restrictedness of Phrasal Nouns

Phrasal lexemes are argued to cross-linguistically show restrictions on their internal complexity (see, among others, Booij 2010 on Dutch A+N phrasal nouns, Hüning 2010 on A+N combinations in German and Masini 2009 on phrasal nouns in Italian). This is also true of Polish phrasal nouns. In A+N and N+A multi-word expressions in Polish, the adjective is not gradable and it (typically) takes no adverbial modifiers, PP complements or adjuncts (see Cetnarowska and Trugman 2012). The occurrence of such modifiers makes the whole expression unacceptable (as in 5c, 6c) or it changes the interpretation of an adjective from a classifying attribute to a qualifying (descriptive) one. Consequently, the A+N or N+A string no longer functions as a phrasal lexeme, as in (6b).

[9]In her overview of multi-word units in various Slavonic languages, Ohnheiser (2015) mentions RA+N expressions (RA = Relational Adjective) , N+N-GEN units and N+PP units.

(5) A+N units

a. (*)*raczej* *kwaś-n-y* *deszcz*
rather [[acid]$_{N}$-n-M.NOM.SG]$_{A}$ rain[M.NOM.SG]
possible only in the descriptive sense ‘rather sour rain’

b. (*)*kwaś-n-y* *jak cytryn-a* *deszcz*
[[acid]$_{N}$-n-M.NOM.SG]$_{A}$ like lemon-F.NOM.SG rain[M.NOM.SG]
possible only in the descriptive sense: ‘rain sour like a lemon’

c. **głuch-sz-y* *telefon*
deaf-COMP-M.NOM.SG telephone[M.NOM.SG]
impossible in the sense ‘Chinese whispers’ (cf. 1d)

(6) N+A units

a. (*)*nazw-a* *niezwykl-e* *handlowa*
name-F.NOM.SG extreme-ADV [[trade]$_{N}$-ow-F.NOM.SG]$_{A}$
potentially acceptable in the (novel) qualifying sense ‘name which is extremely trade-like’

b. (*)*niedźwiedź* *brunatn-y* *na* *grzbieci-e*
bear[M.NOM.SG] brown-M.NOM.SG on back-M.LOC.SG
possible only in the descriptive reading: ‘bear (of any species) which is brown on its back’

c. **dział* *najbardziej* *finansowy*
department[M.NOM.SG] most [[finance]$_{N}$-ow-M.NOM.SG]$_{A}$
intended meaning: ‘?the most financial department’

The adjective in A+N or N+A units in Polish is a bare adjective, and not an adjectival phrase (Cetnarowska and Trugman 2012). In the terminology used by Booij (2010), such an unmodified adjective in A+N phrasal lexemes is regarded as a non-projecting category (i.e. an adjective which does not project a phrase of its own) and represented as A^{0}.

Similarly, in N+N-GEN units the non-head constituent is not modified. The introduction of a qualifying (i.e. descriptive) adjective as a modifier of the attributive noun (in the genitive case) removes the interpretation of such a [N+[(A)+N]] string as a fixed expression. It is interpreted then as a regular syntactic phrase with a descriptive function.

(7) N+N-GEN units

a. *czap-k-a* [[cap]$_N$-k-F.NOM.SG]$_N$ *gór-nik-a* [[mountain]$_N$-nik-M.GEN.SG]$_N$
'miner's cap; miner's shako'

a.′ *czap-k-a* [[cap]$_N$-k-F.NOM.SG]$_N$ *star-ego* old- M.GEN.SG *gór-nik-a* [[mountain]$_N$-nik-M.GEN.SG]$_N$
'cap which belongs to an old miner'

b. *dom* house[M.NOM.SG] *student-a* student-M.GEN.SG
'dormitory; student hall of residence'

b.′ *dom* house[M.NOM.SG] *znajom-ego* familiar-M.GEN.SG *student-a* student-M.GEN.SG
'house of a student who is an acquaintance of mine'

Consequently, the right-hand constituent of N+N phrasal lexemes in (3) and in (7a, b) can be analysed as a bare noun, i.e. as non-projecting N^0.

Apparent counterexamples to this conclusion are given in (8). In (8a) and (8b) the non-head constituent, i.e. the noun in the genitive case occurs with a classifying adjective, which either precedes or follows it. In (8c) the head constituent, i.e. *przewozy lotnicze* 'air transportation' is itself complex, since it is a N+A combination. An even higher degree of internal complexity is shown by the non-head constituent in (8d). It is a genitive attribute whose head *systemów* 'system.GEN.PL' is accompanied both by another genitive (i.e. *zarządzania* 'management.GEN.SG') and by a classifying adjective *zintegrowanych* 'integrated.NOM.PL'.

(8) a. *dom* house[M.NOM.SG] *student-a* student-M.GEN.SG *zaoczn-ego*[10] extramural- M.GEN.SG
'dormitory for extramural students'

b. *telewizja* television[F.NOM.SG] *wysoki-ej* high-F.GEN.SG *rozdziel-cz-ość-i* [[[resolve]$_V$-cz]$_A$-ość-F.GEN.SG]$_N$
'high definition television'

c. *pasażer-ski-e* [[passenger]$_N$-sk-NOM.PL]$_A$ *przewoz-y* transport-NOM.PL *lot-nicz-e*[11] [[[flight]$_N$-nicz]$_N$-NOM.PL]$_A$
'passenger air transportation'

[10]The adjective *zaoczny* 'extramural' can be treated as derived from a prepositional phrase (see Grzegorczykowa 1981: 71 and Szymanek 2010: 248–249 for discussion of adjectives derived from prepositional phrases in Polish). It is formally related to the phrase *za oczami* 'beyond eyes', though the semantic relatedness between this phrase and the adjective *zaoczny* 'extramural' is rather strenuouos (and metaphorical).

[11]The adjective *lotniczy* 'relating to air transportation' is formed from the agentive noun *lotnik* 'pilot' (derived by the attachment of the suffix *–nik* to the noun *lot* 'flight'). As in the case of the

d. *administr-ator* *zintegrow-a-n-ych*
[[administr]$_V$-ator]$_N$[M.NOM.SG] [[zintegrow]$_V$-TH-PASS.PTCP-GEN.PL]$_A$
system-ów *zarządz-ani-a*[12]
system-GEN.PL [[manage]$_V$-ani-N.GEN.SG]$_N$
'IMS administrator (=Integrated Management System administrator)'

However, the expression *student zaoczny* 'extramural student' is an instance of a phrasal noun. The same status can be given to the A+N combination *wysoka rozdzielczość* 'high definition', the N+A unit *przewozy lotnicze* 'air transportation', the N+N-GEN unit *systemy zarządzania* 'management systems', as well as the expression *zintegrowane systemy zarządzania* 'Integrated Management Systems'. Thus, constituents of the N+N-GEN or N+A/A+N construction can be either single nouns or phrasal nouns themselves.[13]

Phrasal lexemes are expected to show a fixed word order (as pointed out by Masini 2009 for Italian multi-word units). Nagórko (2016) makes a similar observation for juxtapositions in Polish. She asserts that the order of their constituents cannot be reversed.[14] In the case of Polish phrasal nouns representing the N+N-GEN pattern, such as *dom studenta* 'dormitory' in (3b), *nerwica serca* 'cardioneurosis' in (3c), or *prawo umów* (lit. law.NOM contracts.GEN) 'contract law', the preposing of

adjective *lwia* 'relating to lion(s)' in (1b), the adjectivalizer is the paradigmatic formative (i.e. a zero affix), which causes [k] ∼ [č] alternation.

[12]The vowel –a- which follows the stem *zarządz-* 'manage' is represented in the gloss as a part of the nominalizing suffix *–ani(e)*. Alternatively, it can be regarded as a thematic (verbalizing) suffix, as in the passive participle *zintegrowanych* 'integrated.GEN.PL'.

[13]I am grateful to the reviewer for providing the example in (8b). More examples of RA+N+RA combinations are discussed by Cetnarowska et al. (2011). The reviewer observes that N+PP combinations can also become constituents of (other) phrasal nouns, e.g. *antena do odbioru telewizji wysokiej rozdzielczości* (lit. antenna for reception-GEN television-GEN high-GEN resolution-GEN) 'high definition television antenna'. It is pointed out by the reviewer that the longer a phrasal noun in Polish becomes, the more felicitous it is to diversify the range of constructions employed in its formation (i.e. A+N, N+A, N+N-GEN, N+PP).

[14]Nagórko (2016: 2834) does not discuss phrasal nouns (since her section on composition is devoted to compounds proper in Polish). Yet, when mentioning the existence of juxtapositions, she states that "[t]hey meet the criteria established for words: the order of constituents cannot be reversed, the constituents cannot be replaced by other words." The replacement of a constituent of a juxtaposition by a synonymous lexeme is impossible in idiomatic N+A, N+A or N+N expressions, cf. *opera mydlana* 'soap opera' and not **opera proszkowa* (lit. opera.NOM washing_powder.RA). In the case of juxtapositions exhibiting a greater degree of semantic compositionality, some variation in form may be attested, e.g. *niedźwiedź brunatny* (lit. bear brown) 'brown bear' and *miś brunatny* (lit. teddy-bear brown) 'a small and/or dear brown bear' (see www.radiozet.pl/.../Najsmutniejszy-na-swiecie-mis-brunatny-uratowany!-00027429).

the genitive either makes the whole expression ill-formed (see 9a, b),[15] or it forces the descriptive reading, as in (9c).

(9) a. **serc-a* *nerwic-a*
heart-F.GEN.SG neurosis-F.NOM.SG
intended meaning: 'cardioneurosis'

b. **umów* *praw-o*
contract[GEN.PL] law-N.NOM.SG
intended meaning: 'contract law'

c. (*)*student-a* *dom*
student-M.GEN.SG house[M.NOM.SG]
unacceptable in the sense 'student hall of residence'
acceptable in the descriptive sense: 'house belonging to the student'

In the case of the idiomatic A+N phrasal lexemes exemplified in (1), such as *koński ogon* 'ponytail' or *lwia paszcza* 'snapdragon', the change in their word order involves the loss of idiomatic reading, as indicated in (10).

(10) a. *ogon* *koń-sk-i*
tail[M.NOM.SG] $[[\text{horse}]_{N}\text{-sk-M.NOM.SG}]_{A}$
'tail of a horse'

b. *paszcz-a* *lwi-a*
jaw-F.NOM.SG $[[\text{lion}]_{N}\text{-F.NOM.SG}]_{A}$
'jaw of a lion'

A change of meaning may also result from the reordering of constituents in the subtype of N+A phrasal lexemes in (11), which are treated as "tight units" by Cetnarowska et al. (2011) and Cetnarowska and Trugman (2012). These are mostly expressions which contain polysemous denominal adjectives, e.g. *dyplomatyczny* 'diplomatic' and *komiczny* 'comic'. The adjective *dyplomatyczny* 'diplomatic' used in the post-head position, as in (11a), has the function of a classifying attribute, and is paraphrasable as 'relating to diplomacy'. When occurring in the pre-head position, as in (11b), *dyplomatyczny* functions as a qualifying attribute and it exhibits the reading 'tactful'. When the adjective in the N+A phrasal noun is a non-derived noun, as in *panda wielka* 'great panda' in (11e), the change of its position (to the pre-head location) signals the descriptive interpretation of the resulting syntactic phrase (and the loss of the generic reading). Thus, in the case of adjectives in

[15] N-GEN+N phrases such as those in (9a) and (9b) could potentially be accepted in poetry or artistic prose, where word order principles are more flexible.

(11), included in the group of 'non-migrating adjectives' by Cetnarowska et al. (2011), the linear position is used as a test disambiguating between distinct senses of adjectives.[16]

(11) a. *kurier* *dyplomat-ycz-n-y*
courier[M.NOM.SG] [[diplomat]$_N$-ycz-n-M.NOM.SG]$_A$
'diplomatic courier'

b. *dyplomat-ycz-n-y* *kurier*
[[diplomat]$_N$-ycz-n-M.NOM.SG]$_A$ courier[M.NOM.SG]
'tactful courier'

c. *aktor* *komicz-n-y*
actor[M.NOM.SG] [[comic]$_N$-n-M.NOM.SG]$_A$
'comedy actor (as a subtype of an actor)'

d. *komicz-n-y* *aktor*
[[comic]$_N$-n-M.NOM.SG]$_A$ actor[M.NOM.SG]
'comic actor (i.e. one that can be described as comic)'

e. *pand-a* *wielk-a*
panda-F.NOM.SG great-F.NOM.SG
'the giant panda' (Ailuropoda melanoleuca)

f. *wielk-a* *pand-a*
great-F.NOM.SG panda-F.NOM.SG
'a big exemplar of panda animal'

However, there are numerous adjectives, exemplified in (12) and referred to as 'migrating adjectives' by Cetnarowska et al. (2011), which retain their classificatory function both in the pre-head and the post-head position (in which they resemble adjectival constituents of Greek A+N constructs, discussed by Ralli and Stavrou 1998). The mobility of such adjectives, in contrast to those in (11) above, results from the lack of distinct qualifying readings (i.e. similitudinal or possessional senses). It is also due to the fact that 'migrating' adjectives are intersective whereas adjectives in "tight units" are subsective (as argued by Cetnarowska and Trugman 2012).

[16] As is shown by Cetnarowska (2015b), for purposes of contrast or word-play speakers may occasionally place 'non-migrating' adjectives in their classifying (relational) sense in the pre-head position, as in *nienaturalnie naturalna katastrofa* (Adv+A+N) 'unnaturally natural disaster', cf. *katastrofa naturalna* (N+A) (lit. disaster.F.NOM.SG natural.F.NOM.SG) 'natural disaster'.

(12) a. *noc-n-y* *dyżur*
[[night]$_{N}$-n-M.NOM.SG]$_{A}$ duty-M.NOM.SG
'night duty'

b. *dyżur* *noc-n-y*
duty-M.NOM.SG [[night]$_{N}$-n-M.NOM.SG]$_{A}$
'night duty'

c. *mineral-n-a* *wod-a*
[[mineral]$_{N}$-n-F.NOM.SG]$_{A}$ water-F.NOM.SG
'mineral water'

d. *wod-a* *mineral-n-a*
water-F.NOM.SG [[mineral]$_{N}$-n-F.NOM.SG]$_{A}$
'mineral water'

e. *spożyw-cz-y* *sklep*
[[consume]$_{V}$-cz-M.NOM.SG]$_{A}$ shop[M.NOM.SG]
'food store'

f. *sklep* *spożyw-cz-y*
shop[M.NOM.SG] [[consume]$_{V}$-cz-M.NOM.SG]$_{A}$
'food store'

The pre-head position of such classificatory adjectives is preferred (in careful Polish) when the head noun is accompanied by another (post-head) classificatory adjective, or by a post-head genitive (see Cetnarowska et al. 2011 for more examples).[17]

(13) a. *mineral-n-a* *wod-a* *butelk-owa-n-a*
[[mineral]$_{N}$-n-F.NOM.SG]$_{A}$ water-F.NOM.SG [[bottle]$_{N}$-TH-PASS.PTCP-F.NOM.SG]$_{A}$
'bottled mineral water'

b. *spożyw-cz-y* *sklep* *samo-obsług-ow-y*
[[consume]$_{V}$-cz-M.NOM.SG]$_{A}$ shop[M.NOM.SG] [[self-service]$_{N}$-ow-M.NOM.SG]$_{A}$
'self-service food store'

c. *piłk-ar-sk-a* *lig-a* *uchodź-c-ów*
[[[ball]$_{N}$-arz]$_{N}$-sk-F.NOM.SG]$_{A}$ league-F.NOM.SG [[escape]$_{V}$-c-GEN.PL]$_{N}$
'football league for asylum-seekers (in Denmark)'

Thus, adjective+noun multi-word expressions in Polish show variable syntactic behaviour, with some units showing greater mobility and others – more restricted syntactic mobility.[18]

[17] Several other pragmatic, semantic or prosodic factors which influence the position of classifying adjectives in Polish are discussed by Linde-Usiekniewicz (2013), Cetnarowska (2014) and Cetnarowska (2015b).

[18] Cetnarowska and Trugman (2012) show that 'migrating' classifying adjectives in Polish are able to occur either in the pre-head and post-head position, can be employed in predicative position (given a suitable context) and are acceptable in scrambling constructions.

3 Semantic Compositionality of Phrasal Lexemes

When discussing A+N phrasal names in Dutch and Greek, Booij (2009: 220) argues that once they become conventionalized names for concepts, they belong to the class of fixed expressions, which are likely to exhibit an opaque meaning. Consequently, they need to be stored in the lexicon (Booij 2009: 235). Semantic opacity is characteristic of Polish A+N phrasal names listed in (1), and exemplified further in (14). The A+N expression *boża krówka* in (14a) does not denote a little cow but a small red beetle with black spots. The phrasal noun *ptasie mleczko* (lit. bird.A milk.Dim) in (14b) is a name of a type of chocolate-coated candy (similar to a marshmallow). The expression *wilcza jagoda* (lit. wolf.A berry) in (14c) is a poisonous plant with black berries.[19]

(14)	a.	*boż-a*	*krów-k-a*
		[[God]$_N$-F.NOM.SG]$_A$	cow-DIM-F.NOM.SG
		'ladybird'	
	b.	*ptasi-e*	*mlecz-k-o*
		[[bird]$_N$-N.NOM.SG]$_A$	milk-DIM-N.NOM.SG
		'marshmallow'	
	c.	*wilcz-a*	*jagod-a*
		[[wolf]$_N$-F.NOM.SG]$_A$	berry-F.NOM.SG
		'belladonna'	

Many of the items in (1) and (14) have a metaphoric motivation. For instance, *lwia paszcza* (lit. lion's jaw) 'snapdragon' in (1c) is a plant with two-lipped flowers. These plants look like a mouth which snaps shut or open when squeezed. In Polish, the plant is claimed to look like a lion's jaw, while in English the similarity of the plant to the face of a dragon is emphasized. In Cetnarowska et al. (2011) A+N units such as those in (1) are treated as lexical idioms.

The N+A units, listed in (2) and additionally exemplified in (15), are largely transparent semantically. The meaning of the phrasal name in (15a) is computable from the meaning of its constituents, i.e. it is a shop which sells furniture. *Piłka siatkowa* 'volleyball' and *piłka lekarska* 'medicine ball' both denote round objects used in games or athletic activities. However, the exact difference between the meaning of the two N+A units in (15b–c) requires some extralinguistic knowledge. They can be treated as lexicalized, i.e. stored in the (mental) lexicon. The expression in (15e) is idiomatic, since *opera mydlana* 'soap opera' does not denote a type

[19] The adjectives *boż(a)* 'relating to god(s), divine', *ptasi(e)* 'relating to bird(s)' and *wilcz(a)* 'relating to wolf or wolves' in (14) are derived from corresponding nouns by means of the paradigmatic formative, which has a palatalizing effect on the stem-final consonant. This results in [k] ∼ [č] alternation in *wilk* 'wolf' – *wilcz(y)* 'relating to wolf or wolves', [g] ∼ [ž] alternation in *Bóg* 'God' – *boż(y)* 'relating to God or gods', and [k] ∼ [ɕ] alternation in *ptak* 'bird' – *ptas(i)* 'relating to bird(s)'.

of opera, but a serial drama on television or radio with many characters and relationships.

(15) a. *sklep* *mebl-ow-y*
shop[M.NOM.SG] [[furniture]$_{N}$-ow-M.NOM.SG]$_{A}$
'furniture shop'

b. *piłk-a* *siatk-ow-a*
ball-F.NOM.SG [[net]$_{N}$-ow-F.NOM.SG]$_{A}$
'volleyball'

c. *piłk-a* *lekar-sk-a*
ball-F.NOM.SG [[physician]$_{N}$-sk-F.NOM.SG]$_{A}$
'medicine ball'

d. *fok-a* *szar-a*
seal-F.NOM.SG grey-F.NOM.SG
'grey seal'

e. *oper-a* *mydl-an-a*
opera-F.NOM.SG [[soap]$_{N}$-an-F.NOM.SG]$_{A}$
'soap opera'

It was mentioned in the previous section that some classifying adjectives in Polish can 'migrate' from the post-head to the pre-head position, depending on their immediate syntactic context. Consequently, A+N phrasal names are not necessarily fixed idioms. They may be fully transparent A+N combinations, e.g. those in (16).

(16) a. *noc-n-y* *pociąg*
[[night]$_{N}$-n-M.NOM.SG]$_{A}$ train[M.NOM.SG]
'night train'

b. *zim-ow-e* *wakacj-e*
[[winter]$_{N}$-ow-NOM.PL]$_{A}$ holiday-NOM.PL
'winter holidays'

As far as N+N-GEN units are concerned, they show varying degrees of semantic transparency, as is exemplified in (17).

(17) a. *Święt-o* *Dzięk-czyni-eni-a*[20]
holiday-N.NOM.SG [[thanks]$_N$-[give]$_V$-eni-N.GEN.SG]$_N$
'Thanksgiving Day'

b. *Dzień* *Dzieck-a*
day[N.NOM.SG] child-N.GEN.SG
'Children's Day'

c. *praw-o* *umów*
law-N.NOM.SG contract[GEN.PL]
'contract law'

d. *praw-o* *pierwokupu*
law-N.NOM.SG [[first]$_A$-Int-[buy]$_V$-M.GEN.SG]$_N$
'right of preemption'

e *mundur* *strażak-a*
uniform[M.NOM.SG] firefighter-M.GEN.SG
'firefighter's uniform'

The phrasal units in (17a) and (17b) exhibit some degree of compositionality and can be treated as endocentric, since *Święto Dziękczynienia* 'Thanksgiving Day' is a kind of a holiday while *Dzień Dziecka* 'Children's Day' is a special type of a day. Yet, they are clearly lexicalized expressions, associated with a fixed interpretation. They denote special events (or public holidays) which are associated with a particular date.[21] The multi-word units in (17c) and (17d) can be given fairly general paraphrases 'legislation or rights associated with what is denoted by the modifying noun'. This semantic pattern can be instantiated by a number of N+N-GEN expressions, which are coined in a productive manner, e.g. *prawo pracy* (lit. law.NOM work.GEN) 'labour law', *prawo morza* (lit. law.NOM sea.GEN) 'law of the Sea', *prawo łaski* (lit. law.NOM pardon.GEN) 'right to grant pardon', *prawo powrotu* (lit. law. NOM return. GEN) 'right of return', *prawo łupu* (lit. law.NOM booty. GEN) 'right of spoil'. Similarly, the expression in (17e) represents a pattern which can be exemplified by numerous N+N-GEN phrasal lexemes whose meaning can be

[20]For simplicity, a "flat" hierarchical structure is given here in the glosses for synthetic compounds in Polish, i.e. (deverbal) compounds which contain two stems (linked by a vowel) and a suffix as the right-hand constituent, such as *dziękczynienie* 'thanksgiving' and *pierwokup* 'preemption'. Szymanek (2010: 221) analyses the synthetic compound *prac-o-daw-c-a* (work+Int+give+suff+infl) 'employer, lit. work-giver' as a formation which exhibits the following structure: STEM1+interfix+STEM2+suffix, in which the interfix and the suffix function as co-formatives. The issue of determining the internal morphological structure of synthetic deverbal compounds in Polish is discussed also by Kolbusz-Buda (2014), within the model of generative grammar. She argues in favour of a left-branching structure, i.e. [[A B] suff], for synthetic deverbal compounds.

[21]The date of Children's Day may actually vary around the world.

(roughly)[22] computed from the meanings of their constituents, e.g. *mundur leśnika* 'forester's uniform', *mundur żeglarza* 'sailor's uniform', *mundur skauta* 'scout's uniform', *mundur czołgisty* 'tank soldier's uniform'.

4 Interaction Between Phrasal Nouns and Word-Formation Operations

Certain affixation processes and compound formation processes in Polish seem to select phrasal nouns as their input. One of them is the operation of morphological condensation,[23] which results in the replacement of a multi-word N+A expression by a suffixal derivative,[24] often terminating in the suffix *–k(a), -ak*, or *-ec* (for more discussion see Grzegorczykowa 1981: 45–47 and Szymanek 2010: 69, 90, 243–244). The noun *żaglówka* 'sailboat' in (18a'), for instance, can be split into the root *żagl-* 'sail', the adjectival suffix *–ów* (which is the allomorph of *–ow*), the nominalizing suffix *–k(a)* and the inflectional ending *–a* 'F.NOM.SG'. Given its formal structure, *żaglówka* 'sailboat' could be treated as a deadjectival formation, derived from the adjective *żaglowy* 'relating to sail'[25] by means of the suffix *–k(a)*.

[22] Extralinguistic knowledge is required, though, to interpret such phrasal names properly. For instance, one needs to know what sort of clothing is used, or was used, by soldiers of a particular regiment to interpret the expression *mundur czołgisty* 'tanker's uniform'.

[23] The phenomenon of morphological condensation is commonly referred to as 'univerbation' (Pol. *uniwerbizacja*) by Slavic morphologists (e.g. Szymanek 2010: 69, 90, 243–244; Nagórko 2016: 2839; Martincová 2015: 742). When analysing similar instances of "squeezed" phrasal lexemes in Russian, Masini and Benigni (2012) decide not to employ the term *univerbation*. They (2012: 433) point out that, in the Western literature, univerbation "is generally intended as the fusion of the members of a multi-word expression into one single word due to diachronic changes", while shortening mechanisms under analysis in Slavonic languages are synchronic.

[24] A reviewer points out that the suffixal derivative *kranówka* 'tap water', containing the constituents *kran* 'tap' and *–ówk(a)*, as well as its augmentative *kranówa* 'tap water', can be potentially regarded as resulting from the morphological condensation of the N+PP expression *woda z kranu* (lit. water from tap) 'tap water'. There is no corresponding N+A phrasal noun **woda kranowa* or N+N-GEN expression **woda kranu* which could function as the input to univerbation. Szymanek (2010: 70) analyses *kranówka* 'tap water' as a denominal suffixal derivative.

[25] Such an analysis is adopted by Grzegorczykowa (1981: 45). She also analyses *parowiec* 'steam boat', in which the root *par-* 'steam' is followed by *–ow* and *–ec*, as (formally) derived from the relational adjective *parowy* 'relating to steam' by means of the suffix *–ec*. However, she points out that some derivatives terminating in *–owiec* (and *–ówka*) are motivated semantically by the nominal root directly. Jadacka (2001) identifies the suffix *–ówka* in *kablówka* 'cable TV', which is synonymous to the N+A phrasal noun *telewizja kablowa* (lit. television cable.RA). She also represents the suffix as *–(ów)ka*, recognizing its internal complexity (Jadacka 2001: 85). Grzegorczykowa and Puzynina (1984: 375) regard the noun *filmowiec* 'film-maker' and *drogowiec* 'road-builder' as containing the suffix *–owiec* but on another page (1984: 346) they list *szybowiec* 'glider' as derived by means of *–ec*. Thus, the representation of the sequence *–owiec* and *–ówka* as single suffixes or as complexes of suffixes is a controversial issue.

However, its semantics indicates that it is the whole phrasal noun in (18a) which should be recognized as the base. The suffixal derivatives in (18a'), (18b') and (18c') have the same propositional meaning as the corresponding phrasal nouns of the [N+A] type. There is (or there may be)[26] a difference in the pragmatic meaning (i.e. stylistic value) of the synonyms given in (18) below: the suffixal derivatives, terminating in *–k(a)* or *– ak*, are marked as expressive formations which belong to the colloquial language or technical jargon.

(18) a. *łódź* — *żagl-ow-a*
boat[F.NOM.SG] — [[sail]$_{N}$-ow-F.NOM.SG]$_{A}$
'sailboat'

a.' *żagl-ów-k-a*
[[[sail]$_{N}$-ow]$_{A}$-k-F.NOM.SG]$_{N}$
'sailboat'

b. *liceum* — *ogóln-o-kształc-ąc-e*
high.school[N.NOM.SG] — [[general]$_{A}$-Int-[educate]$_{V}$-PRS.PTCP-N.NOM.SG]$_{A}$
'academic high school'

b.' *ogólni-ak*
[[general]$_{A}$-ak]$_{N}$ [M.NOM.SG]
'academic high school'

c. *szkoł-a* — *bud-ow-l-an-a*
school-F.NOM.SG — [[[build-TH]$_{V}$-l]$_{N}$-an-F.NOM.SG]$_{A}$
'secondary technical school of building'

c'. *bud-ow-l-an-k-a*
[[[[build-TH]$_{V}$-l]$_{N}$-an]$_{A}$-k-F.NOM.SG]$_{N}$
'secondary technical school of building'

d. *samolot* — *odrzut-ow-y*
plane[M.NOM.SG] — [[recoil]$_{N}$-ow-M.NOM.SG]$_{A}$
'jet plane'

d.' *odrzut-owi-ec*
[[[recoil]$_{N}$-ow]$_{A}$-ec]$_{N}$ [M.NOM.SG]
'jet plane'

When discussing a similar shortening mechanism in Russian, which leads to the replacement of [A+N] phrasal nouns by suffixal *–k(a)* derivatives, Masini and

[26]The nouns *żaglówka* 'sailboat' and *odrzutowiec* 'jet plane' show no colloquial tinge and they are stylistically neutral (when compared to the more formal phrasal nouns *łódź żaglowa* 'sailboat' and *samolot odrzutowy* 'jet plane'). Ohnheiser (2015: 775) observes that stylistic neutralization of selected formations of this type in Slavonic languages follows from their frequency of use.

Benigni (2012) propose that the Russian *–ka* construction takes a phrasal noun as a structural input (i.e. syntactic and semantic base), though phonologically the *–ka* suffix is added to a truncated adjective, as in *èlektronnaja počta* (lit. electronic mail) 'e-mail' and *èlektronka* 'e-mail'.

Another type of ‚squeezing" phrasal nouns into a single word in Polish is illustrated in (19). It results in the replacement of the N+A unit by a noun which can be recognized as a nominal base of the second constituent (i.e. of the relational adjective). The nouns in (19a'), (19b') and (19c') exhibit a colloquial stylistic marking, in comparison to the phrasal nouns in (19a), (19b) and (19c).[27]

(19)	a.	*telefon*	*komórkowy*
		telephone[M.NOM.SG]	$[[\text{cell}]_{N}$ –OW-M.NOM.SG$]_{A}$
		'cellphone, mobile phone'	
	a.'	*komórk-a*	
		cell-F.NOM.SG	
		'cellphone, mobile phone'	
	b.	*wódk-a*	*żyt-ni-a*
		vodka-F.NOM.SG	$[[\text{rye}]_{N}$-ni-F.NOM.SG$]_{A}$
		'rye vodka'	
	b.'	*żyto*[28]	
		rye-N.NOM.SG	
		'rye vodka'	
	c.	*film*	*dokument-al-n-y*
		film[M.NOM.SG]	$[[\text{document}]_{N}$-al-n-M.NOM.SG$]_{A}$
		'documentary'	
	c.'	*dokument*	
		document[M.NOM.SG]	
		'documentary'	

Another phenomenon in Polish morphology which indicates that multi-word units may form an input to word-formation processes is the occurrence of compound nouns and compound adjectives which exhibit semantic relatedness to phrasal N+A or A+N lexemes, as in (20) below.[29] The parasynthetic compound noun in (20b) consists of two stems (*czerwon-* 'red' and *armi-* 'army'), the linking

[27] This process is treated as a kind of back-formation or desuffixation by Szymanek (2010: 245) and Jadacka (2001: 88–89).

[28] Although the word *żyto* in isolation usually means 'rye (as a type of cereal plant)', it can refer to a kind of vodka, e.g. as in the excerpt from a song: *Polej w szklaneczki żyto* 'Pour (some) rye into the glasses' (from http://teksciory.interia.pl/bracia-figo-fagot-pastoralka-tekst-piosenki,t,643253.html)

[29] The Polish examples in (20e–h) resemble those in Greek (discussed by Ralli and Stavrou 1998: 253), where some compound adjectives show semantic relatedness to lexicalized A+N combinations, such as *psixropolemikos* 'cold-war-like' related to *psixros polemos* 'cold war'.

vowel *-o-* and the nominal suffix *–ist(a)* (where *–a* is the marker of 'M.NOM.SG'[30]). The compound adjective in (20d) contains the inflectional stems of the adjective *cywiln(y)* 'civil' and the noun *praw(o)* 'law', linked by means of the vowel -o- and followed by the adjectivizing suffix *–n(y)* (where *–y* is the marker of 'M.NOM.SG'). It is worth pointing out that the adjectival stems precede the nominal stems in the compounds in (20b) and (20d), while in the related phrasal nouns the adjective follows the noun. The post-head position is typical of classifying adjectives of (semantically transparent) multi-word units with a naming function. On the other hand, the order A+N is obligatory in the compound adjective in (20d) since the word-final suffix *–n(y)* attaches to nominal stems (and not to adjectival ones). Similarly, the suffix *–ista* in (20b) occurs in compound nouns which exhibit the A+Int(erfix)+N+(suff) pattern, and not the N+Int+A+(suff) order, e.g. *pierwszoklasista* (lit. first+Int+class+suff) 'first-grader'.

(20) a. *Armi-a* *Czerwon-a*
army-F.NOM.SG red-F.NOM.SG
'Red Army'

b. *czerwon-o-arm-ist-a*[31]
$[[\text{red}]_{A}$-Int-$[\text{army}]_{N}$-ist-M.NOM.SG$]_{N}$
'Red Army soldier'

c. *praw-o* *cywil-n-e*
law-N.NOM.SG $[[\text{civil}]_{N}$–n-N.NOM.SG$]_{A}$
'civil law'

d. *cywil-n-o-praw-n-y*
$[[\text{civil}]_{N}$-n$]_{A}$-Int-$[\text{law}]_{N}$-n-M.NOM.SG$]_{A}$
'relating to civil law'

e. *czarn-y* *rynek*
black-M.NOM.SG market[M.NOM.SG]
'black market'

f. *czarn-o-rynk-ow-y*
$[[\text{black}]_{A}$-Int-$[\text{market}]_{N}$-ow-M.NOM.SG$]_{A}$
'relating to black market'

g. *błękit-n-a* *krew*
$[[\text{blue}]_{N}$-n-F.NOM.SG$]_{A}$ blood[F.NOM.SG]
'blue blood'

h. *błękit-n-o-krw-ist-y*
$[[\text{blue}]_{N}$-n$]_{A}$-Int-$[\text{blood}]_{N}$-ist-M.NOM.SG$]_{A}$
'relating to blue blood; aristocratic'

[30]Nouns with the suffix *–ist(a)* in Polish show masculine gender but follow feminine declension pattern.

[31]As in the case of synthetic deverbal compounds in (17), I adopt a "flat" morphological structure in the glosses for synthetic compound nouns and compound adjectives in (20).

Szymanek (2010: 244) suggests that condensation can select set phrases, i.e. lexicalized syntactic units, as its input. Such a solution can account for the data in (18–19), as well as for the occurrence of compound adjectives and nouns in (20), which are related either to idiomatic expressions (such as *błękitna krew* 'blue blood') or to conventionalised units (e.g. *prawo cywilne* 'civil law'). There is yet another type of morphological process which affects N+A phrasal lexemes in Polish (and which is discussed by, among others, Cetnarowska et al. 2011). It involves the replacement of N+A expressions by adjectives alone, which undergo conversion into nouns and start functioning as names of entities.[32]

(21) a. *lini-a* *krzyw-a*
line-F.NOM.SG curved-F.NOM.SG
'curve'

a.' *krzyw-a*
curved-F.NOM.SG
'curve'

b. *sklep* *muzycz-n-y*
shop[M.NOM.SG] [[music]$_N$-n-M.NOM.SG]$_A$
'record shop, music store'

b.' *muzycz-n-y*
[[music]$_N$-n-M.NOM.SG]$_A$
'music store'

It cannot be claimed that there is a relatively small set of N+A (or A+N) phrasal nouns, identified as lexicalized phrases, which can be subject to the three above-mentioned shortening mechanisms. The phrasal lexeme *sklep muzyczny* 'music store' allows the ellipsis of the head nouns (as in 21b') but it does not undergo morphological condensation into **muzyczniak*. This is in contrast to *sklep spożywczy* 'grocery', which gives rise both to *spożywczak* 'grocery' and *spożywczy* 'grocery'. Furthermore, while the A+N phrase *film dokumentalny* (lit. film documentary.RA) 'documentary' can be shortened to *dokument* 'documentary', *sklep muzyczny* (lit. shop music.RA) does not undergo condensation into *muzyk*. The ellipsis of the head noun in N+A units is a common phenomenon in the case of semantically transparent phrasal nouns, attested both in specialized vocabulary and in informal language, as shown in (22).

[32]Masini and Benigni (2012: 429–430) regard a similar mechanism in Russian as the ellipsis of the head noun, e.g. *mobil'nyj telefon* 'mobile phone' > *mobil'nyj* 'mobile phone'. Ohnheiser (2015: 774) analyses the replacement of Russian RA+N phrasal nouns by adjectives alone as involving the ellipsis of the head and nominalization of the relational adjective.

(22) a. *Czy* *zda-ł-aś* *już* *histor-ycz-n-ą*[33]?
if pass-PST-2SG.F already [[history]$_N$-ycz-n-F.ACC.SG]$_A$
'Have you passed the exam in historical grammar already?'

b. *Nie* *zdąży-ł-am* *na* *osob-ow-y* *do* *Lublin-a.*
not catch-PST-1SG.F on [[person]$_N$-ow-M.ACC.SG]$_A$ to Lublin-M.GEN.SG
'I didn't catch the slow passenger train to Lublin.'

The reduction of fully compositional N+A phrasal lexemes, such as *sklep muzyczny* 'music store', to converted adjectives indicates that it is not only idiomatic phrases which undergo (or which are accessible to) word-formation operations.

5 Phrasal Schemas for Phrasal Nouns and Second Order Schemas

One of the tenets of Construction Grammar is the lack of a clear-cut distinction between syntax and the lexicon, i.e. between lexical items and syntactic structures (see Goldberg 1995, 2006). There are phenomena intermediate between morphology (the lexicon) and syntax, such as phrasal names. The basic unit of linguistic analysis in Construction Grammar is a construction, which can be defined as "a conventionalized association of a form and a meaning" (Masini 2009: 254). Constructional schemas can be posited at various levels (e.g. the level of a word or phrase). They differ in their complexity, starting from most schematic abstract schemas (e.g. syntactic ones, such as passive construction, or abstract lexical constructions), through constructional idiom or intermediate lexical constructions, to specific lexical constructions, and complex words (Masini 2009: 262; Booij 2010:15–16). Constructions can be partially or fully filled, and partially or fully compositional (Goldberg 2006). They are stored in the mental lexicon of a speaker (called constructicon by Goldberg 1995:5) as (more or less abstract) templates.

Due to the overlap between syntax and the lexicon, phrasal schemas can be employed for the analysis or creation of multi-word lexical units, i.e. phrasal lexemes. The two schemas given in (23–24) below are proposed by Booij (2010: 187) to analyse A+N combinations with a naming function in Dutch. The schema

[33]N+A units which undergo condensation in (22) are as follows: *gramatyka historyczna* (lit. grammar historical) 'historical grammar' and *pociąg osobowy* (lit. train person.RA) 'passenger train'.

in (23) can be employed to analyse phrasal names containing non-derived adjectives, e.g. *rode kool* 'red cabbage', while the schema in (24) is applicable to A+N combinations containing denominal relational adjectives, e.g. *academisch jaar* 'academic year'.[34]

(23) $[A^0_i\ N^0_j]_k \longleftrightarrow$ [NAME for SEM_j with property $SEM_i]_{SEMk}$

(24) $[A^0_i\ N^0_j]_k \longleftrightarrow$ [NAME for SEM_j with some relation R to entity E of $SEM_i]_{SEMk}$

The left-hand part of the schemas in (23–24) is a statement about the form of the constructions in questions. The symbol A^0 stands for a non-projecting adjective. The right-hand part of the schemas describes the semantics of A+N phrasal nouns. Their naming function is signalled by the element NAME[35] in the semantic description of the schemas. The double arrow indicates the correspondence relations between the form and the meaning in a given construction. The coindexation specifies the input of the meaning of particular constituents of the combination to the meaning of the whole A+N unit: the element N^0_j is the head in (23–24), hence it determines the kind of entity denoted by the whole phrasal noun.

The nature of the semantic relation between the meaning of A and N (or the meaning of the nominal base of A and the nominal head N) in such phrasal lexemes is unrestricted, as assumed by, among others, Spencer (2013: 252). The schemas in (23) and (24) can be employed in Polish to interpret the internal structure and function (or meaning) of A+N phrasal nouns. They are appropriate for semantically non-compositional, or partially compositional, A+N combinations referred to as 'lexical idioms' by Cetnarowska et al. (2011), such as those in (1), e.g. *kwaśny deszcz* 'acid rain' and *lwia paszcza* 'snapdragon'. Moreover, the schema in (24) can be instantiated by fully (or nearly fully) compositional A+N lexical units,[36] such as those in (16), e.g. *zimowe wakacje* 'winter holidays' or *mineralna woda* 'mineral water', which contain the relational adjectives *zimowe* and *mineralna*.

The A+N template is also used to produce regular syntactic strings, i.e. regular noun phrases in Polish (as in 25).

[34]Booij (2010: 187) refers to *rode* 'red' in *rode kool* 'red cabbage' as a qualifying adjective. In the terminology used by Cetnarowska et al. (2011) and Rutkowski and Progovac (2005), this is an instance of a classifying adjective (with a 'kind' reading), while *red* in *red dress* counts as a qualifying adjective.

[35]Masini (2009) uses the formula 'a kind of N1 that has something to do with N2'.

[36]This corresponds to A+N units containing 'migrating' adjectives in Cetnarowska et al. (2011).

(25) a. *niezwykl-e* *mądr-a* *kobiet-a*
extreme-ADV wise-F.NOM.SG woman-F.NOM.SG
'extremely wise woman'

b. *zmęczon-y* *po* *noc-n-ym* *dyżurz-e*
tired-M.NOM.SG after [[night]$_N$-n-M.LOC.SG]$_A$ duty[M.LOC.SG]
lekarz
physician[M.NOM.SG]
'physician tired after a night duty'

The strings in (25) are instantiations of the abstract A+N pattern, yet they have a descriptive function, instead of the naming one. Moreover, they exhibit no restrictions on their internal complexity.

Let us now consider N+A combinations, such as those in (2), which represent a very frequent pattern for forming adjective-noun phrasal nouns in Polish. They can be treated as instantiations of one of the two schemas given below. For instance, the schema in (26) can be used to interpret the combination *panda wielka* 'great panda' (with the non-derived adjective *wielki* 'great, big'), while the schema in (27) – for the combination *nazwa handl-owa* 'trade name' (in which the classifying adjective is derived from the noun *handel* 'trade').

(26) $[N^0_i\ A^0_j]_k \longleftrightarrow$ [NAME for SEM$_i$ with property SEM$_j$]$_{SEMk}$

(27) $[N^0_i\ A^0_j]_k \longleftrightarrow$ [NAME for SEM$_i$ with some relation R to entity E of SEM$_j$]$_{SEMk}$

The schemas in (26–27) might be seen as counterexamples to the assumption that phrasal lexemes follow regular syntactic rules, because the default position of an adjective in regular noun phrases in Polish is the pre-head position. However, noun phrases with post-head adjectives do occur, as shown in (28–30), though the N+A order is regarded as a marked one (see Nagórko 1996: 190; Topolińska 1984: 284). It is used for stylistic effect (in 28), or when the adjective phrase can be regarded as a reduced relative (as in 29–30).

(28) a. *matk-a* *moj-a*
mother-F.NOM.SG my-F.NOM.SG
'my mother'

b. *Profesorz-e* *koch-an-y!*
professor-M.VOC.SG [[love]$_V$-PASS.PTCP-M.VOC.SG]$_A$
'Dear professor!'

(29) *Książk-i* *wypożycz-on-e* *na* *noc*
book-ACC.PL [[borrow]$_N$-PASS.PTCP-NOM.PL]$_A$ for night[F.ACC.NOM]
należ-y *zwróci-ć* *do* *9.*
should-IMPRS return-INF by 9
'Books on loan for the night are due back by 9 a.m.'

(30) *Człowiek* *mądr-y* *popełni-a* *błęd-y*
man wise- commit- mistake-
[M.NOM.SG] M.NOM.SG PRS.3SG ACC.PL
i *się* *na* *nich* *ucz-y.*
and REFL on them[NOM.ACC] learn-PRS.3SG
'A person who is wise makes mistakes and learns from them.'

Let us now propose an abstract schema for N+N-GEN phrasal lexemes in Polish, such as *nerwica serca* 'cardioneurosis' (or other lexemes in 3). It can have the following (simplified) form:

(31) $[N^0_i\ N_j\text{-GEN}]_k \longleftrightarrow$ [NAME for SEM_i with some relation R to $SEM_j]_{SEMk}$

A related phrasal schema N+N-GEN is often instantiated by noun phrases with a descriptive function in Polish. The syntactic phrases proper exemplified in (32) do not have a generic reading (in contrast to juxtapositions) and they refer to a particular entity or person.

(32) a. *właściciel* *tamt-ego* *mercedes-a*
owner [M.NOM.SG] that- Mercedes-
M.GEN.SG M.GEN.SG
'the owner of that Mercedes'

b. *fundament-y* *wasz-ego* *now-ego* *dom-u*
foundation-NOM.PL your.PL- new-
M.GEN.SG M.GEN.SG house-M.GEN.SG
'the foundations of your new house'

It is important to emphasize at this point that Booij and Audring (2017) recognize two functions of construction schemas. Schemas motivate (i.e. can be used to analyse) existing lexical units. Furthermore, they can be employed as instructions when building novel phrasal names. The second function is certainly important in the case of N+A and N+N-GEN phrasal nouns in Polish, since these are highly productive patterns for novel coinages denoting subtypes of entities.

Booij and Masini (2015) and Booij and Audring (2017) argue for the existence of second order schemas in the model of Construction Morphology. Such schemas state a relationship between a complex word and another linguistic expression (which can be either a word or a phrase, and which is not a subconstituent of the complex word in question). Booij and Masini (2015) propose that second order schemas can, for instance, capture semantic relationship between A+N phrasal nouns in Russian and suffixal nouns which result from morphological condensation, e.g. *mineral'naja voda* 'mineral water' and *mineral'ka* 'mineral water'.

The data from Polish presented in Sect. 4 above, i.e. the derivatives in *–ka*, *-ak* and *-ec*, indicate the need for such a schema which can express the relation of (propositional) synonymy between the suffixal derivatives and N+A phrasal

nouns, exemplified by the pair in (18c) and (18c'), i.e. *szkoła budowlana* 'secondary technical school of building' and *budowlanka* '(colloq.) secondary technical school of building'. The second order schema postulated for Polish in (33) is similar to the one posited by Booij and Masini (2015) for Russian, except for a difference in the word order of N and A constituents in the phrasal noun in Polish and the lack of the truncation[37] of the adjective in front of *–ka*.

(33) $< [\ N_i\ A_j\ ]_{Nk} \longleftrightarrow [\text{SEM}_i \text{ with the property SEMj}]_{\text{SEMk}} > \approx$
$< [\ A_j\ \text{–}ka]_{Nz} \longleftrightarrow [\text{SEM}_k\ [+\text{familiar}]]_z >$

The pattern in (33) can be modified slightly (by replacing *–ka* by another suffix) to give rise to second order schemas expressing the relationship between [N+A] phrasal nouns and derivatives in *–ak* or *–ec*. Moreover, since the adjectives in [N+A] phrasal lexemes in (18) are relational adjectives, the schema in (33) can be rewritten as (34).

(34) $< [N^0_i\ A^0_j\ ]_k \longleftrightarrow$ [NAME for SEM_i with relation R to entity E of $\text{SEM}_j]_{\text{SEMk}} > \approx$
$< [\ A_j\ \text{–}ka]_{Nz} \longleftrightarrow [\text{SEM}_k\ [+\text{familiar}]]_z >$

The feature [+familiar] can be (potentially) dropped from the part of the construction schema with the semantic specification of *–ec* derivatives since *–ec* nouns belong mainly to the neutral register, e.g. *odrzutowiec* 'jet plane', synonymous to the phrasal lexeme *samolot odrzutowy* (lit. plane jet.RA) 'jet plane'.

Second order schemas can also be employed to state a paradigmatic relationship between Polish compound nouns or compound adjectives in (20) and phrasal nouns which motivate them semantically, e.g. the adjective *czarnorynkowy* 'relating to black market' and the idiomatic A+N phrasal lexeme *czarny rynek* 'black market'. The idiomatic phrasal noun in question is not a formal subconstituent of the adjective *czarnorynkowy* since the linking vowel *–o-* in compound adjectives in Polish connects stems, and not fully inflected adjectives and nouns. The second order schema posited in order to express the semantic relationship between the compound adjective and the A+N phrasal noun in question is formulated tentatively in (35).[38]

(35) $< [A^0_i\ N^0_j]_k \longleftrightarrow [\text{NAME for } \text{SEM}_j \text{ with property } \text{SEM}_i]_{\text{SEMk}} > \quad \approx$
$< [[A_{i\text{Stem}}] + \text{Int} + [N_{j\text{Stem}}] - ow(y)]_{Az} \longleftrightarrow [\text{relating to } \text{SEM}_k]_z >$

Furthermore, compound adjectives or compound nouns in Polish can show semantic affinity to N+A phrasal nouns, as exemplified in (20) by the pairs *czerwonoarmista*

[37] In the case of *–ka* derivatives which result from morphological condensation of phrasal nouns in Polish, the nominalizing suffix attaches to the whole inflectional stem of the relational adjective, cf. *budowlan(y)* 'relating to building' and *budowlank(a)* 'secondary technical school of building'.

[38] Booij and Masini (2015) indicate the need for second order schemas in Greek to express the paradigmatic relationship between compound adjectives and lexicalized A+N phrasal nouns. They do not formulate such a schema explicitly.

'Red Army soldier' and *Armia Czerwona* 'Red Army', or *cywilnoprawny* 'relating to civil law' and *prawo cywilne* 'civil law'. A schema showing the relatedness between *prawo cywilne* and the adjective *cywilnoprawny* is given in (36).

(36) $< [N^0_i\ A^0_j]_k \longleftrightarrow$ [NAME for SEM_i with some relation R to entity E of $SEM_j]_{SEMk} > \approx$
$< [[A_{iStem}] + Int + [N_{jStem}] - n(y)]_{Az} \longleftrightarrow$ [relating to $SEM_k]_z >$

Let us emphasize that the phrasal noun *prawo cywilne* cannot form a subconstituent of the compound adjective *cywilnoprawny*, since the interfix *–o-* links two stems (lacking inflectional endings) which are placed in a different order (i.e. A+N) than in the phrasal (N+A) noun. Thus, semantic relatedness between N+A phrasal lexemes and compound adjectives or compound nouns in Polish provides a strong argument for the need of second order schemas.

6 Conclusions

The occurrence of phrasal nouns in Polish testifies to the lack of a clear-cut border between syntax and the lexicon. This theoretical assumption is prominent in Construction Grammar (Goldberg 1995, 2006) and in the works couched within the framework of Construction Morphology (Booij 2009, 2010; Masini 2009; Hüning 2010). Phrasal nouns discussed above exhibit restrictions on their internal complexity (in contrast to syntactic phrases proper), hence their non-head constituents are analysed here as non-projecting (i.e. they are syntactically minimal, not phrasal). Nevertheless, particular subtypes of phrasal nouns differ in the degree of syntactic fixedness, with constituents of N+A units, such as *sklep muzyczny* (lit. shop music.RA) 'music store', showing greater syntactic mobility than N+N-GEN units, such as *prawo pracy* (lit. law.NOM labour.GEN) 'labour legislation'. Phrasal lexemes in Polish show varying degrees of semantic compositionality. The non-compositionality (or partial semantic compositionality) of some N+A, A+N or N+N-GEN units follows from the fact that they are conventionalized as names of particular types of entities, hence they tend to acquire "surplus semantic value" (see Hüning 2010 for a similar observation on A+N in German). However, the N+N or N+A pattern is regularly employed by speakers of Polish for creating complex lexemes. Consequently, phrasal schemas postulated above to analyse the internal structure of phrasal nouns in Polish have a double role. Apart from functioning as redundancy statements (for interpreting existing phrasal nouns), they serve as templates for coining novel names of concepts in Polish. The discussion in Sects. 4 and 5 has also provided support for another mechanism available in the theoretical apparatus of Construction Morphology, namely second order schemas. They can express paradigmatic relatedness between morphologically complex words (such as suffixal *–ka*, *-ak* or *–ec* derivatives or synthetic compounds) and phrasal nouns in Polish. Phrasal lexemes motivate morphologically complex words semantically in spite of not functioning as their formal subconstituents.

References

Booij, G. 2009. Phrasal names: A constructionist analysis. *Word Structure* 2 (2): 219–240.
———. 2010. *Construction morphology*. Oxford: Oxford University Press.
Booij, G., and J. Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41 (S2): 277–302.
Booij, G., and F. Masini. 2015. The role of second order schemas in the construction of complex words. In *Semantics of complex words*, ed. L. Bauer, L. Kőrtvélyessy, and P. Štekauer, 47–66. Cham: Springer.
Cetnarowska, B. 2014. On pre-nominal classifying adjectives in Polish. In *Advances in the syntax of DPs: Structure, agreement, and case*, ed. A. Bondaruk, G. Dalmi, and A. Grosu, 100–127. Amsterdam/Philadelphia: John Benjamins.
———. 2015a. The lexical/phrasal status of Polish Noun+Adjective or Noun+Noun combinations and the relevance of coordination as a diagnostic test. *SKASE Journal of Theoretical Linguistics* 12 (3): 142–170.
———. 2015b. The linearization of adjectives in Polish noun phrases: Selected semantic and pragmatic factors. In *Within language, beyond theories*, Studies in theoretical linguistics, ed. A. Bondaruk and A. Prażmowska, vol. 1, 188–205. Newcastle upon Tyne: Cambridge Scholars Publishing.
Cetnarowska, B., and H. Trugman. 2012. Falling between the chairs: Are classifying adjective+noun complexes lexical or syntactic formations? In *Current issues in generative linguistics: Syntax, semantics and phonology*, ed. J. Błaszczak, B. Rozwadowska, and W. Witkowski, 138–154. Wrocław: Center for General and Comparative Linguistics.
Cetnarowska, B., A. Pysz, and H. Trugman. 2011. Distribution of classificatory adjectives and genitives in Polish NPs. In *On words and sounds: A selection of papers from the 40th PLM, 2009*, ed. K. Dębowska-Kozłowska and K. Dziubalska-Kołaczyk, 273–303. Newcastle upon Tyne: Cambridge Scholars Publishers.
Goldberg, A. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: Chicago University Press.
———. 2006. *Constructions at work. The nature of generalization in language*. Oxford: Oxford University Press.
Grzegorczykowa, R. 1981. *Zarys słowotwórstwa polskiego. Słowotwórstwo opisowe*. Warszawa: Państwowe Wydawnictwo Naukowe.
Grzegorczykowa, R., and J. Puzynina. 1984. Słowotwórstwo rzeczowników. In *Gramatyka współczesnego języka polskiego. Morfologia*, ed. R. Grzegorczykowa, R. Laskowski, and H. Wróbel, 332–407. Państwowe Wydawnictwo Naukowe: Warszawa.
Hüning, M. 2010. Adjective + Noun constructions between syntax and word formation in Dutch and German. In *Cognitive perspectives on word formation*, ed. A. Onysko and S. Michel, 195–215. Berlin/New York: De Gruyter Mouton.
Jadacka, H. 2001. *System słowotwórczy polszczyzny (1945-2000)*. Warszawa: Wydawnictwo Naukowe PWN.
Kallas, K. 1980. *Grupy apozycyjne we współczesnym języku polskim*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.
Kolbusz-Buda, J. 2014. *Compounding in Polish and English. A morphosemantic analysis of deverbal compound nouns in Polish in the light of parallel constructions in English*. Lublin: Wydawnictwo KUL.
Linde-Usiekniewicz, J. 2013. A position on classificatory adjectives in Polish. *Studies in Polish Linguistics* 8: 103–125.
Martincová, O. 2015. Multi-word expressions and univerbation in Slavic. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, vol. 1, 742–757. Berlin: De Gruyter Mouton.
Masini, F. 2009. Phrasal lexemes, compounds and phrases: A constructionist perspective. *Word Structure* 2 (2): 254–271.

Masini, F., and V. Benigni. 2012. Phrasal lexemes and shortening strategies in Russian: The case for constructions. *Morphology* 22 (3): 417–451.

Nagórko, A. 1996. *Zarys gramatyki polskiej*. Warszawa: Wydawnictwo Naukowe PWN.

———. 2016. Polish. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, vol. 4, 2831–2852. Berlin: De Gruyter Mouton.

Ohnheiser, I. 2015. Compounds and multi-word expressions in Slavic. In *Word-formation: An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, vol. 1, 757–779. Berlin: De Gruyter Mouton.

Ralli, A., and M. Stavrou. 1998. Morphology-syntax interface: A+N compounds and A+N constructs in modern Greek. In *Yearbook of morphology 1997*, ed. G. Booij and J. van Marle, 243–264. Dordrecht: Kluwer.

Rutkowski, P., and L. Progovac. 2005. Classification projection in Polish and Serbian: The position and shape of classifying adjectives. In *Formal approaches to Slavic linguistics: The South Carolina meeting*, ed. S. Franks, F.Y. Gladney, and M. Tasseva-Kurktchieva, 289–299. Ann Arbor, MI: Michigan Slavic Publications.

Spencer, A. 2013. *Lexical relatedness*. Oxford: Oxford University Press.

Szymanek, B. 2010. *A panorama of Polish word-formation*. Lublin: Wydawnictwo KUL.

ten Hacken, P., and E. Kwiatek. 2013. Nominal compounds as naming devices: A comparison of English and Polish land surveying terminology. In *The semantics of word formation and lexicalization*, ed. P. ten Hacken and C. Thomas, 83–101. Edinburgh: Edinburgh University Press.

Topolińska, Z. 1984. Składnia grupy imiennej. In *Gramatyka współczesnego języka polskiego. Składnia*, ed. M. Grochowski, S. Karolak, and Z. Topolińska, 301–393. Państwowe Wydawnictwo Naukowe: Warszawa.

Willim, E. 2001. On NP-internal agreement: A study of some adjectival and nominal modifiers in Polish. In *Current issues in formal Slavic linguistics*, ed. G. Zybatow, U. Junghanns, G. Mehlhorn, and L. Szucsich, 80–95. Frankfurt/Main: Peter Lang.

Arabic Nonconcatenative Morphology in Construction Morphology

Stuart Davis and Natsuko Tsujimura

Abstract This chapter examines nonconcatenative morphology of Arabic with a particular focus on its templatic nature. While much of the past research on Arabic templatic morphology has centered on the verbal system, our discussion largely takes up the nonverbal templatic morphology of Arabic including the comparative, nouns of profession, and the diminutive. In developing formal analyses of these constructions we specifically address the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touch upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that some templatic constructions in Arabic seem to require the consonantal root as its base. The goal of this chapter, then, is not only to make known the fuller extent of Arabic templatic morphology (i.e. beyond the verbal system), but also to show advantages of approaching these prosodic issues in construction terms.

Keywords Root-based morphology · Root-and-pattern morphology · Stem modification · Templatic morphology · Word-based morphology

1 Introduction

The goal of this article is to offer an analysis and conception of Arabic nonconcatenative morphology within the framework of Construction Morphology (CxM) by focusing on Arabic templatic morphology. As discussed in Davis and Tsujimura (2014: 191), nonconcatenative morphology entails cases where morphological exponence is not (exclusively) expressed by the concatenation of additive phonemic

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content (i.e. affixes) to a base. Two types of nonconcatenative processes that are characteristic of Arabic are stem modification and templatic morphology. While there is some discussion and analysis of stem modification in CxM, templatic morphology has been little discussed (but see Inkelas and Zoll 2005 on reduplication). In stem modification, morphological marking is indicated by modification of some aspect internal to a base. Examples discussed by Booij (2010a), for one, include German plural umlaut (vowel fronting) and change of tone pattern observed with inalienable plurals in Ngiti (Central Sudanic). In templatic morphology, which is characteristic of Semitic languages and found marginally in many other languages, a morphological construction (e.g. the Arabic comparative) requires that its members have a specific prosodic shape, expressible by a template. Such prosodic templates might be composed of a specific CV pattern or a prosodic unit such as a syllable or a foot. Booij (2010a: 241) briefly mentions the English nickname formation like *Alfreda-Alf-Alfy* as an example of a templatic construction where the syllable/foot that characterizes the nickname is triggered by the construction itself.

In developing formal analyses of Arabic nonconcatenative constructions in the framework of CxM, we specifically address the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touch upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that there are some templatic constructions in Arabic that seem to require the consonantal root as its base.

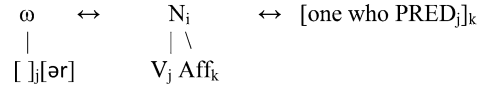
Below, we first begin in Sect. 2 by summarizing the assumptions and formalisms of CxM as developed in various works of Geert Booij exemplifying it with the English deverbal *–er* and comparative *–er* constructions. Sections 3 and 4 focus on Arabic nonconcatenative morphology. In Sect. 3 we consider verbal derivation of what is termed "Form 2" and "Form 3" in traditional grammars. Form 2 verbs often express the causative and are morphologically marked by consonant gemination. Form 3 verbs roughly correlate with reciprocal meaning and are indicated by vowel lengthening. There has been a controversy as to whether these verbal forms are templatic in nature referencing root consonants or just involve stem modification of a base verb. After briefly reviewing this controversy, we will attempt to formalize both analyses using the schemata of CxM. Section 4 will examine a variety of templatic constructions in Arabic outside of the verbal system. Dividing templatic constructions according to whether the consonantal root or a nominal word serves as a major component, we will discuss the comparative and occupational nouns as examples of the former while the diminutive and "broken" plural illustrate the latter.

2 Construction Morphology

In a series of works, Booij (2005, 2007, 2009a, b, 2010a, b, 2013 among others) has developed the detailed application of Construction Grammar to morphological analysis. This has led to the emergence of CxM as an increasingly important subfield

of Construction Grammar. The development is in line with earlier comments by researchers such as Michaelis and Lambrecht (1996) and Croft (2001) who posit that in addition to syntactic constructions, complex words also constitute constructions. Booij (2010a) develops the formal use of schemata to express generalizations about form-meaning pairings of morphological constructions. The schemata capture abstractions over related sets of words. Nevertheless, a morphological schema can be used to create new words. As detailed by Booij (2010a), a morphological schema represents three kinds of information: phonological, morpho-syntactic, and semantic. A specific example of a schema demonstrating this tripartite division is shown in (1) for English deverbal *–er*, taken from Booij (2010a: 8).

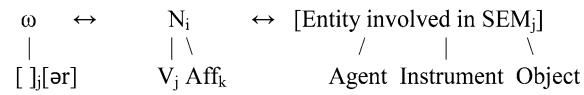
(1) The schema for deverbal *-er*



The schema in (1) specifies that there is a systematic relation between the three types of linguistic information involved, [PHON], [SYN], and [SEM]. The phonological structure [PHON] of the morphological schema is displayed to the left of the first double arrow in (1), showing that a word serves as the base for the construction. The morphosyntactic structure [SYN], shown in the middle, indicates that the suffix *-er* attaches to a verb resulting in a noun. The semantic structure [SEM] on the right expresses the meaning of the combination. The double arrow indicates correspondence between the different parts of the representation, while the co-indexing is used to specify the correspondence between the three types of information.

The operation of the [PHON] level of (1) is one of concatenative affixation: the deverbal *–er* suffix can go onto a (verb) form. The absence of phonological restriction is formally indicated by the lack of any content in the brackets that are dominated by the phonological word node, ω. The [SEM] level requires an additional analysis with subschema because the suffix leads to polysemy that includes an instrumental meaning (e.g. *opener*, *mixer*), an object meaning (e.g. *reader*) and an agentive interpretation. (2) represents the construction with the variety of semantics that *–er* denotes.

(2) The schema for deverbal *–er* with subschemas



The bound morpheme *–er* does not exist as a separate lexical entry under Booij's conception of construction morphology (i.e. morphology is word-based), but instead, the existence and associated meaning of the affix is bound to the construction. Under this view, a morphological schema is abstract and can be used to create new words such as *skyper* from *skype*.

Independent of the deverbal *–er* in (2), a phonologically identical suffix can be attached to adjectives to yield a corresponding comparative. Despite the apparent similarity, the two constructions are very different not only in the semantic and morphosyntactic properties but also phonological restrictions imposed on them. The comparative *–er* construction requires that the base adjective be no more than two syllables, as is illustrated in (3).[1]

(3)

	Adjective	*Comparative*	
a.	smart	smarter	
	funny	funnier	
	simple	simpler	
	pretty	prettier	
b.	intelligent	*intelligenter	(more intelligent)
	hilarious	*hilariouser	(more hilarious)
	elementary	*elementrier	(more elementary)
	beautiful	*beautifuler	(more beautiful)

The prosodic requirement on the base adjective is construction-specific since the homophonous *-er* agentive construction has no such prosodic requirement (e.g. *interrogate-interrogater*). As such, the prosodic requirement is part of the [PHON] component of the comparative construction, as in (4) following Booij's (2010a).

(4) English comparative *–er* construction (A = adjective; σ = syllable)

$$\begin{array}{ccccc} \omega & \leftrightarrow & A_i & \leftrightarrow & \text{[more A, comparative semantics]} \\ / \backslash & & | \ \backslash & & \\ [\sigma(\sigma)]_j[\text{ər}] & & A_j\ Aff_k & & \end{array}$$

The English *–er* comparative construction brings up the matter of how to encode phonological restrictions on morphological constructions using the schemata of Construction Grammar. The English example in (4) shows that phonological restrictions on the base can be relatively easily incorporated in the formalization of the construction. As we will demonstrate drawing on Arabic data below, somewhat more difficult cases include templatic morphology, where the output of the morphological operation must conform to a particular phonological or prosodic shape. Booij (2010a: 241) briefly deals with a similar matter in his discussion of the English nickname construction (e.g. *Alfreda-Alf*, *Elizabeth-Liz, Jeffrey-Jeff*, *Barbara-Barb*), which requires the nickname to consist of a single heavy syllable. His analysis is summarized as follows: "...there is a morphological construction schema for proper names in which the semantic representation is enriched with a semantic or pragmatic property, without an additional corresponding overt affix. This construction then will trigger the phonological operation of truncation, which may be modelled as the mapping of the phonological form of the input name onto

[1] Individual variation on the acceptability of some two-syllable forms has been noted by Carstairs-McCarthy (1998).

a specific prosodic template, that of a heavy syllable (nickname)...” (p. 241). While this summary provides an insight at the conceptual level, the exact mechanisms incorporating templatic phonological restrictions remain to be worked out. In what follows, we shall make a modest attempt to that end.

3 Arabic Verbal Morphology: Form 2 and Form 3

As discussed in McCarthy (1979, 1981), the Classical Arabic verbal system consists of fifteen different morphological classes or “forms” as it is termed in the traditional literature on Arabic.[2] We focus on Forms 1–3 since they are the most widely maintained in almost all dialects. Form 1 is considered to be the basic form of a verb while the others are usually derivable from the Form 1 verb. Form 2 typically expresses causative or intensive.[3] Form 3 is understood as a reciprocal, although Benmamoun (2016) argues that it more accurately reflects a case of verb plurality in that the event or state involves more than one participant. (5) demonstrates different verbs from Classical Arabic in these three forms. Each of the verbs is given in the 3rd person, masculine singular perfective active, which has no overt marking for person and number. In (5a) and (5b), the corresponding passive form is indicated in parenthesis. Glosses are provided for the perfective active forms immediately under the verb. In the transcription, a capital letter indicates a pharyngealized consonant.

(5) Arabic verbs Form 1-3 (data from Wehr 1976)

	Form 1	Form 2	Form 3
a.	katab (kutib)	kattab (kuttib)	kaatab (kuutib)
	‘wrote’	‘dictated’	‘corresponded with’
b.	qatal (qutil)	qattal (quttil)	qaatal (quutil)
	‘killed’	‘massacred’	‘killed one another’
c.	daras	darras	daaras
	‘studied/learned’	‘taught’	‘studied together’
d.	raqaS	raqqaS	raaqaS
	‘danced’	‘made dance’	‘danced (with someone)’
e.	kasar	kassar	———-
	‘broke’	‘shattered’	
f.	qarib	qarrab	qaarab
	‘was near’	‘brought close’	‘came near’

[2] Ten of these classes are common (Forms 1–10), but contemporary dialects keep only a subset of them.

[3] See Doron (2003) for detailed discussion on the semantics of this class.

g.	salim	sallam	saalam
	‘was safe’	‘protected’	‘kept the peace’/‘made up with’
h.	kaTar	kaTTar	kaaTar
	‘was many’	‘increased’	‘outnumbered’
i.	Salaħ	Sallaħ	Saalaħ
	‘was good’	‘fixed’	‘made peace’/‘reconciled’
j.	ʃaruf	———	ʃaaraf
	‘was noble’		‘vied for nobility (with someone)’

The Form 1 verbs in Arabic are considered to be the basic verb class in that they are not derivable from other verb forms, while serving as the base for the other derived verbal classes (Forms). Form 1 also contains the largest number of verbs and includes stative verbs (5f-j). The gaps in (5e) and (5j) show that not all Form 1 verbs can be made causative (Form 2) or reciprocal (Form 3). Although there are some Form 1 verbs that cannot derive corresponding Forms 2 and 3, it is rare for a Form 2 or Form 3 verb not to have a Form 1 counterpart.

The description and analysis of the verbal forms in (5) have been the subject of a debate in Arabic linguistics since McCarthy’s seminal works (1979, 1981). McCarthy analyzes the causative (Form 2) and reciprocal (Form 3) by separating a consonantal root, a vowel pattern, and a CV prosodic template and representing each of them as a separate morpheme on independent tiers. In (5a) and (5b), for instance, the consonants *ktb* and *qtl* provide the lexical meaning *write* and *kill*, respectively. The vowel pattern involving *a*, on the other hand, provides grammatical information pertinent to tense/aspect/mood. The overall word shape CVVCVC marks ‘reciprocal’ and/or ‘verbal plurality’ (Benmamoun 2016). The exact meaning of a given verbal form, thus, is determined not only by the consonantal sequence and the vowel but also by a specific CV template to which the consonants and the vowels are linked. This can be expressed in CxM with the schema for the reciprocal exemplified in (6) where the template is incorporated.

(6) base form: katab ‘write’

```
k      t   b   ↔ ‘writing’
|      |   |
C VVCVC        ↔ reciprocal
   \\  /
     a         ↔ past, active

→ kaatab  ‘corresponded with’
```

The construction for the causative forms can be posited in a similar way, as in (7), which we illustrate with the passive causative *kuttib* ‘was dictated’. The base word for *kuttib* ‘was dictated’ (the past tense of Form 2) in (5a) is *katab* ‘write’, and the CVCCVC template is associated with the causative meaning. The consonantal tier consists of the root consonants of *ktb* ‘write’; the vocalic pattern *ui* (past, passive)

comprises the vocalic tier, and these tiers together lead to the passive verb of the Form 2, *kuttib* 'was dictated'. This mechanism can be expressed in CxM terms in (7).

(7) base form: katab 'write'

```
k    t   b   ↔ 'writing'
|    /\  |
C VCCVC      ↔ causative
  |   |
  u   i      ↔ past, passive

→ kuttib  'was dictated'
```

In (6–7), the CV tier plays an important role to give rise to the reciprocal and the causative meanings, but these meanings are not predicted from the individual parts of the CV-tier. Rather, the semantic property belongs to the template as a whole that is formed by a specific number and order of consonants and vowels.

In the literature on Arabic morphology, the approach to verb formation demonstrated above has traditionally been termed the root-and-pattern analysis, but there has been an opposing treatment that is consistent with a word-based approach. Heath (1987), Ratcliffe (1997, 2013), and Benmamoun (1999), for example, downplay the role of the consonantal root in developing a word/stem base view of Arabic morphology whereby most (verb) stems would minimally consist of the shape CCVC.[4] Following McCarthy (1993),[5] they analyze the causative (Form 2) and reciprocal (Form 3) verbs in (5) as the affixation of a moraic prefix to the base verb. Under this view, the gemination that indicates the Form 2 causative reflects the affixation of a consonantal mora (μ_c), while the vowel lengthening that marks the reciprocal results from the affixation of a vocalic mora (μ_v) to the base verb. This is shown in (8) for the active perfective forms that were given in (5a); it is somewhat modified from Ussishkin (2000).

(8) Moraic affixation analysis of the causative and the reciprocal
a. Causative (perfective) /μ_c + katab/ → [kattab] "dictated"
b. Reciprocal (perfective) /μ_v + katab/ → [kaatab] "corresponded with"

The moraic (consonantal) affix in (8a) that marks the causative is realized as the gemination of the medial consonant since a stem (or root) initial consonant of a verb cannot be geminated in Classical Arabic. In (8b), the affixation of the vocalic mora that marks the reciprocal results in the lengthening of the first stem vowel. Notably, it is the phonology that determines that the prefixal consonantal mora gets realized by the gemination of the medial consonant in (8a) and that the vocalic mora is realized

[4]Under this view, the CCVC does constitute a phonological word in those dialects that allow for initial consonant clusters.

[5]McCarthy (1993) is quite distinct from McCarthy (1979, 1981).

by the lengthening of the first vowel in (8b). The schematic representations in (9a) and (9b) capture the mechanism of the moraic affixation for the formation of Form 2 and Form 3.

(9) Abstract schemata for the causative (Form 2) and the reciprocal (Form 3)
a. $[\mu_c[x]_{vi}]_{vj} \leftrightarrow$ [causative/intensive in $SEM_i]_j$
b. $[\mu_v[x]_{vi}]_{vj} \leftrightarrow$ [reciprocal/plurality in $SEM_i]_j$

The schemata in (9) show the prefixal mora, which is subscripted as consonantal for the causative/intensive and as vocalic for the reciprocal/plurality. The variable *x* stands for a major lexical category indicated as verb by the subscript *v*, and the coindexation between the different types of information expresses the relation between the base verb and the derived verb. As noted above, the way in which the consonantal mora in (9a) and the vocalic mora in (9b) are realized as gemination and vowel lengthening, respectively, is determined by the phonology. The precise meaning of the individual word form (e.g. causative for Form 2 verbs and reciprocal Form 3) involves the semantic property of each construction, and thus reflects the holistic nature of the form-meaning correspondences in Construction Grammar.

In this section we have discussed two opposing views of the Arabic verbal forms as demonstrated by the analysis of Form 2 and Form 3 verbs. The traditional root-and-pattern analysis considers the consonantal root and prosodic templates morphological entities. The word-based approach, in contrast, allows for the affixation of an abstract mora whose realization is determined by the phonology. On the latter approach, there is no need to reference a consonantal root or a prosodic template. To the extent that both perspectives are compatible with the basic tenet of CxM, we have demonstrated how the relevant generalizations leading to appropriate verbal forms can be represented in terms of construction schemata.

4 Templates and Roots in Arabic Nonverbal Morphology

Work by John McCarthy has made known the nonconcatenative nature of the Arabic verbal system; less known is the templatic nature of its nonverbal morphology. In this section we will consider three different constructions: the comparative, nouns of profession, and the diminutive. We will start by introducing nonverbal templatic morphology as relevant background for our discussion, citing an Arabic hypocoristic (nickname) pattern as an example.

Various patterns of hypocoristics in Arabic have been described by Davis and Zawaydeh (1999) and analyzed from an optimality-theoretic perspective by Zawaydeh and Davis (1999). One common type reflects the Ammani-Jordanian dialect, as is illustrated in (10). The hypocoristic adds a sense of endearment as they are normally used among family members and intimates. (In the transcription, [y] indicates a palatal glide.)

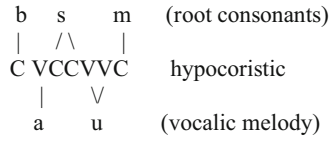
(10)

Full Name	*Hypocoristic*
a. hind	hannuud
b. baasim	bassuum
c. saliim	salluum
d. yaasir	yassuur
e. widaad	wadduud
f. salman	salmuun
g. maryam	maryuum
h. muusa	masmuus

Regardless of the phonological shape of the full name, the hypocoristic always has the same bisyllabic templatic form where the first syllable is closed and the second syllable has a long vowel. For convenience, we represent this as C_iVCCVVC_f, where C_i is the initial consonant of the full name and C_f is the final consonant of the full name. The vowel of the first syllable of the hypocoristic template is specified as /a/ and that of the second syllable as /u/, which is realized as long. The data in (10a–e) show that in names with three consonants, the medial consonant of the full name is realized as a geminate in the hypocoristic. The examples in (10f–g) indicate that the hypocoristic template can accommodate names that have four consonants, while the name in (10h) shows that template can also accommodate names with only two consonants by consonantal reduplication. While we do not discuss here the specific details of the phonological issue of how the mapping is realized between the full name and the hypocoristic form, we can schematize the Ammani Jordanian Arabic hypocoristic as a morphological construction as shown by the abstract form-meaning pairing in (11) with the illustration in (12).

(11) Ammani Jordanian Arabic hypocoristic construction
a. Form: C_iaCCuuC_f
b. Semantics: endearment

(12) Base name: baasim



→ bassuum

One issue that is raised by the representation in (12) is the formal status of the root consonants and the vocalic melody. Sharing the underlying concept of the word-based approached discussed in Sect. 3, an alternative analysis, proposed by Ratcliffe (2004, 2013), claims that having no formal morphological status, the root consonants are just what is left over after the vowels of the base name have been removed. If we consider the vocalic melody shown in (12) as part of the hypocoristic

template, then the formation of hypocoristic *bassuum* based on the full name *baasim* need not reference a separate consonantal root. This is shown in (13).

(13) Base name: baasim

b aa s i m (root consonants)
| / \ |
C a CC uu C hypocoristic

→ bassuum

Since the vowel pattern of (13) has no independent semantics outside of the hypocoristic pattern, there is no reason to represent the vowels of the hypocoristic template on a separate tier. Consequently, as shown in (13), when the phonemes of the full name map onto the hypocoristic template, the vowels of the full name do not get realized since other vowels (*a*, *u*) are specified as part of the hypocoristic template. From this perspective, the root just constitutes the phonemes that are left over once the vowels of the base name are stripped away.

The representations in (12) and (13) can both be viewed as consistent with the form-meaning pairing in (11) with the difference being in what exactly maps onto a template, i.e. root consonants in (12) and a full base form in (13). This background regarding the morphological status of the consonantal root will serve as a focal point of the discussion of the Arabic comparative in the following subsection.[6]

4.1 Comparative Construction

The comparative in Arabic seems to be a model example of templatic morphology, but outside of recent work by Davis (2016, 2017), its templatic nature has rarely been discussed in contemporary works on Arabic morphology. In most dialects of Arabic, the morphological comparative seems to be formed by taking an adjectival word and matching it to the templatic shape aCCaC where the C-slots represent the root consonants that comprise many Arabic words.[7] (14) illustrates the comparative in the Egyptian dialect. A possible adjectival base is shown in the lefthand column, the comparative form in the middle, and the gloss on the right. (Data are from Kamel and Hassanein 1980; Badawi and Hinds 1986; and also Davis 2016, 2017.)

[6]Whether the hypocoristic pattern illustrated in (11) supports the morphological status of the consonantal root has been the subject of a debate within the literature on Arabic linguistics with various positions taken. For more details, see, in particular, Davis and Zawaydeh (2001), Idrissi et al. (2008), and Ratcliffe (2013).

[7]Phonetically, the comparative usually begins with an initial glottal stop, but since this results from a low-level process of epenthesis, we will not indicate it in our transcription or discussion.

(14) The Arabic comparative – Egyptian dialect

	Adj. (m. sg.)	*Comparative*	*Gloss*
a.	kibiir	akbar	big
b.	wiħi∫	awħa∫	bad
c.	dayyaʔ	adyaʔ	narrow
d.	tixiin	atxan	fat
e.	Tawiil	aTwal	long
f.	Saʕb	aSʕab	difficult
g.	faʔiir	afʔar	poor
h.	biʕiid	abʕad	far
i.	laTiif	alTaf	pleasant
j.	bakkiir	abkar	early
k.	zaħma	azħam	crowded
l.	zaayid	azyad	excessive

(14) shows that the comparative is formed from an adjectival base by extracting the three consonants of the base and putting them into the templatic frame aCCaC. The stress is on the initial syllable of the comparative in accordance with the stress rules of Egyptian Arabic (e.g. Watson 2002). The vowel pattern and syllable structure of the base adjective in (14) is irrelevant in determining the form of the comparative. Although (14) presents a limited number of examples, it clearly establishes that Arabic has a morphological comparative that is templatic with the shape aCCaC.[8] Moreover, the comparative form is invariant in Egyptian Arabic; that is, unlike other adjectives, it does not inflect for gender or number to agree with the subject noun phrase. Based on (14), we can posit a CxM analysis using the abstract schema in (15) that expresses the form-meaning pairing that holds for the comparative. (16) exemplifies the construction for the comparative [akbar] ‘bigger’.

(15) Egyptian Arabic comparative construction

a. Form: aCCaC

b. Semantics: comparative

(16) Base: kibiir

k b r (root consonants)

| | |

aCCaC comparative

→ akbar

Interestingly, the comparative shows allomorphy based on the nature of the root consonants: one type of allomorphy is phonological, and the other type is templatic. In the simpler case of phonologically determined allomorphy, the templatic shape

[8] Additional examples can be found in Kamel and Hassanein (1980) and Badawi and Hinds (1986).

seems to be aCCa rather than aCCaC. In all cases of the comparative with the template aCCa, the last root consonant is a glide. This is shown in (17) where we include the feminine form of the adjective in addition to the masculine since it is often the case that the final glide surfaces in the feminine but not in the masculine form.[9]

(17) Comparative of adjectives with final glides

Adj. (m. sg.)	*Adj. (f. sg.)*	*Comparative*		*Gloss*
a. ħilw	ħilw-a	aħla	(*aħlaw)	sweet
b. waaTi	waTy-a	awTa	(*awTay)	low
c. ʕaali	ʕaly-a	aʕla	(*aʕlay)	high
d. zaki	zakiyya	azka	(*azkay)	intelligent
e. haadi	hadya	ahda	(*ahday)	calm
f. ʔawi	ʔawiyya	aʔwa	(*aʔway)	strong

In the adjective in (17a), the final glide, [w] is present in the adjectival base, but does not surface in the comparative. In the masculine forms of the adjectival base in (17b–f), the root final glide consonant, /y/, is expected at the end of the base word but does not surface. For example, the masculine forms in (17b) and (17c) are underlyingly /waaTiy/ and /ʕaaliy/, with the final glide deleting resulting in [waaTi] and [ʕaali], respectively, as is suggested by their corresponding feminine forms. The lack of the final glide in all the comparative forms in (17) (e.g. [aħla] instead of *[aħlaw] 'sweeter' and [awTa] instead of *[awTay] 'lower') is attributed to a phonological effect, since content words in Egyptian Arabic do not have vowel-glide sequences in word-final position, precluding words ending in diphthongs (Broselow 1976; Youssef 2013). As a result, comparatives of adjectives with a root-final glide consonant, as in (17), delete the final glide so that the templatic shape of the comparative appears as aCCa rather than the expected aCCaC. Thus, the comparatives of the aCCa form in (17) can be understood as displaying the same form-meaning pairing of the aCCaC template in (15). Here, no construction-specific stipulation is needed for the presence of allomorphy since it follows from a more general phonological constraint against a word ending in a final (postvocalic) glide in Egyptian Arabic.

The more complicated allomorph of the templatic comparative in Egyptian Arabic occurs when the adjectival form ends in two identical root consonants including geminates. Such roots have been analyzed as consisting of only two root consonants, rather than as comprising three root consonants where the last two are identical – a view consistent with the Obligatory Contour Principle (OCP, see McCarthy 1986). For these forms, the comparative typically takes the pattern aCaCC where the last two consonant slots comprise a geminate and word stress is on the final syllable in compliance with the regular Egyptian Arabic stress rules. Sample data are given in (18).

[9]For a more comprehensive discussion, see Davis (2017).

(18) Comparative of adjectives ending in two identical consonants: $aC_1aC_2C_2$

Adj. (m. sg.)	*Comparative*	*Gloss*
a. ʃidiid	aʃadd	strong
b. xafiif	axaff	light
c. laziiz	alazz	delicious
d. widdi	awadd	desirable
e. tamm	atamm	complete

The templatic shape $aC_1aC_2C_2$ of the comparative forms in (18) is not phonologically derivable by a regular process from the template aCCaC. This makes the allomorphy of the words in (18) quite different from the forms in (17) where the relevant pattern of aCCa is derivable from aCCaC by the regular phonology. The difference between (18) and (14) is that the base adjectives in (18) have only two root consonants. The template $aC_1aC_2C_2$ pertains to forms with two root consonants while the template $aC_1C_2aC_3$ is relevant to forms with three root consonants. The comparison of the adjective [kibiir] 'big' in (14a) with [ʃidiid] 'strong' in (18a) points to the templatic difference in the number of root consonants: these two words have identical syllable structure and vowel patterns but only differ in whether the consonantal root is triliteral (*kbr*) in (14a) or biliteral (*ʃd*) in (18a).

The issue of templatic allomorphy of the Arabic comparative poses an interesting challenge for the schematic representation in CxM. In order to show the specific details of our suggested analysis, we will make use of the schema that displays the detailed tripartite structure of the components [PHON], [SYN], and [SEM] as discussed by Booij (2010a, b) and exemplified in Sect. 2 above. The generalization that emerges from the above discussion of the Arabic comparative is that the construction seems to embed a mechanism that allows for a mapping of root consonants onto a template, but precisely where in a constructional schema would these be indicated? In (19), we show our posited abstract schema for the comparative where the form-meaning pairing displays the tripartite structure of the components [PHON], [SYN], and [SEM].

(19) The schema for the Arabic comparative construction with subschema (R = root consonants)

$$\begin{array}{ccccc} R & \leftrightarrow & \mathrm{Adj}_i & \leftrightarrow & [\text{comparative of } \mathrm{SEM}_j]_k \\ | & & / \quad \backslash & & \\ [\ ]_j & & [aC_1C_2aC_3]_k\ [aC_1aC_2C_2]_k & & \end{array}$$

In (19) we indicate the root consonants as phonologically accessible and thus can be referenced in the [PHON] component of the construction. The templatic allomorphy that differentiates between forms with two or three root consonants is indicated by subschemas – $[aC_1C_2aC_3]_k$ for a triliteral root and $[aC_1aC_2C_2]_k$ for a biliteral root – as part of the [SYN] component, which represents the comparative

template as a morphosyntactic construct.[10] The indication of root consonants in the [PHON] component of the construction seems to assume that root consonants are listed in the mental lexicon and that the comparative construction is indeed root-based, not word-based. We briefly turn to these issues by providing further evidence for the root-based nature of the comparative construction and offering a novel conception of the Arabic consonantal root.

Although we have indicated in (19) that the comparative form of the adjective is based on the consonantal root, we earlier referenced an adjectival base (i.e. the positive form of the adjective) in our initial data presentation of (14). Based on arguments in Davis (2016, 2017), we further explain that the comparative indeed reflects the consonantal root as base rather than an adjectival word. The distinction that we have shown between the template aCCaC for comparatives with three root consonants (14) and the template aCaCC for those with two root consonants (18), in fact, supports the root as a base. That is, as demonstrated by *kibiir-akbar* 'big/bigger' in (14a) and *ʃidiid-aʃadd* 'strong/stronger' in (18a), the specific nature of the comparative template is based on the number of root consonants and not on the syllable structure or other phonological characteristics of an adjectival base word. Below we provide additional evidence for the root-base approach.

Our data presentation thus far has been limited to comparatives where the corresponding adjectives do not have affixal consonants. The data from the Egyptian dialect in (20), however, demonstrate comparatives whose (assumed) adjectival base contains affixal consonants.

(20) Comparatives of adjectives with affixal consonants (affixal consonants are underlined)

	Adj. (m. sg.)	*Comparative*	*Gloss*
a.	mu-naasib	ansab	appropriate
b.	mu-himm	ahamm	important
c.	ma-gnuun	agann	crazy
d.	kaslaan	aksal	lazy
e.	taʕbaan	atʕab	tired
f.	rufayyaʕ	arfaʕ	thin

[10]The choice for a triliteral root to map onto the aCCaC template and for a biliteral one onto the aCaCC template is determined by the interface module between morphology and phonology in a way consistent with Booij's (2010a: 8–9, 239–241) discussion of this module. That is, in the interface module, an assigned word feature (here the feature [comparative]) triggers the application of specific phonological processes unique for words with that feature. Such processes are not general ones in the phonology. We discuss the role of this interface module further at the end of Sect. 4.3.1 on the diminutive. The issue of the formal status of root consonants is discussed at the end of this section.

g.	ʔuSayyar	aʔSar	short
i.	ʔurayyib	aʔrab	near
j.	ʔulayyil	aʔall	few
k.	ħinayyin	aħann	kind/affectionate

The adjectives in (20a–c) have a derivational prefix while the adjectives in (20d–e) have a final derivational suffix. The adjectival base in (20f–k) arguably has the shape of a templatic diminutive that is characterized by the infixal geminate glide [-yy-] between the second and third root consonants. These affixal consonants are invisible in the formation of the comparative. Thus, we see from the middle column of (20) that the comparative template (aCCaC/aCaCC) takes only the root consonants as the base with absolutely no reference to the affixal ones. This is consistent with the view that only the consonantal root is essential to the comparative construction.

Further, there are comparatives that do not seem to find their corresponding base adjectival form. Three examples from Egyptian Arabic are given in (21) with an explanation as to why it does not seem to have an adjectival base.

(21) Comparatives without corresponding base adjectival forms (Egyptian dialect)

a. [azwaʔ] ‘more polite’	The base might be [zooʔ], but [zooʔ] is a noun rather than an adjective
b. [anwar] ‘more luminous’	The base is not clear. It could be [nuur] ‘light’ or [minawwar] ‘luminous’.
c. [aħaʔʔ] ‘more entitled’	The base is not clear. One possible base is the adjective [ħaʔiiʔi] ‘truthful’ but the meaning of the comparative does not match the meaning of the possible base.

Native speakers of Egyptian Arabic that we consulted are unsure of or disagree on what exactly the positive form of the adjective is for the comparatives in (21). Given a certain degree of ambivalence on the speakers’ judgments concerning the origin of the alleged corresponding adjective, the meaning of the comparative is always consistent with the semantics encompassed by the root but not necessarily with an adjective deriving from it. For example, [aħaʔʔ] and [ħaʔiiʔi] in (21c) share the root /ħʔʔ/, which encompasses the meaning roughly corresponding to English ‘truth’ and ‘right’. One might suggest that [ħaʔiiʔi] ‘truthful’ could serve as the adjectival base for the comparative [aħaʔʔ]. However, this adjectival meaning is nongradable, and Davis (2017) shows that nongradable adjectives lack a templatic comparative form. It follows then that these two words could in no way be derivationally related to each other. Instead, the semantics of the comparative is more in line with the meaning

of 'right' borne by the root /ħ??/. This is how the meaning of 'more entitled' is assigned to [aħa??]; it follows from the holistic nature of the construction.[11]

In our formalization of the comparative construction in (19), we have indicated that the consonantal root can be referenced by the PHON component of the constructional schema. The accessibility of the Arabic consonantal root finds its support in the psycholinguistics literature. The priming experiments of Boudelaa and Marslen-Wilson (2001, 2005) show that Arabic speakers are aware of relationships between words that share the same root. It is shown in their experiments that the root as a phonological construct is more important than the actual semantic relatedness of word forms that share the same root. Thus, as noted by Ratcliffe (2013), a lexeme like *kitaab* 'book' can prime a lexeme such as *katiiba* 'regiment' even though their meanings are quite unrelated. Based on this and other similar experimental findings, Boudelaa and Marslen-Wilson propose that the root consonant is a lexically listed morphemic unit. Here we give their proposal a somewhat different interpretation, maintaining that root consonants are akin to a label for a word family or family of lexemes in the sense of Haspelmath and Sims (2013). For example, if one considers lexemes with the root *ktb*, then *kitaab* 'book' and its inflected forms would comprise a lexeme; *katiiba* 'regiment' and its inflected forms would comprise another lexeme; and *katab* 'he wrote' and its inflectional paradigm forms would constitute a third lexeme. There are other lexemes of the *ktb* family as well (such as *maktab* 'office'). A consonantal root then can be better understood as a label for a family of lexemes, and (native) Arabic speakers have access to this label so that a consonantal root can then be accessed as part of the [PHON] component of a morphological construction.[12, 13]

[11]Grano and Davis (2018) discuss the typological implications of the comparative in Arabic since it instantiates a language that has a morphological comparative that is not based on a corresponding positive form.

[12]Lahrouchi (2010: 259), in comparing the nature of the consonantal root in Classical Arabic with Tashlhiyt Berber, refers to the root as an abstract morpheme in Arabic but as a surface-true morpheme in Tashlhiyt Berber. This is because in Berber, which allows for vowelless words, the consonantal root can comprise an unaffixed word form, as in the example [nkr] 'stand up (aorist)'. Nonetheless, we would suggest that in Berber, just as in Arabic, the root consonants can also be considered a label of a family of lexemes.

[13]The notion that a consonantal root is akin to a label for a family of lexemes as we have posited is different from the suggestion in Ryding (2005) that an Arabic consonantal root can be thought of as representing a semantic field. Moreover, we believe our view is consistent with that of Bybee (2001: 32), who considers schemas to be formed at many different levels of generality where schemas are generalizations over numerous instances of usage. The Arabic consonantal root then can be understood as a type of schema within the model developed by Bybee (2001).

4.2 Occupation Nouns

In the previous section we offered a detailed examination of the Arabic comparative in the framework of CxM. A consequence is that the construction approach in turn provides evidence for the root-based approach to templatic allomorphy. In this section we discuss one other root-based templatic construction in Arabic, namely the class of occupation nouns. These nouns are common across Arabic dialects, although rarely discussed in the contemporary linguistics literature on the language. Our discussion below is based on occupational nouns in Damascus Arabic.

Ferguson and Ali (1961: 229) describe various ways that occupational nouns are formed in Damascus Arabic: "The commonest type of occupation noun is characterized by the pattern $C_1aC_2C_2aaC_3$, i.e. with double second consonant and long -aa- between the second and third consonants of the root." The structure is templatic and the consonants that fill the template always are root consonants. In their examples of occupation nouns, Ferguson and Ali do not indicate any related word but just assume that the occupation noun references the root directly. (22) presents the data on occupation nouns.

(22) Occupation nouns (Damascus dialect)

	Root	*Occupational Noun*	*Gloss*
a.	xbz	xabbaaz	baker
b.	xyT	xayyaaT	tailor
c.	xdm	xaddaam	servant
d.	smk	sammaak	fish seller
e.	nZr	naZZaar	carpenter
f.	Tbx	Tabbaax	cook
g.	Tyr	Tayyaar	pilot
h.	bwb	bawwaab	doorkeeper
i.	lħm	laħħaam	butcher
j.	zyt	zayyaat	oil seller
k.	ħlʔ	ħallaaʔ	barber
l.	ħTb	ħaTTaab	firewood cutter/seller
m.	ʔTʕ	ʔaTTaaʕ	bandit
n.	dl	dallaal	one who shows things (e.g. real estate agent)
o.	ʔS	ʔaSSaaS-a	beautician (f.)
p.	xT	xaTTaaT	calligrapher

The occupational nouns in Damascus Arabic in (22) invariably fit the templatic schema $C_1aC_2C_2aaC_3$. These nouns only contain root consonants. It is not clear whether any of these nouns have a specific base word from which they are derived. Even if the occupational noun could be related to a base word, any affixal consonants of such a base would not have any realization in the template $C_1aC_2C_2aaC_3$ of the occupation noun. Consequently, the occupation noun reflects only consonants that comprise the consonantal root. Furthermore, unlike the comparative, the template

for the occupation noun is exactly the same for roots containing two consonants as seen by the data in (22n–p). For example, the root in (22p), *xT*, consists of two consonants while the template requires three, C_1, C_2, and C_3. To compensate for the gap in the number of consonants, the second consonant, *T*, appears both as C_2, and C_3.[14]

We can posit the tripartite structure for the occupational noun construction in (23) consisting of the components [PHON], [SYN], and [SEM].

(23) The schema for the Arabic occupation noun construction (*R* = root consonants)

R	↔	N_i	↔	[occupation of $SEM_j]_k$
|		|		
[ ]$_j$		[$C_1aC_2C_2aaC_3]_k$		

In (23) we indicate the phonological form of root consonants (viewed as a label on a family of lexemes) is accessible in the [PHON] component of the construction, whereas the template is specified in the [SYN] component. The constructional schema captures that the structural, meaning, and functional properties of occupation nouns are represented as being a holistic property of the construction as a whole.

Although the occupation noun construction does not display templatic allomorphy, it does exhibit phonological allomorphy when the last root consonant is a glide. This relates to the observation made earlier that Arabic content words do not end in a sequence of a vowel followed by a glide. Consider the examples of the occupation nouns in (24) that have a final root glide.

(24)	a.	ħky	ħakka	(*ħakkaay)	speaker
	b.	kwy	kawwa	(*kawwaay)	presser of clothes
	c.	ʃry	ʃarra	(*ʃarraay)	buyer

Similar to the comparative forms in (17) (e.g. *awTa* ‘lower’ vs. **awTay*), the word-final glide, which would correspond to C_3, deletes in the occupation noun forms in (24). As discussed by Broselow (1976) and Youssef (2013), the deletion of a final glide in this context can be viewed as phonological. Notice also that the occupation nouns in (24) demonstrate a further complication vis-à-vis the expected templatic representation of $C_1aC_2C_2aaC_3$: if these nouns simply involved the deletion of the word-final glide, then we expect the final vowel to be long, yielding **ħakkaa*, for example. While leaving open the question of whether the shortening of the final vowel can be viewed as purely phonological or construction specific, we note that a final long vowel in many Arabic dialects marks an inflectional category.

[14]We suggest that this association of the second root consonant to the final slot of the template with biliteral roots reflects autosegmental principles of phonology, as discussed, for example, by McCarthy (1986).

Consequently, there may be some motivation for the unexpected shortening of the final vowel in (24).

4.3 Word-Based Templatic Constructions

In Sects. 4.1 and 4.2 we have exemplified root-based templatic constructions in Arabic drawing on the data from the comparative and occupation nouns. The diminutive in Arabic, to which we turn now, instantiates a word-based templatic construction. We will also briefly discuss the "broken" plural. In both constructions, the noun serves as the base word.[15]

4.3.1 The Diminutive

The diminutive in Classical Arabic displays a variety of subpatterns that are completely predictable from the prosodic structure of the base noun.[16] Sample data showing most of the diminutive subpatterns are provided in (25). (A period indicates syllable boundary, and a hyphen represents a morpheme boundary.)

(25) Arabic diminutive (data are mainly from McCarthy and Prince 1990; Watson 2006)

	Base noun	*Diminutive*	*Gloss*
a.	dam	dumay	blood
b.	ħukm	ħu.kaym	judgment
c.	ʕi.nab	ʕu.nayb	grape
d.	ma.lik	mu.layk	king
e.	d͡ʒun.dub	d͡ʒu.nay.dib	locust
f.	ma-k.tab	mu.kay.tib	office
g.	sul.Taan	su.lay.Tiin	sultan
h.	mi-f.taaħ	mu.fay.tiiħ	key
i.	ki.taab	ku.tay.yib	book
j.	d͡ʒa.ziir-a	d͡ʒu.zay.yir	island
k.	xaa.tam	xu.way.tim	signet ring
l.	qaa.muus	qu.way.miis	dictionary
m.	baab	bu.wayb	door

[15] We offer a construction morphology analysis of the diminutive, but because of the complexities of the broken plural, a detailed account will be left for future research.

[16] The analysis of the Classical Arabic diminutive in the framework of Prosodic Morphology can be found in McCarthy and Prince (1990) and from an optimality-theoretic perspective in Watson (2006).

The data in (25) are divided into six groups depending on the prosodic structure of the base noun. (25a–b) are monosyllabic nouns; (25c–d) are bisyllabic, the first syllable being light; (25e–f) are bisyllabic nouns with a closed first syllable and a short vowel in the second; (25g–h) and (25i–j) both have a long vowel in the second syllable but differ in whether the first syllable is closed or open; and in the last group of (25k–m), the base noun contains a long vowel in the first syllable. This brief description indicates that while the diminutive forms display a range of patterns, the specific shape that the diminutive takes is dependent on the prosodic characteristics of the base noun, thus making it quite different from the comparative in Sect. 4.1. The commonality of all the diminutive word forms is that they begin with the same sequence: Cu.Cay where the C slots represent the first two consonants of the base noun, unless the first syllable of the base has a long vowel, in which case, the second C-slot of Cu.Cay is realized as [w], as in (25k–m). Following McCarthy and Prince (1990), the initial Cu.Cay part of the diminutive is characterized as comprising an iambic template since the first syllable is light and the second syllable is heavy. The remainder of the diminutive word form incorporates the other consonants of the base noun.[17] In those rare Arabic nouns such as [dam] 'blood' in (25a) that have the CVC pattern, the diminutive form is simply what matches the Cu.Cay template, as seen by [du.may] in (25a).[18] Thus, despite a wide variety of subpatterns, the specific subpattern is always predictable from the prosodic characteristics of the base noun.

The range of subpatterns of dimunitive forms exemplified in (25) can be generalized into the construction schema of (26).

(26) The schema for the Arabic diminutive

$$\begin{array}{ccccc} \omega & \leftrightarrow & N_i & \leftrightarrow & [\text{diminutive SEM}_j]_k \\ | & & | & & \\ [\ ]_j & & [\text{CuCayX}]_k & & \end{array}$$

In (26) we capture the generalization that for the diminutive, the base noun (without phonological restriction) maps onto the template CuCayX.[19] Specifically, the diminutive construction itself triggers the mapping of the phonological form of the input noun onto the template. Regarding the CuCayX template in (26), Cu.Cay is the part of the template that characterizes what all diminutives share; X indicates

[17] When necessary, a high front vowel is added between the last two consonants of the diminutive word form (e.g. 25e–l) for phonotactic reason; the added high vowel may be long if the final vowel of the noun base is long.

[18] That the final glide does not delete in this word reflects that the /y/ is part of the diminutive template and not a root consonant. See the discussion of (17) where a final root glide of the comparative undergoes deletion after a vowel.

[19] It is worth noting that a broken plural as in (27) can never serve as a base for a diminutive. We do not think this is accidental. That is, because the broken plural reflects a word-based templatic construction, it cannot be unified with another word-based templatic construction.

the remainder of the diminutive word, the realization of which is predictable given the phonological nature of the base noun. In those rare nouns of the form CVC such as *dam* 'blood' in (25a), X would have no content. In (25b–e), X would be a single consonant as exemplified in (25d) by the pair *malik-mulayk* 'king', where the /k/ of the base does not map on the Cu.Cay part of the template but surfaces in the diminutive word immediately after Cu.Cay. In base words having more complex prosodic structure due to the presence of a long vowel, X is an entire syllable as in the example in (25l) *qaamuus – quwaymiis* 'dictionary'.

We suggest that the precise nature of the phonological mapping between the base noun and the diminutive template CuCayX is determined by the interface module between morphology and phonology in a way consistent with Booij's (2010a: 8–9, 239–241) discussion of this module whereby an assigned word feature such as [plural] triggers the application of specific phonological processes unique for words with that feature. These processes are not general ones in the phonology. For the diminutive forms in (25), the interface module would specify a mapping relationship between the base noun, and the diminutive word that would include several formalized statements (rules) relating aspects of the phonological form of the base to its effect on how the templatic diminutive is realized. For example, there would be a statement indicating that the second consonant of a diminutive is [w] if the first syllable of the base noun has a long vowel, as in (25k–m). The reference to an interface module between the morphology and phonology involving fairly complex statements seems to be characteristic of Arabic word-based templatic morphology, given that similar statements would be needed to account for the details of the broken plural subpatterns in (27). In contrast, the content of the interface module between the morphology and phonology in the root-based templatic morphology discussed in Sects. 4.1 and 4.2 would be quite minimal. For example, for the templatic allomorphy shown in the schema for the root-based comparative construction in (19), we suggest that there would be a statement in the interface module that a base with three root consonants takes the templatic structure $[aC_1C_2aC_3]_k$ and those with two root consonants take the base $[aC_1aC_2C_2]_k$. The exact nature of the interface module between morphology and phonology is left for future research. Nonetheless, we see that the constructional schema in (26) captures that the structural, meaning, and functional characteristics of the diminutive can only be attributed to the property that belongs to the construction as a whole. Similar to the comparative and occupational nouns analyzed in Sect. 4.2, the template is part of the SYN component of the construction.

4.3.2 The Broken Plural

As a final example of a templatic word-based construction in Arabic, we briefly mention the "broken" plural, but because of its complexity we do not formalize its constructional schema. The "broken" plural is ubiquitous in Classical Arabic and all modern dialects. The broken plural is related to the nominal singular base by specific changes in the vowel pattern and syllable structure; there is no prefixation

or suffixation involved.[20] The word-internal changes that accompany the broken plural are not predictable for any given noun, and there are many subpatterns. A small sample that testifies to the variety of subpatterns is given in (27).

(27) Arabic broken plural (data taken from Wehr 1976; McCarthy and Prince 1990)

	singular	*plural*	*gloss*
a.	nafs	nu.fuus	soul
b.	ra.d͡ʒul	ri.d͡ʒaal	man
c.	ʔasad	ʔu.suud	lion
d.	ta-q.diir	ta.qaa.diir	calculation
e.	ma-k.tab	ma.kaa.tib	office
f.	mi-f.taaħ	ma.faa.tiiħ	key
g.	xaa.tim	xa.waa.tim	signet-ring
h.	d͡ʒaa.muus	d͡ʒa.waa.miis	(water) buffalo
i.	kitaab	ku.tub	book
j.	kaafil	kuf.fal	breadwinner
k.	Dilaʕ	ʔaD.luʕ	rib

The data in (27) illustrate the problem that confronts any analysis of the broken plural, especially considering that there are even more subpatterns in addition to those shown. Based on McCarthy and Prince (1990), the following two observations can be made: (i) most of the broken plural subpatterns are expressible by a single template; (ii) the precise mechanism that leads to actual forms depends, to an extent, on the phonological characteristics of the base noun. Regarding the first observation, the majority of broken plurals, as reflected by (27a–h), have a syllable structure pattern of the first syllable being light and the second being heavy with a long vowel. This sequencing of a light syllable followed by a heavy one is consistent with an iambic foot structure. From such a perspective, it is the iambic template that is the exponence of the broken plural. For (27a–h), the plural template would consist of the form CV.CVV and is aligned to the left edge of the word. The second observation on the precise realization can be illustrated by (27d, f–h). If the last syllable of the base noun contains a long vowel, as in (27d, f, h), the last syllable of the plural will always have a long vowel. Moreover, as shown in (27g–h), if the first syllable of the base noun has a long vowel, then the second consonant of the plural is [w]. Finally, as shown in (27d–f), a prefixal consonant in the singular also occurs in the plural. This makes the broken plural quite different from the comparative data discussed in Sect. 4.1 where only root consonants can occur in the comparative template.

Analyses of the broken plural are very complex. While forms like (27a–h) indicate that many of the subpatterns have an iambic template, there are complications that include the unpredictability of the vowel patterns (although there are certain

[20] Arabic also has a suffixal plural referred to as the "sound" plural in traditional studies on Arabic. The suffix marks the plural for certain noun classes and for most borrowed words.

tendencies) and complications entailing the subpatterns in (27i–k) that do not seem to have an iambic structure in the plural. Detailed analyses of the broken plural are lengthy (e.g. McCarthy and Prince 1990; Ratcliffe 1998). From the perspective of CxM, an analysis of the broken plural would need to incorporate a large number of subschema. Given the complexities of such an analysis, we leave the details of this for future research.

5 Conclusion

In this article we have made an initial attempt at accounting for Arabic nonconcatenative morphology in the framework of CxM centering on templatic morphology. Our major focus has been on addressing the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touched upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that there are some templatic constructions in Arabic that seem to require the consonantal root as its base. We have maintained that the Arabic prosodic template is formally part of the SYN component of a construction, which is consistent with its morphosyntactic nature. We have also suggested that Arabic root consonants do not comprise a lexically listed morpheme with its own semantics (as in Boudelaa and Marslen-Wilson 2001, 2005), but can be conceptualized as a label to a family of lexemes that is accessible to a construction. Their precise meaning is determined in its realization in a morphological construction. That is, the specific meaning of a word form in a root-based construction – such as the comparative and occupational nouns – is captured as coming from the construction itself. In this way, both root-based templatic morphology and word-based templatic morphology share the notion of a prosodic template as part of the SYN component of the morphological construction. Nevertheless, they differ in the nature of the base, with its consequential ramifications for how the template is phonologically realized. Our analysis is consistent with an emerging consensus that Arabic morphology can be both root-based and word-based.[21] While the account presented here of the application of construction morphology to Arabic is far from definitive and sufficient, our aim is to initiate the discussion on how Arabic templatic and root-based morphology can be conceptualized within the framework of CxM.

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[21] See, in particular, Watson (2006), Idrissi et al. (2008), and Benmamoun (2016).

References

Badawi, E.-S., and M. Hinds. 1986. *A dictionary of Egyptian Arabic*. Beirut: Librairie Du Liban.

Benmamoun, E. 1999. Arabic morphology: The central role of the imperfective. *Lingua* 108: 175–201.

———. 2016. Verbal and nominal plurals and the syntax-morphology interface. In *Perspectives on Arabic linguistics XXVII*, ed. S. Davis and U. Soltan, 59–74. Amsterdam: John Benjamins.

Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O. Pfeiffer, and F. Rainer, 109–132. Amsterdam: John Benjamins.

———. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 34–44. Somerville: Cascadilla Press.

———. 2009a. Constructions and lexical units: An analysis of Dutch numerals. *Linguistische Berichte* Sonderheft 19: 1–14.

———. 2009b. Compounding and construction morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.

———. 2010a. *Construction morphology*. Oxford: Oxford University Press.

———. 2010b. Construction morphology. *Language and Linguistic Compass* 3 (1): 1–13.

———. 2013. Morphology in CxG. In *The Oxford handbook of construction grammar*, ed. Th. Hoffmann and G. Trousdale, 255–273. Oxford: Oxford University Press.

Boudelaaa, S., and W. Marslen-Wilson. 2001. Morphological units in the Arabic mental lexicon. *Cognition* 81: 65–92.

Boudelaa, S., and W. Marslen-Wilson. 2005. Discontinuous morphology in time: Incremental masked priming in Arabic. *Language and Cognitive Processes* 20: 207–260.

Broselow, E. 1976. *The phonology of Egyptian Arabic*. PhD dissertation. University of Massachusetts.

Bybee, J. 2001. *Phonology and language use*. Cambridge: Cambridge University Press.

Carstairs-McCarthy, A. 1998. Phonological constraints on morphological rules. In *The handbook of morphology*, ed. A. Spencer and A. Zwicky, 144–148. Oxford: Blackwell.

Croft, W. 2001. *Radical construction grammar*. Oxford: Oxford University Press.

Davis, S. 2016. The Arabic comparative and the nature of templatic mapping in Arabic. In *Word-formation across languages*, ed. L. Körtvélyessy, P. Štekauer, and S. Valera, 73–90. Newcastle: Cambridge Scholars Press.

———. 2017. Some issues for an analysis of the templatic comparative in Arabic with a focus on the Egyptian dialect. In *Perspectives on Arabic linguistics XXIX*, ed. H. Ouali. 129–150. Amsterdam: John Benjamins.

Davis, S., and N. Tsujimura. 2014. Non-concatenative derivation: Other processes. In *The Oxford handbook of derivational morphology*, ed. R. Lieber and P. Štekauer, 190–218. Oxford: Oxford University Press.

Davis, S., and B. Zawaydeh. 1999. A descriptive analysis of hypocoristics in colloquial Arabic. *Language and Linguistics* 3: 83–98.

———. 2001. Arabic hypocoristics and the status of the consonantal root. *Linguistic Inquiry* 32: 512–520.

Doron, E. 2003. Agency and voice: The semantics of the Semitic templates. *Natural Language Semantics* 11: 1–67.

Ferguson, Ch., and M. Ali. 1961. *Damascus Arabic*. Washington, DC: Center for Applied Linguistics.

Grano, Th., and S. Davis 2018. Universal markedness in gradable adjectives revisited: The morpho-semantics of the positive form in Arabic. *Natural Language and Linguistic Theory* (36):131–147.

Haspelmath, M., and A. Sims. 2013. *Understanding morphology*. 2nd ed. London: Routledge.

Heath, J. 1987. *Ablaut and ambiguity: Phonology of a Moroccan Arabic dialect*. Albany: State University of New York Press.
Idrissi, A., J.-F. Prunet, and R. Béland. 2008. On the mental representation of Arabic roots. *Linguistic Inquiry* 39: 221–259.
Inkelas, S., and Ch. Zoll. 2005. *Reduplication: Doubling in morphology*. Cambridge: Cambridge University Press.
Kamel, M., and A. Hassanein. 1980. *Yalla ndardish sawa*. Cairo: Arabic Language Unit, American University in Cairo.
Lahrouchi, M. 2010. On the internal structure of Tashlhiyt Berber triconsonantal roots. *Linguistic Inquiry* 41: 255–285.
McCarthy, J. 1979. *Formal problems in Semitic phonology and morphology*. PhD dissertation. MIT.
———. 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12: 373–418.
———. 1986. OCP effects: Gemination and antigemination. *Linguistic Inquiry* 17: 207–263.
———. 1993. Templatic form in prosodic morphology. *Proceedings of the Formal Linguistics Society of Mid-America* 3: 187–218.
McCarthy, J., and A. Prince. 1990. Foot and word in prosodic morphology: The Arabic broken plurals. *Natural Language and Linguistic Theory* 8: 209–282.
Michaelis, L., and K. Lambrecht. 1996. Toward a construction-based theory of language functions: The case of nominal extraposition. *Language* 72: 215–247.
Ratcliffe, R. 1997. Prosodic templates in a word based morphological analysis of Arabic. In *Perspectives on Arabic linguistics X*, ed. M. Eid and R. Ratcliffe, 147–171. Amsterdam: John Benjamins.
———. 1998. *The "broken" plural problem in Arabic and comparative Semitic: Allomorphy and analogy in non-concatenative morphology*. Amsterdam: John Benjamins.
———. 2004. Sonority-based parsing at the margins of Arabic morphology. *Al-Arabiyya* 37: 53–75.
———. 2013. Morphology. In *The Oxford handbook of Arabic linguistics*, ed. J. Owens, 71–91. Oxford: Oxford University Press.
Ryding, K. 2005. *A reference grammar of Modern Standard Arabic*. Cambridge: Cambridge University Press.
Ussishkin, A. 2000. *The emergence of fixed prosody*. PhD dissertation. University of California Santa Cruz.
Watson, J. 2002. *The phonology and morphology of Arabic*. Oxford: Oxford University Press.
———. 2006. Arabic morphology: Diminutive verbs and diminutive nouns in San'ani Arabic. *Morphology* 16: 189–204.
Wehr, H. 1976. In *Arabic-English dictionary*, ed. J.M. Cowan. Ithaca, NY: Spoken Language Services.
Youssef, I. 2013. *Place assimilation in Arabic: Contrasts, features, and constraints*. Ph.D dissertation. University of Tromsø.
Zawaydeh, B., and S. Davis. 1999. Hypocoristic formation in Ammani-Jordanian Arabic. In *Perspectives on Arabic linguistics XII*, ed. E. Benmamoun, 113–139. Amsterdam: John Benjamins.

Foreign Word-Formation in Construction Morphology: Verbs in *-ieren* in German

Matthias Hüning

Abstract This paper discusses some problems and questions related to the study of foreign word-formation. German verbs in *-ier(en)* are used as a case study and as a testing ground for an output-oriented and exemplar-based approach to morphology. I will try to show that Construction Morphology is conceptually and with respect to its central notions very appropriate for the phenomena and the patterns in this domain of word-formation. While I will point out some peculiarities of foreign word-formation, I will also try to show that there is no difference in principle. In essence, word-formation is always an analogical process based on formal and semantic similarities between words and on paradigmatic relationships between (groups of) words.

Keywords Foreign word-formation · Loan morphology · Construction Morphology · Morphological schema · Analogy · Productivity · German verb-formation

1 Introduction[1]

Borrowing is one of the characteristics of natural languages. Most obviously, language contact results in the adoption of foreign words, but it can also result in the borrowing of word-formation patterns. Bloomfield (1933: 454) already describes the possibility of affix borrowing: "When an affix occurs in enough foreign words, it may be extended to new-formations with native material." The integration of foreign lexical material is, however, often a partial integration. Words and morphemes tend

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to keep some of the phonological or grammatical characteristics of the language they are taken from. Therefore, word-formation with foreign elements has often been perceived as largely irregular and unpredictable. This might explain the relative lack of interest on the part of theoretical morphology.

As Eisenberg (2012: 247–250) and Müller (2015: 1615) point out, foreign word-formation has always been the poor cousin of the growing discipline of lexical morphology. Müller himself has been one of the morphologists demanding more attention for the features and the details of foreign word-formation in German. He edited two volumes with articles on diverging aspects of the topic (Müller 2005, 2009), and his own work and work of his research group has provided us with many insights (and many open questions) regarding this part of the lexicon.

In this paper, I will use the verbal suffix *-ier* in German to illustrate some of the problems and questions related to the study of foreign word-formation. I will point out some peculiarities of foreign word-formation, but I will also try to show that there is no difference in principle with native word-formation.

In essence, word-formation is always an analogical process based on formal and semantic similarities between words, on paradigmatic relationships between (groups of) words and on the creative capacity of language users to come to generalizations and to productively use the analogies they see (Hüning 1999). This is a very traditional conception of word-formation, already formulated in the nineteenth century, for example by Hermann Paul in his famous *Prinzipien der Sprachgeschichte* (Paul 1920; the first edition appeared in 1880)[5]. In recent years it faces kind of a revival in usage-based linguistics and in construction grammar approaches to word-formation.

I will adopt a usage-based view on language as a complex adaptive system in the sense of Beckner et al. (2009). In line with Bybee (2010), I will argue in favor of an exemplar-based approach of word-formation, and I will try to show that Construction Morphology (Booij 2010) might provide a model that enables us to better describe what is going on in (foreign) word-formation.

2 Issues in Foreign Word-Formation

2.1 Stratal Peculiarities

With respect to the lexicon and the word-formation in Germanic languages, it is often assumed that we have to deal with a 'stratal split', a general division into two 'strata', each with its own possibilities and restrictions. For German, Müller (2000: 115) distinguishes indigenous (native) and exogenous (foreign) word-formation. And Booij advocates such a view for Dutch:

> Stratal restrictions are a specific kind of lexical restrictions related to the division of the Dutch lexicon into two layers or strata, a native (Germanic) layer, and a non-native (Romance) one. (Booij 2002: 94)

A general restriction concerns the use of foreign suffixes, which are usually only attached to base words of non-native origin. Booij illustrates this behavior with the competing nominal suffixes *-iteit* (non-native) and *-heid* (native).

(1) Native *-heid* vs. non-native *-iteit* in Dutch (adapted from Booij 2002: 95)

Native stem		
blind 'blind'	*blind-heid* 'blindness'	**blind-iteit*
doof 'deaf'	*doofheid* 'deafness'	**dov-iteit*
Non-native stem		
stabiel 'stable'	*stabiel-heid* 'stableness'	*stabil-iteit* 'stability'
divers 'diverse'	*divers-heid* 'diversity'	*divers-iteit* 'diversity'

There are exceptions to this rule, but generally speaking, *-iteit* can only be combined with non-native stems, while *-heid* can be attached to both native and non-native stems. A similar pattern is found in German (*-heit/-keit* vs. *-ität*). As Bauer (1998: 409) points out, languages like Dutch and German tend to be stricter in the separation of native and foreign word-formation patterns than English.

The second important difference between the two types of word-formation has to do with accentuation. While suffixes of Germanic origin are unstressed, those of Romance origin are usually stressed: Dutch *stabielheid* vs. *stabiliteit*, German *Diversheit* vs. *Diversität*. Even well integrated loan-suffixes like Dutch *-erij* and German *-erei* that do not show the typical restrictions on combinability, reveal their Romance origin because they are stressed (Hüning 1999). Only very old loans like *-er* (from Latin *-arius*) do not show this behavior.

2.2 Combining Forms/Confixes

Germanic languages have intensively borrowed from the Romance lexicon, which according to Booij (2002: 95) has "the function of a pan-European lexical stock". Very often, we find paradigmatically related complex words, like Dutch *bibliotheek,* German *Bibliothek* 'library' and Dutch *bibliofiel*, German *bibliophil* 'bibliophile'. While *-theek* and *-fiel* might be interpreted as suffixes, the first part of these words is not an independent word either. Rather, it is a root that cannot be used independently. Hence, the decomposition of these words and the productive use of their components are a challenge for any account of word-formation that sees the word as the basis of derivational processes.

There are lots of analytical and terminological problems connected to such complex words (see Seiffert 2009 for a discussion). Is the adjective *viral* derived from the noun *virus*? Are *-al* and *-us* to be seen as suffixes? What is, then, the status of *vir*? In Germanic languages, it is not a word since it cannot function independently in an utterance. It is a bound element that can be used in combination

with other bound elements (like suffixes). 'Combining form' is the term usually found in the English literature, but German speaking morphologists often prefer the term *Konfix* 'confix' for these bound elements. Because of its in-between status (not word, not affix) and of the heterogeneity of the members of this category, there has been a lot of discussion about the concept and about the term. This discussion and the still unclear status of the category made scholars like Eins (2008) or Donalies (2009) suggest to avoid the term.

There is, however, agreement about the core members of the category. A prototypical confix like German *polit* has a non-native origin and a lexical meaning. It is lexicalized, but it is not (or rarely) used independently. Nevertheless, it can be used in compounds (*Politdrama* 'political drama') and it can function as a base for derivation (*politisch* 'political', with resyllabification *po·li·tisch*).

(2) Units in word-formation
(adapted from Fleischer and Barz 2012: 64; Donalies 2009: 55)

	bound form	**lexical meaning**
words	−	+
affixes	+	−
confixes	+	+

It is usually seen as a defining feature of affixes that they are attached to words (or word stems) in the formation of new words; affixes cannot be attached to affixes. Confixes, on the other hand, are more flexible in this respect. They are not used independently, but the combination with another bound form can result in a word: the confix *naut*, for example, can be combined with an affix (*naut-ical*) and it can also be the second element of a complex word consisting of two confixes (*astro-naut, cosmo-naut, aero-naut*).

The combination of two confixes (or combining forms) has been discussed extensively in the literature on 'neoclassical compounds'. Neoclassical compounds consist of Greek and Latin elements but they are not formed in the classical languages; they are formed and used in modern languages. Many of these compounds are international words, like the words with *naut*, mentioned above, or all the different nouns in *-ology* for the science or the discipline of what is indicated by the first element (*anthropology, philology, theology*, etc.).

The status of such words has always been controversial. While most text books assume a class of neoclassical compounds, Lüdeling et al. (2002) claim that neoclassical word-formation does not differ in principle from native word-formation. And Bauer (1998) discusses neoclassical compounds as a prototypical category, also showing that there is much overlap with native word-formation patterns.

A question narrowly connected with notions like confix or neoclassical word-formation is the question of productivity of such patterns. As pointed out by Bauer (1998), the influential position of Dutch morphologists like Schultink and Van Marle has been that word-formation on a foreign basis cannot be productive.

> Only those morphological processes may rank as 'productive' which (i) can be fully characterized in terms of 'major lexical categories', and which (ii) are not restricted to the 'nonnative' strata of the lexicon. (Van Marle 1985: 60)

This raises a lot of questions about the nature of 'productivity' and, again, about the nature of borrowed word-formation patterns.

2.3 Constructional Schemas

I think that most of the 'problems' of foreign word-formation mentioned above, find their place quite naturally in Construction Morphology. I adopt the approach to Construction Morphology as laid out in Booij (2010, 2015). Some of the central notions are also introduced by Booij and Audring (2018). This approach takes a word-based perspective; words are the starting points of morphological analysis. Formal and semantic generalizations about sets of complex words are captured in morphological schemas that express predictable properties of existing complex words, and indicate how new ones can be coined (Booij 2010: 4). This notion of schema is essential for the description of word formation patterns, i.e. the regularities found in word formation. As Booij and Audring (2018) point out: "Morphological patterns, whether productive or unproductive, can be characterized by output schemas."

As an example, we can come back to our *naut*-example: While people often will not know the etymology of words like *aeronaut, astronaut, cosmonaut* etc., they will recognize the pattern, for which the OED formulates the following description: the combining form *-naut* is used "to form a number of words with the sense 'voyager, traveller', with the first element defining the nature of the travel or experience." We can characterize this generalization in an output schema:

(3) $<[X_i + naut]_{Nj} \leftrightarrow$ [voyager with SEM_i indicating the nature of the voyage$]_{SEMj}>$

While this schema is mostly a descriptive generalization about existing words, it can also motivate incidental new formations like *gendernaut*, which is the title of a film about queers and their voyages through the space between man and woman (*Gendernauts – A Journey through shifting Identities*, 1999).

Output schemas of this kind will be central to my description of German verbs in *-ieren.*

2.4 Verbal Word-Formation with **-ier** *in German*

Derivational morphology offers many suffixes for the formation of new nouns and adjectives in German. Verbal word-formation, on the other hand, is characterized by 'Suffixarmut' (suffix poverty), according to Fleischer and Barz (2012: 428). New verbs are formed through conversion and/or prefixation. The exception to this rule

of thumb is the verbal suffix *-ier*. This suffix is borrowed from French in Middle High German; loanwords with this suffix are attested from the thirteenth century onwards (see for the history of the suffix in German, among others, Rosenqvist 1934; Öhmann 1970; Leipold 2006; Scherer n.d.). There are variants of this suffix *-ier*, that will be dealt with in the next section.

The relatively high frequency of verbs in *-ieren* has also been noted – and criticized – in the older literature on word-formation in German. Grimm (1864: 343) talked about "die zahllosen verba auf IEREN, die [...] wie schlingkraut den ebnen boden unsrer rede überziehen" (countless verbs in *ieren*, that – like twining plants – cover the even surface of our speech). Wilmanns (1899: 114) calls the use of *-ieren* with German base words a "schlimmer Missbrauch" (a bad misuse). And even Henzen (1965: 228) criticized the excessive use of the pattern for the formation of verbs ("zu viele!", too many!).

This negative attitude towards word-formation with foreign elements is characteristic of the older literature, not only for *-ieren* but for foreign elements in general. Nowadays, we find such puristic attitudes especially in the media and in popular scientific writing, and while the criticism is now usually directed against the use of English elements, it used to be directed against loans from Romance languages for a long time.

2.5 The Patterns

The suffix *-ier(en)* is typically found with non-native bases and in words that are characteristic for specific registers of written language. The resulting verbs differ systematically from 'regular' verbs of German. Because of its Romance origin, the suffix is stressed (*interpretíeren – er interpretíert*) and, therefore, the past participle is formed without the regular prefix *ge-* (*sie hat interpretíert*).[2]

Verbs in *-ier(en)* can be found with corresponding adjectives or nouns as base words (Eisenberg 2012: 291):

(4) $[[x]_A + ier]_V$
aktivieren 'to activate' – *aktiv* 'active'
blondieren 'to bleach, to dye' – *blond* 'blond'
effektivieren 'to make (sth.) more effective' – *effektiv* 'effective'
fixieren 'to fix (sth.)' – *fix* 'fixed'
legitimieren 'to authorize/legitimize' – *legitim* 'legitimate'

[2]In German the prefix *ge-* is omitted in participles from verbs with an unstressed first syllable (Duden 2005: 447).

(5) $[[x]_N+ier]_V$
attackieren 'to attack' – *die Attacke* 'the attack'
betonieren 'to concrete' – *der Beton* 'the concrete'
codieren 'to code' – *der Code* 'the code'
boycottieren 'to boycot' – *der Boycott* 'the boycot'
intrigieren 'to intrigue' – *die Intrige* 'the intrique'

Within the group of denominal verbs, we also find verbs that have been formed from an indigenous noun:

(6) Denominal verbs from indigenous nouns:
amtieren 'to hold office' – *das Amt* 'the office'
buchstabieren 'to spell' – *der Buchstabe* 'the character/letter'
drangsalieren 'to plague (sb.)' – *die Drangsal* 'the suffering'
gastieren 'to guest/to make a guest appearance ' – *der Gast* 'the guest'
hausieren 'to hawk, to peddle' – *das Haus* 'the house'
schattieren 'to shade' – *der Schatten* 'the shadow'

The denominal pattern thus has been used creatively for the formation of new verbs. An interesting thing to note: in some cases the *-ieren* verb replaces an older verb that had been formed by implicit transposition (conversion), like *buchstabieren* that replaced from the sixteenth century onwards the older verb *buchstaben*, or *gasten* that got replaced by *gastieren* in the seventeenth century.[3]

Germanic adjectives do appear as base words (*halbieren* 'to divide in half' from *halb* 'half') and sometimes one cannot decide whether a verb is deverbal or denominal (like *stolzieren* 'to strut, to prance' which corresponds to the adjective *stolz* 'proud' as well as to the noun *der Stolz* 'the pride').

The third group consists of root-based complex verbs. The first elements of these verbs cannot be used as words independently, but they can be used in other complex words: *neg-ieren, neg-ativ, Neg-ation* ('to negate, negative, negation').

(7) Verbs without a corresponding base word (root-based): $[x+ier]_V$
addieren 'to add' –? *add*
dominieren 'to dominate' –? *domin*
harmonieren 'to harmonize' –? *harmon*
negieren 'to negate' –? *neg*
reparieren 'to repair' –? *repar*
studieren 'to study' –? *stud*

This is, according to Eisenberg (2012: 291), by far the largest group of verbs in *-ieren*.

[3]Cf. the etymological information available via DWDS ('Das Wortauskunftssystem zur deutschen Sprache in Geschichte und Gegenwart', www.dwds.de).

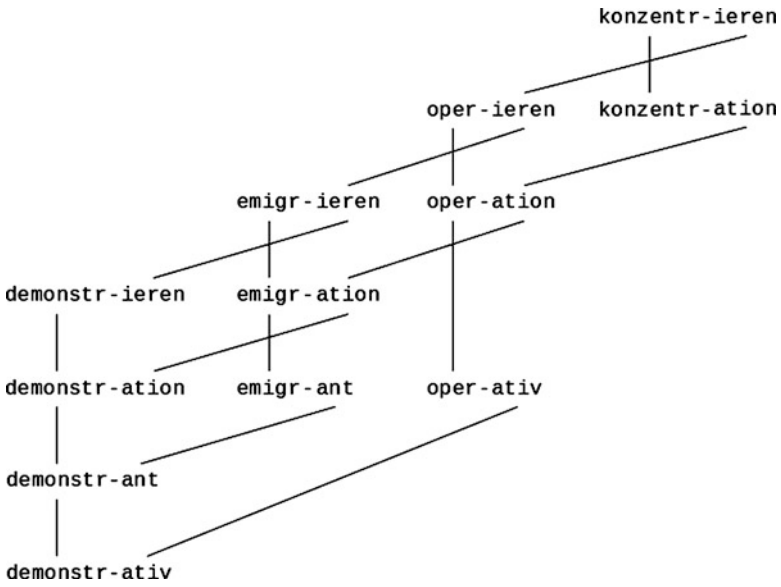

Fig. 1 A paradigmatic network view on verbs in *-ier(en)*

That most verbs in *-ier(en)* do not have existing words as their bases does not mean that they are not motivated at all. We can link them to other complex words in order to motivate the form and the meaning of these verbs. Even if we do not know what *emigr* might mean, we do recognize it as the string that keeps together words like *emigrieren* 'to emigrate', *Emigrant* 'emigrant', and *Emigration* 'emigration'. These words are part of a network of paradigmatic relations between words (Fig. 1).

Other roots tightly integrate in this network: *inform-ieren, Inform-ation, Inform-ant, inform-ativ*. However, not all use exactly the same forms: *invest-ieren, Invest-ition; selekt-ieren, Selekt-ion, selekt-iv*. This suggests that other segmentations are possible as well. If we assume a morpheme *iv,* we would get *oper-at-iv,* and the element *at* could also be assumed for *Inform-at-ion* and *Demonstr-at-ion*, if we want to see *ion* as a morpheme. Alternatively, one might want to assume allomorphy (of the affixes or of the stems).

Confixes like *neg* or *emigr* do not have a meaning on their own, but only as a component of paradigmatically related complex words that are motivated by each other. *Emigrant* and *Demonstrant* can be paraphrased by using the corresponding verbs ('ein Emigrant ist jemand der emigriert'), and by comparing the words in *-ant*, language users can infer the nomen agentis-meaning. The means that the relation between the nouns *Demonstrant* and *Demonstration* is as important as the one with the verb *demonstrieren* for the proper understanding and usage of these words. These relations do not have predictive power in the strict sense. We could predict an

agentive noun *Operant* from the existence of *Demonstrant* and *Emigrant,* but this noun does not exist in German. Its function is already fulfilled by another form: *der Operateur* (or *Operator*). But if it were formed, it would not be too difficult to interpret within a certain context, through the analogical relations with other words with an agentive meaning.

In morphology, we often focus on the derivational relation between base word and complex word. The study of foreign word-formation with so-called confixes suggests that this derivational relation is not the only and probably not even the most important relation, at least for the interpretation of complex words.

There are lots of root-based morphological patterns in which the morphemes involved do not have a meaning by themselves. Booij and Audring (2018) discuss some examples from Dutch that show the necessity of word-based instead of morpheme-based morphology. They use constructional schemas for stating regularities that are not productive, schemas that have a motivational function. And it is such an output-oriented view that is most useful in foreign word-formation, too. The structure and the meaning of a complex word can be captured through the (multiple) motivation it gets from its place in the 'construct-i-con', to use Goldbergs well-known term for the network of constructions that captures our knowledge of a language (Goldberg 2003).

If we want to formalize the relationship between the different patterns, we might use a circular variant of what is known as 'second order schema' in Construction Morphology. Second order schemas are used by Booij (2017) to paradigmatically link two constructional schemas by means of co-indexation. In our case, this would look like this:

(8) $<[[x]_i ier]_{Vj} \leftrightarrow$ [to undertake $SEM_k]_{SEMj}> \approx <[[x]_i ation]_{Nk} \leftrightarrow$ [the event/action of $SEM_j]_{SEMk}>$

The ≈ sign is used to express the paradigmatic relationship between the two schemas and between hundreds of root-based derivatives, these schemas stand for, like:

(9) *deklarieren* 'to declare' – *Deklaration*
designieren 'designate' – *Designation*
dissimilieren 'dissimilate' – *Dissimilation*
evaluieren 'evaluate' – *Evaluation*
emanzipieren 'emancipate' – *Emanzipation*

The schema in (8) could be extended with other elements, paradigmatically related to the verb and the noun (e.g. a schema for corresponding adjectives in *-ativ*). The words are related through the root element (x) and their meaning is dependent from (and motivated by) the other elements in the paradigm in which the word has its place.

2.6 *The Function of* -ier

Output orientation means that we focus on the similarities between complex words. This includes in our case the obvious observation that, regardless of the category of the base word (or root), the verbs share a formal element, the string *ieren* at the end of the word, and their part-of-speech category. Thus, the general function of *-ier* is that of a verbalizer: it signals a verbal stem that can be followed by the infinitive marker *-en* or another inflectional ending (*ich buchstabier-e, du buchstabier-st, sie buchstabier-t*, etc.). The resulting verb can be transitive (like *reparieren* 'to repair') or intransitive (like *amtieren* 'to officiate').

The most general schema for these verbs, therefore, has the form $[x+ier]_V$. It has two subschemas that specify the part of speech of the x-element (adjective or noun). They all share the verbalizing function, but it is not possible to find a common meaning for all verbs in *-ieren*.

Let us, therefore, look at the subschema in which the first element can be identified as an adjective. Within this category, it is possible to identify a group of verbs that can be characterized as causative verbs: they denote an action/event that results in some kind of state that can be characterized by the adjective: *aktivieren* means 'to make so./sth. *aktiv* (active)', *legitimieren* means 'to make so./sth. *legitim* (legitimate)'. For these verbs, we can assume a subschema:

(10) $<[[x]_{Ai}+ier]_{Vj} \leftrightarrow$ [to make so./sth. $SEM_i]_{SEMj}>$

Within the group of denominal verbs, however, it is difficult to find some kind of a common function/semantics (Fuhrhop 1998: 73).[4] This lack of "begrifflich-semantische Eigenständigkeit" (conceptual-semantic autonomy) of *-ier-* might, according to Fleischer (1997: 77), be responsible for the pairs of verbs with and without *-ier-*:

(11)

Chlor 'chlorine'	– *chloren* | *chlorieren* 'chlorinate'
Filter 'filter'	– *filtern* | *filtrieren* 'filter'
Kontakt 'contact'	– *kontakten* | *kontaktieren* 'contact'
Lack 'lacquer, paint'	– *lacken* | *lackieren* 'lacquer'
Sinn 'sense'	– *sinnen* | *sinnieren* 'ponder'

These verbs have been formed in German on the basis of an existing noun, but there is no coherent semantics, that would distinguish the converted verbs from those in *-ieren*.

[4] But see Fleischer and Barz (2012: 432/3), who distinguish ten different 'Wortbildungsreihen', i.e. semantic patterns which they also find with other kinds of verbal word-formation.

Therefore, Fuhrhop (1998: 138) called *-ier(en)* an 'Eindeutschungsendung', which means that its main (and in many cases only) function is to integrate the word into the German verbal system. Beyond that, the suffix does not have a specific semantic function, and Fuhrhop claims that the pattern is (therefore?) not productive synchronically. This view is endorsed by Eisenberg, who argues that *-ier* has the function to make foreign stems fit into the German system. To the left of *-ier* are the non-native elements, to the right are the native elements, which means that the stems with *-ier* are not only accessible to inflection, but also to the word-formation processes typical for the verbs in the Germanic part of the lexicon (Eisenberg 2012: 293).

Therefore, a verbal stem like *interpretier* can easily be used with the suffix *-bar*: *interpretierbar*. Subsequently, this adjective can be the basis for nominalization (*Interpretierbarkeit* 'interpretability'). In computer jargon we also find *die Bytecode-Interpretierung* and *der Interpretierer* (which is not a person but a computer program). English does not need such a verbal ending to produce a suitable verbal stem. It uses the root *interpret* as a verbal stem and also as a base for further derivation: *interpretable, interpreting, interpreter*. In German, on the other hand, derivational forms like **interpretbar* and **Interpretung* are not possible.[5]

Another example of this contrast is that while English uses *convert* as the verbal stem to which inflectional as well as derivational endings can be attached (*he convert-s, convert-ing, convert-er, convert-ible*), German needs the verbalizer *-ier* in order to make such complex words possible: *er konvert-ier-t, Konvert-ier-ung, Konvert-ier-er, konvert-ier-bar*, etc.

A foreign root can be used as a basis for the formation of nouns, but only with foreign suffixes: *Akkumul-ation* ('accumulation') is possible, but (synonymous) nominalization with *-ung* is only possible when the corresponding verb in *-ier(en)* is available: *akkumul-ier-en – Akkumul-ier-ung*. More examples: while we can have an agent noun *commander* in English, the German equivalent uses non-native suffixes *-ant* or *-eur* (*Kommandant, Kommandeur*). The suffix *-er* is possible in German only after the verbalizing *-ier*: *Kommandierer*. And parallel to the verbs *zit-ier-en* and *refer-ier-en*, we find nouns with non-native formatives: *Zit-at* 'citation', *Refer-ent* 'speaker'. Native suffixes are only possible with the verbal stem in *-ier* (*Zit-ier-ung, refer-ier-bar*). This can lead to near-synonyms like *Illustr-ier-ung* and *Illustr-ation*, or *diskut-ier-bar* and *diskut-abel* (Fleischer 1997: 78). The suffix *-ier* has been used not only as a verbalizer for Romance roots, but for loans from English, too. An example is German *train-ier-en* from English *to train*.

The English verb *to boycot* has been borrowed at the end of the nineteenth century. In the beginning it had the form *boycotten* (as still in Dutch), but around 1900 the verb had already been 'germanized' by using the originally French suffix: *boykottieren*, which then made possible further derivation like *Boykottierung, boykottierbar*.

[5] *Interpreter* can be found, but only as a loanword from English computer terminology.

There is some limited regional variation with respect to the form of some verbs borrowed from English: Swiss German has *grillieren, rezyclieren* and *parkieren* instead of *grillen* 'to have a barbecue', *recyceln* 'recycle' and *parken* 'to park', which are the forms used in Germany (Ammon et al. 2016).[6]

Nowadays, the 'Eindeutschungssuffix' does not seem to be necessary any more, verb-formation with *-ier* has become largely unproductive (Koskensalo 1986; Fuhrhop 1998). New loanwords from English are usually integrated into German directly: *box-en, design-en, layout-en, scann-en*, etc. They all allow for the formation of agentive or instrument nouns (*Design-er, Scann-er*) or for adjective formation with *-bar* (*ein gut scannbarer Text*). With respect to productivity, *-ier* differs from its variants, which can very well be used productively.

3 Variants of *-ier(en)*

If we take an exemplar-based approach and compare the different verbs in *-ier(en)*, we can identify two 'extended forms': *-isier(en)* and *-ifizier(en)*. This process of inductive generalization is in line with Bybee's idea of emergent morphological relations (e.g. Bybee 1988, 2010: 22 ff.) as illustrated in Fig. 2.

In text- and handbooks, the forms are usually lumped together, most probably because they do not seem to have any specific semantics. This happens for example in *Deutsche Wortbildung* (Kühnhold and Wellmann 1973), in Elsen (2011: 231) and in Fleischer and Barz (2012: 432).

Fleischer (1997: 84), on the other hand, does not want to see *-isier(en)* and *-ifizier(en)* as variants of *-ier(en)*, but as separate suffixes, on morpho-syntactic and structural grounds. They do, indeed, differ from other *-ier(en)* verbs quite fundamentally, mainly because they are all transitive. This makes them behave more homogeneous syntactically and with respect to further word-formation. Most verbs with *-isier* and *-ifizier* allow for further derivation with *-ung* (*Modern-isier-ung, Stabil-isier-ung, Ident-ifizier-ung*), and because they are transitive, derivation with *-bar* is also possible (*modern-isier-bar, stabil-isier-bar, ident-ifizier-bar*). With *-ier(en)* verbs, this is much less regular (cf. **Blamierung, *blamierbar, *Stolzierung, *stolzierbar, *Fotografierung,? fotografierbar*).

An important question concerns the structure of a verb like *identifizieren*. What is the stem, what is the affix? Is *-ifizieren* one morpheme or a combination of more than one morpheme? Compare the nominalizations *Identifikation, Personifikation, Spezifikation* with *Konzentration, Demonstration*. Above, we splitted the latter words into two parts/morphemes: *Konzentr-ation, Demonstr-ation* because of their link with *konzentr-ieren* and *demonstr-ieren*. If we assign morpheme status to *ation*, the logical consequence is to split up the sequence *ifizier* into two parts.

[6] In Dutch we find a similar phenomenon with respect to loans from English. For some words, the Flemish use the suffix *-eer* to integrate the word into the verbal system, where Northern Dutch uses conversion and the infinitive marker *-en*: *boycotteren, recycleren, handicapperen, relaxeren* vs. *boycotten, recyclen, handicappen, relaxen* (Berteloot and van der Sijs 2002).

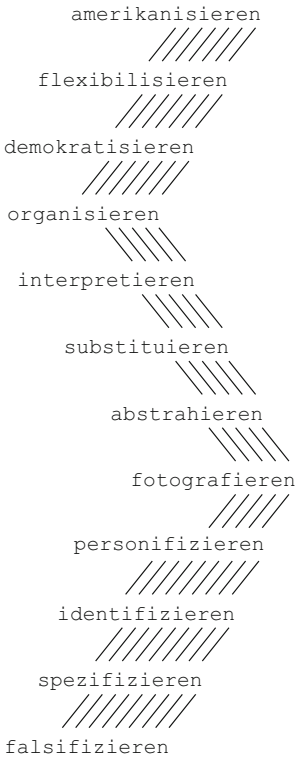

Fig. 2 Similarities between exemplars; emerging suffix variants

(12) Segmentation problems
Ident-ität 'identity'
ident-isch 'identical'
ident-ifiz-ier-en 'identify'
Ident-ifiz-ier-ung 'identification'
Ident-ifiz/k-ation 'identification'

We get a confix (*ident*) and some suffixes. But what is the status of *ifiz* (and *ifik*). What would be its function? Does this element somehow contribute to the meaning of the complex verb? Should we assume stem-allomorphy (*identifiz*)? Or do we analyze *-ifizier* to be an allomorph of *-ier*? But what would, then, be the condition under which the allomorph is used? After all, we have other stems in *-ent* that take *-ier* as a verbalizer: *komment-ier-en* 'comment', *implement-ier-en* 'implement'.

With respect to the Dutch counterpart of *-isier*, Booij (2016) also discusses this segmentation problem. He seems to be quite confident about splitting *-iseer* into two parts:

> The suffix *-iseer* is a combination of the morphemes *-is-* and *-eer*, as can be concluded from the way in which deverbal nouns are formed: the suffix *-eer* is replaced with the suffix *-atie*, and this also applies to verbs ending in *-iseer*: *modern-is-eer* – *modern-is-atie* 'modernization' (only the part *-eer* is replaced). (Booij 2016: 2444)

The analysis seems plausible, but one has to ask what the status is of *is*, since it does not have any kind of obvious semantic function and it is not easy to find a phonetic reason for its presence either (compare the adjective *modern* with *intern*, and notice that the verbalization of the latter is done without *-is-*, i.e. with *-eren* in Dutch and with *-ieren* in German, *interneren/internieren*).

This might suffice to illustrate some of the problems of a morpheme-based approach to foreign word-formation. The exemplar-based network-approach, on the other hand, allows for generalizations that do not rely on the notion of morpheme. In the words of Bybee (2010: 23): "One advantage of this approach to morphological analysis is that it does not require that a word be exhaustively analysed into morphemes." An output-oriented and word-based perspective avoids many problems of the morpheme- and rule-based approaches.

Nevertheless, language users do recognize similarities and they do group together words on the basis of formal correspondences. While all words in *-ier(en)* share the verbalizing function, the 'short' and the 'long' forms correspond to other differences, especially with respect to productivity. While the general *-ier(en)* pattern is hardly productive anymore, the patterns with the extended variants are used for the formation of new words.

3.1 Verbs in -isier(en)

Verbs with *-isier* have a stress pattern that makes them differ from the verbs we were dealing with up to now. Since the first *i* is unstressed, the verb stems always end in a iamb. Stress clash which is common with derivation in *-ier* (e.g. *fíx-íer*) is absent. Furthermore, they are transitive (as mentioned above), with only very few exceptions (one such exception is *theoretisieren* 'theorize').

The verbs in *-isier(en)* quite systematically correspond to verbs in *-ize* in English. In this respect, they differ from verbs in *-ier(en)* which are usually equivalent to bare stems in English:

(13) German *-ieren* and English stems
exekut-ieren – to execute
inform-ieren – to inform
interpret-ieren – to interpret
konklud-ieren – to conclude

(14) German *-isieren* and English *–ize*
dämonisieren – to demon-ize
organ-isieren – to organ-ize
real-isieren – to real-ize
sozial-isieren – to social-ize

This difference corresponds with an etymological difference: while the verbs in (13) are loans from French, the German *-isier* and English *-ize* in (14) have their origin in Greek:

(15) Greek *-ίζειν* (*-izein*) → Latin *-izāre*, *-īzāre* → French *-ise-r,* Italian *-izare*, Spanish *-izar*

Most of the existing words have a non-native derivational base (Greek or (Early Modern) Latin). It is often impossible to tell whether they are borrowed from Greek, Latin or French. They could also be analogical formations, built after Latin or French examples.

In German, verbs in *-isier(en)* appear from the sixteenth century onwards. The group is largely expanded during the eighteenth and the nineteenth century (Marchand 1969; Fleischer 1997). For verbs in *-isier(en)* different groups can be distinguished, cf. Fuhrhop (1998: 75) and Eisenberg (2012: 291/2). The verbs in the first group have a corresponding noun:

(16) Denominal verbs in *-isier(en)*
alphabet-isieren 'alphabetize'
charakter-isieren 'characterize'
katalog-isieren 'catalogue'
organ-isieren 'organize'
pulver-isieren 'pulverize'

Some verbs show an epenthetic *t* after the noun, which is not only found in the verb but also in the corresponding adjective in *-isch*:

(17) *Drama* 'drama' – *dramatisch* – *dramatisieren*
Schema 'schema' – *schematisch* – *schematisieren*
Narkose 'narcosis' – *narkotisch* – *narkotisieren*

The next group consists of verbs that can be analyzed as deadjectival:

(18) Verbs in *-isier(en)* that correspond to an adjective synchronically
digital-isieren 'digitize'
funktional-isieren 'functionalize'
legal-isieren 'legalize'
mobil-isieren 'mobilize'
modern-isieren 'modernize'
radikal-isieren 'radicalize'
stabil-isieren 'stabilize'

Semantically, the verbs in (18) form a quite homogenous group. Their meaning can be described as 'to make something X' (where X stands for the adjective).

There are no clear-cut criteria for the choice of *-isier* instead of *-ier*, but there are preferences. Adjectives in *-l* have a strong preference for *-isier*. And within this group, the adjectives with *-il* (*mobil* 'mobile', *steril* 'sterile') and especially those

ending in *-al* (*legal* 'legal', *national* 'national') form coherent subgroups. There are only a few exceptions (like *nasal-ieren* 'nasalize'). Adjectives in *-ell* join the *-alisieren* group:

(19) *generell – generalisieren* 'generalize'
individuell – individualisieren 'individualize'
kommerziell – kommerzialisieren 'commercialize'

The stem in *-al* serves as an allomorph, used in derivational word-formation processes (*Individual-ität* 'individuality', *Individual-ismus* 'individualism') and in compounds (*Individual-tourismus* 'individual tourism', *General-verdacht* 'universal suspicion', *Kommerzial-rat* 'councilor of commerce').[7]

Verbs corresponding to adjectives are part of a bigger network of paradigmatic relations. Almost all adjectives in *-al* and many of the other adjectives also allow for the derivation of a noun in *-ität*: *Banalität, Legalität, Mobilität, Stabilität* etc. (but not **Privatität*; the corresponding noun is *Privatheit*). At the same time, nominalization of the verbal stem is possible, too: *Digital-isier-ung, Modern-isier-ung, Mobil-isier-ung, Stabil-isier-ung*, etc. Since the verbs are transitive, the formation of *-bar* adjectives is also possible for all those verbs.

In addition to these groups where a corresponding base word can clearly be identified, we find other interesting series of verbs in *-isier(en)* for which the identification of the base is not that obvious.

One group of such verbs consists of words with a confix as their first element. Usually, these verbs correspond to adjectives in *-isch* from the same confixes. Subgroups can be formed, when the corresponding noun is taken into account (they often end in *-ik, -ie* or *-ität*).

(20) Root-based verbs with corresponding adjective in *-isch*

root/confix	**noun**	**adjective**	**verb**	
botan	*Botan-ik*	*botan-isch*	*botan-isieren*	'to botanize'
krit	*Krit-ik*	*krit-isch*	*krit-isieren*	'to criticize'
polem	*Polem-ik*	*polem-isch*	*polem-isieren*	'to polemize'
polit	*Polit-ik*	*polit-isch*	*polit-isieren*	'to politicize'
techn	*Techn-ik*	*techn-isch*	*techn-isieren*	'to mechanize'
solidar	*Solidar-ität*	*solidar-isch*	*solidar-isieren*	'to solidarize'
demokrat	*Demokrat-ie*	*demokrat-isch*	*demokrat-isieren*	'to democratize'
harmon	*Harmon-ie*	*harmon-isch*	*harmon-isieren*	'to harmonize'

[7] Cf. Booij (2002: 176–182) for a discussion of stem allomorphy in Dutch.

There is a partial overlap with the denominal verbs in (17) that correspond to *-isch* adjectives: *Drama, Dramatik, dramatisch, dramatisieren*.

The correspondence with adjectives in *-isch* is characteristic of the last group, too. It contains verbs, based on special derivational stem forms of proper nouns. These nouns are mostly names of countries or for (groups of) people.

(21) *Afrika – afrikan-isch – afrikan-isieren* 'to Africanize'
Amerika – amerikan-isch – amerikan-isieren 'to Americanize'
Freud – freudian-isch – freudian-isieren 'to Freudianize'
Hegel – hegelian-isch – hegelian-isierung 'to Hegelianize'

The resulting verbs often end in *-anisier(en)* (but not always, as *französisieren* 'to make French' illustrates). Formally and semantically, the verbs in (20) and (21) can be related to the corresponding *-isch*-adjectives. Their meaning can be paraphrased as 'to make so./sth. X' (where X stands for the adjective). But, of course, the verb-meaning is also related to the corresponding noun: 'to make so./sth. show characteristics that are stereotypically linked to country X or to person X'.

Verbs like *japanisieren* join this group, as they also have a corresponding adjective in *-isch* (*japanisch* 'Japanese'), but in these cases, there is no special stem allomorph involved. *Japanisieren* or *taiwanisieren* could also be derived from the country name directly.

(22) 'Sicher können wir von anderen lernen, aber **amerikanisieren**, **japanisieren**, **taiwanisieren** läßt sich das Modell Deutschland nicht.' (*Die Zeit*, 05.12.1997, via DWDS)
[Of course, we can learn from others, but the model Germany cannot be amerikanized, japanized, taiwanized.]

Japanisieren forms the bridge to other deonymic verbs that have to be seen as denominals: formally, *finnlandisieren* ('finlandize') has to be related to the name of the country (*Finnland*), since the corresponding adjective shows umlaut: *finnländisch*. Similar is *hollandisieren* (*Holland, holländisch*):

(23) '[. . .] und van Gaal dürfte den FC Bayern dann weiter **hollandisieren**.'
(Kölner Stadt-Anzeiger, 10.06.2009, http://www.ksta.de/12647928)
[. . . and van Gaal will probably further hollandize FC Bayern]

Furthermore, some of the *-isch*-adjectives serve as language names at the same time: *Französisch* 'French', *Koreanisch* 'Korean', *Norwegisch* 'Norwegian', *Polnisch* 'Polish', *Ungarisch* 'Hungarian', etc. These can also be turned into verbs:

(24) ‘Noch in den sechziger Jahren fühlten Schauspieler sich verpflichtet, ihre Namen zu “**ungarisieren**”, wenn sie nicht ungarisch klangen.’ (*Die Zeit*, 1999, http://www.zeit.de/1999/42/199942.l-ungarn_.xml/seite-2)
[In the sixties, actors still felt obliged to hungarize their names, if they did not sound Hungarian.]

(25) ‘Während in Südkorea englische und chinesische Wörter oft einfach übernommen werden, will das nordkoreanische Regime alles **koreanisieren** [. . .]’ (*taz*, 10.02.2016, http://www.taz.de/!5272550/)
[While in South Korea English and Chinese words are often simply adopted, the North Korean regime wants to koreanize everything.]

Again, the meaning of these verbs can be characterized as causative/resultative: ‘to make sth. look/sound (more) X’ (where X is the adjective that can also be used as language name).

There are many more peculiarities and idiosyncrasies to be observed with these verbs but in this context, the more interesting part is that we do find some generalizations and patterns within this complex network of paradigmatic relations between (groups of) nouns, adjectives and verbs in *-isieren.*

3.2 Verbs in -ifizier(en)

The verbs in *-ifizieren* join the *-isieren* verbs, but it is difficult to find criteria for the distribution of both forms. The *-ifizieren* verbs form a small group, the verbs have foreign words or roots (confixes) as bases. With *-ifizier*, the suffix gets longer again, it gets another, third syllable; stress is attracted to the third syllable *(ier)*. The English equivalent usually is *-ify*; etymologically we have to think of Latin *-ificare* as its origin (as in *personificare*, German *personifizieren*, Dutch *personificeren*, English *personify*).[8]

(26) Verbs in *–ifizieren*
falsifizieren ‘falsify’, *glorifizieren* ‘glorify’, *identifizieren* ‘identify’, *modifizieren* ‘modify’, *mumifizieren* ‘mummify’, *qualifizieren* ‘qualify’, *simplifizieren* ‘simplify’, *spezifizieren* ‘specify’, *verifizieren* ‘verify’

The verbs share the causative, transitional meaning with the verbs in *-isieren*. As Fuhrhop (1998: 76) points out, there is some rivalry between both forms: *polnisieren* and *polnifizieren* (from *Polen* ‘Poland’) can be used synonymously. There are some new words with *-ifizier(en)*, formed in German. Fuhrhop mentions *russifizieren* ‘russify’ or *(ent)nazifizieren* ‘(de)nazify’. One might want to add *gentrifizieren* ‘to gentrify’.

[8] See e.g. the OED (*-fy, suffix*) for some historical notes (http://www.oed.com/view/Entry/75882).

Since *russisieren* is not possible, Fuhrhop suggests to view *-ifizier(en)* as an allomorph for *-isier(en)*, to be used after alveolar fricatives, for the formation of new verbs (cf. *klassifizieren* 'classify', *spezifizieren* 'specify'). Given the limited number of examples, this is hard to prove (or refute).

3.3 Productive Use of -isier(en)

As already mentioned, the *-isier(en)* pattern can be used productively with a causative meaning. The resulting verbs denote some kind of transition from one state into another, which is indicated by the corresponding adjective or noun. This can be accounted for by assuming a subschema that characterizes the productive pattern within the large group of *-(is)ieren* verbs:

(27) $<[[X]_i + isier]_{Vj} \leftrightarrow$ [cause so./sth. to become/behave/be more like $SEM_i]_{SEMj}>$

This schema can be further specified with respect to the X slot. It is especially the group of verbs that can be related to (proper) nouns that has become quite productive. The X slot can, for example, be taken by toponyms in order to express a transition of someone or something getting some characteristics typically related to X.

(28) 'Wenn wir Pech haben, dann wird der Rest der Republik aber **berlinisiert**, und das wäre dann das Ende.' (*Die Welt*, 07.01.2015, https://www.welt.de/kultur/article136110516/)
[If we are unlucky, the rest of the republic will be berlinized, and that would be the end.]

(29) 'Rührend zu sehen, wie die Illustrationen '**chinaisiert**' wurden: Maria und der Engel Gabriel als Chinesen.' (*Merkur*, 25.03.2009, https://www.merkur.de/kultur/chinaleidenschaft-107084.html)
[Touching to see how the illustrations have been 'china-ized': Maria and the Angel Gabriel as Chinese.]

Besides toponyms, proper nouns that denote (groups) of people with special characteristics can function as base words for the productive schema. Names of politicians or VIPs are used frequently in this construction:

(30) 'Trotz der dummen Attacken einiger französischer Sozialisten gegen Angela Merkel scheint sich Präsident Hollande selbst zu **merkelisieren**.' (*Die Welt*, 29.07.2013, https://www.welt.de/print/die_welt/debatte/article118466633/Merkel-Daemmerung.html)
[Despite of the stupid attacks of some French socialists on Angela Merkel, pesident Hollande seems to Merkel-ize himself.]

(31) ‘Selbst in der Türkei [. . .] zeigt sich immer mehr, dass der angeblich gemäßigte Islamismus Recep Tayyip Erdoğans die Demokratie zunehmend “**putinisiert**”, also zu einer Farce degradiert.’ (Blog *Ortner Online*, 30.08.2017, http://www.ortneronline.at/?p=24047)
[Even in Turkey, it shows that the allegedly moderate islamism of Erdoğan increasingly Putin-izes democracy, i.e. degrades it to a farce.]

The denominal pattern is, however, productive not only with names, but with other nouns, too. They all express a transitional meaning.

(32) Productive use of denominal *-isier(en)*
computerisieren ‘to computer-ize’
hipsterisieren ‘to hipster-ize’
pornoisieren ‘to porn-ize’
typisieren ‘to typ-ify’

These facts all show the productivity of *-isier(en)*.

3.4 Verbs in -isier(en) *and Nouns in* -isierung

The productive formation of verbs in *–isier(en)* is closely linked to the formation of nouns in *-isierung*. The question is, then, whether these nouns have to be seen as secondary derivations on the basis of the (possible) verbs.

Wilss (1992) examined the productive use of German nouns in *-isierung*. He found hundreds of examples, deadjectival ones like *Brutalisierung* ‘brutal-ization’, *Digitalisierung* ‘digit(al)ization’ or *Humanisierung* ‘humanization’ and denominal ones like *Automatisierung* ‘automation’, *Kanalisierung* ‘canalization’ or *Motorisierung* ‘motorization’. More often than not, such nouns are (much) more frequent than the corresponding verbs. The nouns are characteristic for present-day German. They belong especially, but not exclusively, to German jargon (special, technical language).

Wilss already used the notion of ‘schema’ to account for these nouns. He pointed out that they usually stand in a paradigmatic relationship with the corresponding verbs in *-isieren* which, however, not always get realized. Therefore, he calls *-isierung* a suffix and he does not want to see this process of noun formation as secondary, since it is “praktisch unentscheidbar, ob das Substantivsuffix das Verbsuffix nach sich gezogen hat oder umgekehrt” [virtually undecidable, whether the noun suffix entailed the verb suffix or vice versa] (Wilss 1992: 232).[9]

[9]Fleischer (1997: 82), on the other hand, acknowledges the productivity of the pattern, but he wants to assume the (implicit) intermediate step of verb-formation. He criticizes Wilss for assigning suffix-status to *-isierung*.

Construction Morphology has a proper way of handling this problem. It acknowledges that speakers might use shortcuts when coining new complex words and accounts for these short cuts with schema unification (Booij 2010: 41–50).

(33) $[\text{N-}isier]_{\text{v}} + [\text{V-}ung]_{\text{N}} \rightarrow [[\text{N-}isier]_{\text{V}}\ \text{-}ung]_{\text{N}}$

These unified schemas match the output of the productive pattern without necessarily presupposing the existence of the verb in *-isier*. It is possible to form this verb, but there is no need that it is known to the language user as an independent word when coining the complex formation in *-isierung*.

Kempf and Hartmann (2018) demonstrate the usefulness of the concept of schema unification from a diachronic perspective. The suffix *-ung* is one of their cases, and they point out that this suffix is losing its productivity, as we know from Demske (2000). The suffix is, however, productively used in contexts, where the verb itself is complex, especially in combination with a prefix. This can be accounted for by using embedded and unified schemas, as demonstrated by Kempf and Hartmann (2018).

I would like to add the case of nouns in *-isierung* to their argumentation, which, I think, also nicely demonstrates the necessity and usefulness of unified schemas in morphological theory. Let me mention some more examples to illustrate this point.

Next to the place name *Berlin*, we see the verb *berlinisieren* in (28) and we also find the corresponding noun:

(34) ‘Afrika-Konferenz: 130 Jahre **Berlinisierung** eines Kontinents und Einübung ins Verbrechen’ (Volksbühne Berlin, 2015, http://www.volksbuehne-berlin.de/praxis/afrika_konferenz/)
[Africa-conference: 130 years of Berlin-ization of a continent and of exercising for crime]

Berlin is, of course, referred to metonymically in this case and stands for the nineteenth century German empire. If we take another German place name, *Dresden*, we can easily find examples for the derived noun, but not for the corresponding verb.

(35) ‘“Gegen die **Dresdenisierung** Leipzigs” hatten einige junge Leipziger am Waldplatz auf ihr Transparent geschrieben.’ (*taz*, 14.01.2015, http://www.taz.de/!239558/)
[‘Against the Dresden-ization of Leipzig’ some young inhabitant of Leipzig had written on their banner at the Waldplatz.]

The same is true for country names like *Bangladesh*.

(36) ‘Wenn dann die Wirtschaft angekurbelt worden ist, kann Griechenland auch Schulden zurückzahlen. Mit der bisher verfolgten **Bangladeshisierung** wäre das unmöglich.’ (*Spiegel Online*, 01.02.2015, http://www.spiegel.de/forum/politik/pressekompass-tsipras-gegen-die-eu-das-sagen-die-medien-thread-229699-3.html)
[Once economy has been boosted, Greece can repay the loan. With the Bangladeshization followed to date, this would be impossible.]

The pattern seems to be very productive with nouns referring to well-known personalities, too. Politicians are one of the source domains for this kind of word-formation. Some examples (via Google):

(37) *die **Merkelisierung** Europas* ‘the Merkel-ization of Europe’
*die **Schröderisierung** der Sozialdemokratie* ‘the Schröder-ization of social democracy’
*die **Westerwellisierung** der FDP* ‘the Westerwelle-ization of the FDP’
*die **Berlusconisierung** der Kulturpolitik* ‘the Berlusconi-ization of the cultural policy’
*die **Trumpisierung** der deutschen Sprache* ‘the Trump-ization of the German language’

In *Westerwellisierung* and *Berlusconisierung* the final vowel of the name is deleted before the suffix, which is unproblematic as long as the word ends in *–isierung*, and as long as the name is recognizable, at least in the context in which it is used. In the context of the Dutch elections in 2017, German media repeatedly used constructions like *die Wilderisierung der Politik.* No problem, since the name of Geert Wilders was sufficiently recognizable, despite the stripping of the last consonant. Another example:

(38) ‘Die **Wilderisierung** Ruttes ist nur die halbe Wahrheit.’
(*Rheinische Post*, 17.03.2017, http://www.rp-online.de/politik/eu/der-deich-hat-gehalten-aid-1.6695035)
[The Wilder(s)-ization of Rutte is only half of the truth.]

Again, in examples like these the nouns in *-isierung* are much more frequent than the corresponding verbs, and for many nouns a corresponding verb is not attested at all. The usual search engines will return dozens of examples of *(Helmut-)Kohlisierung*, but even Google won’t find more than an incidental example of *kohlisieren*.

Besides names of well-known politicians, other VIP names are also possible as base words for this derivational pattern. The *Kim-Kardashianisierung der Politik* ('Kim Kardashianization of politics') is such an example, or the *Kardashianisierung des Pop*:

(39) 'Beinahe unbemerkt von den Augen und Ohren der Öffentlichkeit hat die **Kardashianisierung** des Pop begonnen: Selbstbespiegelung als einzig erlaubtes Thema. Kim Kardashian ist Kim Kardashian ist Kim Kardashian.' (*Süddeutsche Zeitung*, 28.11.2016, http://www.sueddeutsche.de/kultur/starboy-von-the-weeknd-wie-ein-selfie-von-kim-kardashian-1.3270175)
[Almost unnoticed by the eyes and the ears of the public, the Kardashianization of pop has started: self-reflections as the only permitted subject. Kim Kardashian is Kim Kardashian is Kim Kardashian.]

Other examples (via Google):

(40) *die **Löwisierung** des deutschen Fußballs* 'the Löw-ization of German soccer'
*die **Karajanisisierung** des Musikbetriebs* 'the Karajan-ization of the music business'
*die **Pavarottisierung** des Pop* 'the Pavarotti-ization of pop'
*die **Schweigerisierung** der deutschen Komödie* 'the Schweiger-ization of the German comedy'

Such nouns can also be completed with the first name: *die Til Schweigerisierung des deutschen Films* 'the Til Schweiger-ization of the German film' is used, too. And the *Helene-Fischerisierung* of Germany is bemoaned by many people. Spelling is flexible in these cases: *Helenefischerisierung, HeleneFischerisierung, Helene-Fischerisierung* or *Helene Fischerisierung* are all attested.

Complex words in *-isierung* are also possible from brand names and from other nouns that represent some stereotypical concept. De Gruyter has a book called *Die Googleisierung der Informationssuche* (2014) 'the Google-ization of information retrieval' (sometimes spelled as *Googelisierung* or *Googlisierung*, which corresponds to an altered pronunciation, omitting the sjwa). Other examples relate to trends in the coffee business:

(41) 'Der schleichende Trend zur **Tchiboisierung** des Buchhandels vollzog sich bislang langsam aber sicher.'
(WAZ, 4.11.2011, https://www.waz.de/staedte/essen/thalia-und-mayersche-setzen-auf-teelichter-und-fruehstuecksbrettchen-id6045605.html)
[The trend towards Tchibo-ization of the book store took place slowly but surely.]

(42) ‘An den Kommerz, das überall Gleiche, die Kettenläden-Ketten, die **Starbuckisierung** der Zentren hat man sich nicht bloß in Berlin gewöhnt.’
(*Der Tagesspiegel*, 30.01.2017, http://tagesspiegel.de/politik/boomtown-berlin-am-ende-die-hauptstadt-leidet-unter-ihrer-normalitaet/19318566.html)
[Not only in Berlin, one got used to commerce, everywhere the same, the chain stores, the Starbuck(s)-ization of the centres.]

(43) ‘Und auch über die **Cappuccinisierung** der Gesellschaft oder die internationalen Ketten mit ihrer Pappbecherkultur, sei es in Wien oder in Berlin, rümpft er nicht die Nase.’
(*Deutschlandfunk Kultur*, 07.01.2016, http://www.deutschlandfunkkultur.de/wiener-kaffeehauskultur-in-berlin-herr-ober-einen.1001.de.html?dram:article_id=341702)
[And he also doesn’t turn up his nose at the Cappuccin(o)-ization of society or at the international chains with their paper cup culture, in Vienna as well as in Berlin.]

(44) ‘Und weil St. Paulianer bekanntlich nicht auf den Mund gefallen sind, schimpfen sie im Film ordentlich gegen die **Lattemacchiatisierung** ihres Stadtteils an.’
(*Spiegel Online*, 07.05.2009, http://www.spiegel.de/kultur/kino/st-pauli-dokumentation-vom-rotlichtviertel-zur-sahnelage-a-623399.html)
[And because the people of Sankt Pauli are never at a loss for words, they rant and rave against the Lattemacchiat(o)-ization of their district.]

Again, we see the reduction at the end of the base word (*Starbucks, cappuccino, latte macchiato*), to make the nouns fit better into the pattern.

As Wengeler (2010) pointed out, some names of persons of public interest, give rise to whole series of derivations in the media. As a near synonym of *Merkelisierung,* we find the *Vermerkelung* (of something or somebody) and the contamination of both patterns is found, too: *Vermerkelisierung.*[10] Of course, we also have *Merkelismus* ‘Merkel-ism’ and its supporter is the *Merkelist* or the *Merkelianer*. An interesting form is *Merkelantismus*, which, apparently, alludes to *Merkantilismus* ‘mercantilism’. Examples with these and more derivatives can easily be found via Google. Furthermore, *Merkel* is, of course, the first element in a vast number of nominal compounds (*der Merkel-Besuch* ‘the Merkel visit’, *das Merkel-Zitat* ‘the Merkel quote’; cf. recent work by Barbara Schlücker on proper names in compounds, e.g. Schlücker (2017)).

[10]See for the combination of a prefix with *-ung* the contribution by Kempf and Hartmann (2018).

3.5 Derivation vs. Conversion

With respect to verbs in *-isieren*, it is remarkable, that it is also possible to create another verbal form by conversion: *merkeln.* Apparently, there is a functional split between both patterns: while *merkelisieren* is transitive, conversion leads to an intransitive or reflexive verb. *Merkeln* has been on the shortlist for the 'Jugendwort 2015' and the jury described its meaning as 'doing nothing, not making a decision' (http://www.stern.de/familie/kinder/jugendwort-2015--die-top-30-bitten-zur-wahl-6356488.html). It can also be used in compounds like *rummerkeln* 'behave like Angela Merkel' or *(sich) rausmerkeln*:

(45) "In dem Sinne hätte Angela Merkel sich aus der Frage, ob sie Feministin ist, auch nicht so **rausmerkeln** müssen" (*Spiegel Online*, 02.05.2017, http://www.spiegel.de/kultur/gesellschaft/ivanka-trump-und-ihr-verdrehtes-bild-vom-feminismus-kolumne-a-1145655.html)
[In that sense, there was no need for Angela Merkel to merkel herself out of that question.]

The same pattern can be found with *schrödern* and *schröderisieren*. While the latter is transitive, the first verb can be used in a headline like *Merkel schrödert* ('Merkel acts like Gerhard Schröder') (*Die Zeit*, 6.12.2012, http://www.zeit.de/2012/50/Merkel-Ruestungsexporte-Sicherheitspolitik). With respect to such verbs, Wengeler (2010: 86) distinguishes between mostly intransitive verbs of comparison, formed by conversion, and the mostly transitive verbs in *-isieren* expressing a transition.

Another example is *steinmeiern* ('act like Frank-Walter Steinmeier'):

(46) "Vizekanzler Gabriel inszeniert sich seit der Bundestagswahl als Verantwortungspolitiker, er versucht gewissermaßen zu **steinmeiern**." (*Die Welt*, 09.02.2015, https://www.welt.de/print/welt_kompakt/debatte/article137251198/Gabriel-zeigt-Nerven.html) [Since the election, vice-chancellor Gabriel sets himself in scene as responsible politician, in a way, he tries to steinmeier.]

Again, this is an intransitive verb, as opposed to transitive *steinmeierisieren* and *Steinmeierisierung*:

(47) 'Das Regieren in Konsens und mit Kommissionen, "die **Steinmeierisierung** der Politik kann nicht das letzte Wort bleiben".' (*Die Welt*, 22.11.2002, https://www.welt.de/print-welt/article268581/Schelte-fuer-Schroeder.html) [To govern in consensus and with commissions, "the Steinmeier-ization of politics cannot be the last word".]

The verb *riestern* (from former minister Walter Riester) through metonymical extension even became a technical term for paying into a certain kind of pension insurance (the *Riester-Rente* 'Riester insurance').

As Wengeler (2010: 93) pointed out, such new formations demonstrate the importance of shared knowledge. Shared knowledge about the world is necessary for every communication, but its importance has to be stressed for the proper interpretation of new and often ad hoc formations with low frequency.

3.6 Prefixation

Verbs in *-isieren* and the corresponding nouns in *-isierung* convey the transition from one state into another. A transition into the opposite direction, back to the original state, can be expressed as well by using prefixes (*de-, ent-*). And with the prefix *re-* a repetition of the transitional process can be put into words:

(48) **de-:**
dezentralisieren 'decentralize' – *Dezentralisierung* 'decentralization'
dekolonisieren 'decolonize' – Dekolonisierung 'decolonization'
ent-:
entmilitarisieren 'demilitarize' – *Entmilitarisierung* 'demilitarization'
entpolitisieren 'depoliticize' – *Entpolitisierung* 'depoliticization'
re-:
rekontextualisieren 'recontextualize' – *Rekontextualisierung* 'recontextualization'
revitalisieren 'revitalize' – *Revitalisierung* 'revitalization'

While the prefix *ent-* can be used productively in German with all kinds of verbs (*enterben* 'to dispossess', *entsagen* 'to abjure', *entschädigen* 'to compensate', *entmilitarisieren* 'demilitarize'), the use of *de-* and *re-* is much more restricted to foreign base words, which – in the verbal domain – means: verbs in *-ieren*. Nouns in *-ung* can be derived from all of these verbs (*Enterbung, Entsagung, Entschädigung, Entmilitarisierung*).

The productive use of *de-* and *re-* could again be accounted for by schema unification. Here is the schematic representation for the combination of *de-* and *-isieren*:

(49) $[\text{X } \textit{-isier}]_{\text{V}} + [\textit{de-}\ \text{V}]_{\text{V}} \rightarrow [\textit{de-}\ [\text{X } \textit{-isier}]_{\text{V}}]_{\text{V}}$

The resulting schema is paradigmatically related to the corresponding nouns in *-ung* and to other complex words: *dezentralisieren, Dezentralisierung, dezentralisierbar, Dezentralisierbarkeit*.

4 Conclusion

In this paper, I have used the verbal suffix *-ier* and its variants in German to illustrate some of the questions related to the study of foreign word-formation. I have tried to show that an output-oriented and exemplar-based approach to morphology is necessary for a proper analysis of the phenomena in this domain of word-formation.

Foreign word-formation often shows a lot of irregularities and peculiarities that can only be fully understood when we take the historical genesis into account. Nevertheless, we do find regularity and patterns that language users seem to make use of. Schemas in Construction Morphology have an output-oriented orientation, and they can express the generalizations and abstractions that language users need in order to understand and use complex words and word-formation patterns. Language users do not need a complete decomposition of morphologically complex words into morphemes. The interpretation of complex foreign words takes place by means of paradigmatic association with similar words, rather than by decomposition. We use similarities with other complex words, paradigmatic relations and analogical reasoning to grasp the meaning of these words.[11]

The German verbs in *-ier(en)* are formally related through the element *-ier* and its extended forms *-isier* or *-ifizier*. The category of the base element (a noun, an adjective or a root element, a confix) is less important than the fact that it returns in other complex words. For instance, we do not need to know the meaning of the root *polem-* in *polemisieren* 'to polem(ic)ize' in order to understand the meaning of this verb. It is linked to and motivated by other complex words like *Polemik* and *polemisch*. Through the comparison of these words and other words in *-isieren, -ik* and *-isch*, we know enough about the internal structure of these verbs to come to an adequate interpretation. We can use this information for the formation of new words.

The schema approach allows to specify subschemas that are characterized by formal and/or semantic features. Such subschemas can also be used to account for the productivity within a 'semantic niche' (cf. Hüning 2009). With respect to *-isier(en)* we find such a productive pattern for example for verbs that are based on person names (*merkelisieren* etc.). The case study has shown some of the relevant paradigmatic relations of such verbs (especially with the even more productive nouns in *-isierung*). It also demonstrated the importance of the old insight of Aronoff (1976: 45) that "productivity goes hand in hand with semantic coherence". Semantic coherence together with a coherent syntactic behavior of the verbs (transitivity) turns out to be more important than formal characteristics of the bases. This does, however, leave room for creative use: everything is possible in the formation of new words, as long as it makes sense in a certain context (cf. Heringer 1984).

[11] This is in line with recent publications by Geert Booij, but see also Bybee's (2010) plea for usage-based approaches or the discussion of 'Bausteine und Schemata' (building blocks and schemas) by Hartmann (2014: 186), who considers the advantages of a constructional schema approach to (productive) word formation patterns.

Furthermore, the formation of *-ier(en)* verbs has demonstrated the relevance of the notion of 'schema unification', used in Construction Morphology in order to account for the conflation of two word-formation processes in the formation of a new word. In the formation of a word like *Deemotionalisierung* 'de-emotionalization', the use of the prefix *de-* and the suffix *-ung* depend on the presence of the verbalizing element *-isier*. The corresponding verb does not need to be realized; for the formation of the complex noun it is sufficient that it could be formed if needed. Such interdependencies can be formalized very well as unification of schemas.

Another notion of Construction Morphology appeared to be necessary as well, the notion of 'second order schema', which can be used to analyze and motivate paradigmatic relations between morphologically complex words. For example, the structure of and the relation between *dissimilieren* and *Dissimilation* can be easily analyzed by means of a second order schema.

In this article, I largely neglected the historical perspective on complex loan words. I am, however, convinced that the Construction Morphology approach is very appropriate to express the following basic insight, formulated more than a century ago by Hermann Paul:

> Es werden immer nur ganze Wörter entlehnt, niemals Ableitungs- und Flexionssuffixe. Wird aber eine grössere Anzahl von Wörtern entlehnt, die das gleiche Suffix enthalten, so schliessen sich dieselben ebensogut zu einer Gruppe zusammen wie einheimische Wörter mit dem gleichen Suffix, und eine solche Gruppe kann dann auch produktiv werden. Es kann sich das so aufgenommene Suffix durch analogische Neubildung mit einheimischem Sprachgut verknüpfen. (Paul 1920: 399)[12]

I also did not consider the comparative perspective. The German verbs in *-ier(en)* have counterparts in other Germanic languages as well as in Romance languages. Closely related is Dutch, and many of the questions, the analyses and the insights presented here could be applied to this language as well. An interesting case is Luxembourgish. In Luxembourgish, the suffix has the form *-éieren* and it seems to be used productively.[13]

A careful comparative analysis might shed some light on the factors that lead to divergence and convergence between languages. It would, for example, show that the emergence of productive word-formation patterns cannot only be observed for German, but for Dutch, English and other Germanic languages, as well. German *Merkelisierung* corresponds to *Merkelization* in English and to *merkelisering* in Dutch. What are the similarities, which language specific differences can be observed? It is an intriguing question which factors control the Europeanization or

[12]English translation of the 2nd edition of Pauls *Principles* by H.A. Strong: "Words are always borrowed in their entirety; never derivative and inflexional suffixes. If, however, a large number of words containing the same suffix is borrowed, these range themselves into a group just as easily as native words with the same suffix: and such a group may become productive in its turn. The suffix thus adopted may be attached, by means of analogical new-creation, to a native root."

[13]Peter Gilles pointed me to Southworth (1954) which might serve as a starting point for investigating the use of the pattern in Luxembourgish.

even internationalization of the lexicon. The emergence of parallel word-formation patterns through language contact and due to convergent communication needs is a phenomenon that deserves further investigation.

References

Ammon, U, H. Bickel, and A.N. Lenz, eds. 2016. *Variantenwörterbuch des Deutschen. Die Standardsprache in Österreich, der Schweiz, Deutschland, Liechtenstein, Luxemburg, Ostbelgien und Südtirol sowie Rumänien, Namibia und Mennonitensiedlungen*. 2., völlig neu bearbeitete und erweiterte Auflage. Berlin/Boston: De Gruyter.

Aronoff, M. 1976. *Word formation in generative grammar*. Linguistic Inquiry Monographs 1. Cambridge, MA/London: The MIT Press.

Bauer, L. 1998. Is there a class of neoclassical compounds, and if so is it productive? *Linguistics* 36 (3): 403–422.

Beckner, C., R. Blythe, J. Bybee, M.C. Christiansen, W. Croft, N.C. Ellis, J. Holland, J. Ke, D. Larsen-Freeman, and T. Schoenemann. 2009. Language is a complex adaptive system: Position paper. *Language Learning* 59 (Suppl. 1): 1–26.

Berteloot, A., and N. Van der Sijs. 2002. Dutch. In *English in Europe*, ed. M. Görlach, 37–56. Oxford/New York: Oxford University Press.

Bloomfield, L. 1933. *Language*. New York: Holt.

Booij, G. 2002. *The morphology of Dutch*. Oxford: Oxford University Press.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2015. Word-formation in construction grammar. In *Word-formation. An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, Vol. 1, 188–202. (HSK – Handbücher zur Sprach- und Kommunikationswissenschaft 40.1). Berlin/Boston: De Gruyter Mouton.

———. 2016. Dutch. In *Word-formation. An international handbook of the languages of Europe*, ed. P.O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, Vol. 4, 2427–2451. (HSK – Handbücher zur Sprach- und Kommunikationswissenschaft 40.4). Berlin/Boston: De Gruyter Mouton.

———. 2017. The construction of words. In *The Cambridge handbook of cognitive linguistics*, ed. B. Dancygier, 229–246. Cambridge: Cambridge University Press.

Booij, G., and J. Audring. 2018. Partial motivation, multiple motivation: the role of output schemas in morphology. This volume.

Bybee, J. 1988. Morphology as lexical organization. In *Theoretical morphology*, ed. M. Hammond and M. Noonan, 119–141. San Diego: Academic.

———. 2010. *Language, usage and cognition*. Cambridge: Cambridge University Press.

Demske, U. 2000. Zur Geschichte der *ung*-Nominalisierung im Deutschen: Ein Wandel morphologischer Produktivität. *Beiträge zur Geschichte der Deutschen Sprache und Literatur* 122 (3): 365–411.

Donalies, E. 2009. *Stiefliches Geofaszintainment* – Über Konfixtheorien. In *Studien zur Fremdwortbildung*, ed. P.R.O. Müller, 41–64. (Germanistische Linguistik 197–198). Hildesheim/Zürich/New York: Georg Olms Verlag.

Duden. 2005. *Duden. Die Grammatik*, 7, völlig neu erarbeitete und erweiterte Auflage. Herausgegeben von der Dudenredaktion. (Duden 4). Mannheim/Leipzig/Wien/Zürich: Dudenverlag.

Eins, W. 2008. *Muster und Konstituenten der Lehnwortbildung. Das Konfix-Konzept und seine Grenzen*. (Germanistische Linguistik Monographien 23). Hildesheim/Zürich/New York: Georg Olms Verlag.

Eisenberg, P. 2012. *Das Fremdwort im Deutschen*. 2., überarbeitete Auflage. (De Gruyter Studium). Berlin/Boston: De Gruyter.

Elsen, H. 2011. *Grundzüge der Morphologie des Deutschen*. (De Gruyter Studium). Berlin/Boston: De Gruyter.

Fleischer, W. 1997. Zum Status des Fremdelements *-ier-* in der Wortbildung der deutschen Gegenwartssprache. In *Sprachsystem - Text - Stil. Festschrift für Georg Michel und Günter Starke zum 70. Geburtstag*, ed. Ch. Keßler, and K-E. Sommerfeldt, 75–87. (Sprache – System und Tätigkeit 20). Frankfurt am Main/Berlin/Bern/New York/Paris/Wien: Peter Lang.

Fleischer, W., and I. Barz. 2012. *Wortbildung der deutschen Gegenwartssprache*, 4. Auflage; völlig neu bearbeitet von Irmhild Barz unter Mitarbeit von Marianne Schröder. (De Gruyter Studium). Berlin: De Gruyter.

Fuhrhop, N. 1998. *Grenzfälle morphologischer Einheiten*. (Studien zur deutschen Grammatik 57). Tübingen: Stauffenburg Verlag.

Goldberg, A.E. 2003. Constructions: A new theoretical approach to language. *Trends in Cognitive Sciences* 7 (5): 219–224.

Grimm, J. 1864. Über das Pedantische in der deutschen Sprache. Vorgelesen in der öffentlichen Sitzung der Akademie der Wissenschaften am 21. October 1847. In *Reden und Abhandlungen von Jacob Grimm*, ed. K. Müllenhoff, 327–373. (Kleinere Schriften von Jacob Grimm 1). Berlin: Ferd. Dümmlers Verlagsbuchhandlung.

Hartmann, S. 2014. Wortbildungswandel im Spiegel der Sprachtheorie: Paradigmen, Konzepte, Methoden. In *Paradigmen der aktuellen Sprachgeschichtsforschung*, ed. V. Ágel, and A. Gardt, 176–193. (Jahrbuch für Germanistische Sprachgeschichte 5). Berlin/Boston: De Gruyter.

Henzen, W. 1965. *Deutsche Wortbildung*. Dritte, durchgesehene und ergänzte Auflage. (Sammlung kurzer Grammatiken germanischer Dialekte). Tübingen: Max Niemeyer Verlag.

Heringer, H.J. 1984. Gebt endlich die Wortbildung frei! *Sprache und Literatur in Wissenschaft und Unterricht* 15: 42–53.

Hüning, M. 1999. *Woordensmederij. De geschiedenis van het suffix* -erij. (LOT International Series 19). Den Haag: Holland Academic Graphics.

———. 2009. Semantic niches and analogy in word formation: Evidence from contrastive linguistics. *Languages in Contrast* 9 (2): 183–201.

Kempf, L., and S. Hartmann. 2018. Schema unification and morphological productivity: A diachronic perspective. This volume.

Koskensalo, A. 1986. Syntaktische und semantische Strukturen der von deutschen Basiswörtern abgeleiteten *-ieren*-Verben in der Standardsprache. *Zeitschrift für germanistische Linguistik* 14 (2): 175–191.

Kühnhold, I., and H. Wellmann. 1973. *Deutsche Wortbildung – Typen und Tendenzen in der Gegenwartssprache. Erster Hauptteil: Das Verb*. (Sprache der Gegenwart 29). Düsseldorf: Pädagogischer Verlag Schwann.

Leipold, A. 2006. *Verbableitung im Mittelhochdeutschen: eine synchron-funktionale Analyse der Motivationsbeziehungen suffixaler Verbwortbildungen*. (Studien zur mittelhochdeutschen Grammatik 2). Tübingen: Max Niemeyer Verlag.

Lüdeling, A., T. Schmid, and S. Kiokpasoglou. 2002. Neoclassical word formation in German. In *Yearbook of morphology 2001*, ed. G. Booij and J. Van Marle, 253–283. Dordrecht: Kluwer.

Marchand, H. 1969. Die Ableitung deadjektivischer Verben im Deutschen, Englischen und Französischen. *Indogermanische Forschungen* 74: 155–173.

Müller, P.O. 2000. Deutsche Fremdwortbildung. Probleme der Analyse und der Kategorisierung. In *Wortschatz und Orthographie in Geschichte und Gegenwart. Festschrift für Horst Haider Munske zum 65. Geburtstag*, ed. M. Habermann, P.O. Müller, and B. Naumann, 115–134. Tübingen: Max Niemeyer Verlag.

Müller, Peter O., ed. 2005. *Fremdwortbildung. Theorie und Praxis in Geschichte und Gegenwart*. (Dokumentation Germanistischer Forschung 6). Frankfurt am Main: Peter Lang.

Müller, P.O., ed. 2009. *Studien zur Fremdwortbildung*. (Germanistische Linguistik 197–198). Hildesheim/Zürich/New York: Georg Olms Verlag.

———. 2015. Foreign word-formation in German. In *Word-formation. An international handbook of the languages of Europe*, ed. P. O. Müller, I. Ohnheiser, S. Olsen, and F. Rainer, Vol. 3, 1615–1637. (HSK – Handbücher zur Sprach- und Kommunikations-wissenschaft 40.3). Berlin/Boston: De Gruyter Mouton.

Öhmann, E. 1970. Suffixstudien VI: Das deutsche Verbalsuffix *-ieren*. *Neuphilologische Mitteilungen* 71 (3): 337–357.

Paul, H. 1920. *Prinzipien der Sprachgeschichte: Studienausgabe*. 9., unveränderte Auflage, 1975 [Nachdruck der 5. Auflage, 1920]. (Konzepte der Sprach- und Literaturwissenschaft 6). Tübingen: Max Niemeyer Verlag.

Rosenqvist, A. 1934. Das Verbalsuffix *-(i)eren*. *Suomalaisen Tiedeakatemian Toimituksia. Annales Akademiae Scientiarum Fennicae.* Sarja-Ser B, Nide-Tom. XXX, 589–635.

Scherer, C. n.d. Zur Geschichte des *-ieren*-Suffixes im Deutschen. Manuskript. Mainz, ms.

Schlücker, B. 2017. Eigennamenkomposita im Deutschen. In *Namengrammatik*, ed. J. Helmbrecht, D. Nübling, and B. Schlücker, 59–93. Linguistische Berichte, Sonderheft 23.

Seiffert, A. 2009. *Inform-ieren, Informat-ion, Info-thek*: Probleme der morphologischen Analyse fremder Wortbildungen im Deutschen. In *Studien zur Fremdwortbildung*, ed. P. O. Müller, 19–40. (Germanistische Linguistik 197–198). Hildesheim/Zürich/New York: Georg Olms Verlag.

Southworth, F.C. 1954. French elements in the vocabulary of the Luxemburg dialect. *Bulletin linguistique et ethnologique* 2: 1–20.

Van Marle, J. 1985. *On the paradigmatic dimension of morphological creativity*. (Publications in language sciences 18). Dordrecht: Foris Publications.

Wengeler, M. 2010. *Schäubleweise, Schröderisierung* und *riestern*. Formen und Funktionen von Ableitungen aus Personenamen im öffentlichen Sprachgebrauch. *Komparatistik online* 2010, 79–98.

Wilmanns, W. 1899. *Deutsche Grammatik. Gotisch, Alt-, Mittel- und Neuhochdeutsch.* Zweite Abteilung: *Wortbildung*. Zweite Auflage. Strassburg: Karl J. Trübner.

Wilss, W. 1992. Schematheorie und Wortbildung. *Deutsch als Fremdsprache* 29 (4): 230–234.

Japanese Word Formation in Construction Morphology

Natsuko Tsujimura and Stuart Davis

Abstract Along with the growing number of studies taking a construction approach to phrasal and clausal phenomena, applications of Construction Grammar to morphology has highlighted its importance in analyzing human language. In this chapter, we will illustrate that the construction morphology approach is most insightful in analyzing four word formation phenomena in Japanese: innovative verbs, hypocoristic formation, intensified mimetic adverbs, and innovative prenominal noun modification. They exhibit that a set of properties jointly belong to the construction in which they appear. These properties individually or collectively do not follow from general or Japanese-specific morpho(phono)logical principles. In each case, the properties that pertain to its form, meaning, and usage are better captured holistically belonging to the construction itself. The construction morphology approach offers the conceptual framework and methodological tools for analyzing them.

Keywords Coercion · Hypocoristics · Innovative verbs · Mimetic adverbs · Non-concatenative morphology · Prosodic morphology · Truncation

1 Introduction

While most work in Construction Grammar has focused on phrasal and clausal phenomena, a series of works, particularly by Booij (2005, 2007, 2009a, b, 2010), has developed the detailed application of the insights of Construction Grammar to morphological analysis. This has led to the emergence of Construction Morphology as an increasingly important subfield of Construction Grammar. This development

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is in line with earlier comments by Michaelis and Lambrecht (1996: 216), who claim that "[i]n Construction Grammar, the grammar represents an inventory of form-meaning-function complexes, in which words are distinguished from grammatical constructions only with regard to their internal complexity"; and also by Croft (2001: 17), who observes "... the internal structure of words are also constructions ... The only difference between morphological constructions and syntactic ones is that the former are entirely made up of bound morphemes while the latter are largely made up of free morphemes." Booij (2010) develops the use of morphological schemas to express generalizations about form-meaning pairings. These schemata are non-derivational in the sense that they are product- or output-oriented, and do not change an input into an output, as with classic word formation rules (Aronoff 1976). Nevertheless, a morphological schema is abstract and can be used to create new words. As an initial example, Booij (2010: 3) gives the abstract morphological schema $[[x]_V er]_N$ "one who Vs" for the English deverbal (agentive) construction, and goes on to say: "This schema expresses a generalization about the form and meaning of existing deverbal nouns in *-er* listed in the lexicon, and can also function as the starting point for coining new English nouns in *-er* from verbs." A crucial aspect of the constructional schema is that the formal, meaning, and usage properties are captured as being a holistic property of the construction as a whole. The affix *-er* is a bound morpheme, and so does not exist as a lexical entry; its existence and associated meaning is bound to the construction.

The major goal of this paper is to consider the form-meaning-usage complex of four different morphological constructions in Japanese, illustrating how they can be expressed using the morphological schema along the lines developed in Booij (2010). To this end, we provide a detailed account of the four constructions in lieu of a general overview of Japanese construction morphology. The phenomena we wish to analyze are the formation of innovative verbs, truncated hypocoristics, intensified mimetic adverbs, and innovative prenominal noun modifiers. In our discussion of each phenomenon, we wish to illustrate that linguistic properties pertaining to its form and meaning go hand in hand. Although some of their behavior follows from general and specific linguistic principles, they also exhibit an intriguing set of characteristics that cannot be attributed to anything but the schemata in which they appear. We will argue that construction morphology analysis is the most fitting for our sample of word formation types.

2 Formation of Innovative Verbs

Creating new verbs based on existing lexical items of other categories such as nouns and adjectives is a common word formation pattern. Of the denominal verbs in Japanese, what we call innovative (denominal) verbs[1] demonstrate a cluster of prop-

[1]Innovative verbs can also be formed around mimetic words, whose categorial status is often indeterminate. Examples include *nikoru* 'smile', *chibiru* 'stint', *pakuru* 'swindle', and *guzuru*

erties that cannot individually characterize their linguistic nature. As is described in detail and argued for in Tsujimura (2010) and Tsujimura and Davis (2008a, b, 2010, 2011), capturing the cluster of properties collectively as a form-meaning-usage complex in construction terms provides insight into the nature of this type of word formation at its core. In particular, the formation of innovative verbs epitomizes what Booij (2010) refers to as "tripartite parallel architecture" that is built upon "a pairing of three types of information . . . labelled as PHON, SYN, and SEM," where SEM "may have both strictly semantic and pragmatic components." (p. 5).

Examples of innovative verbs are given in (1), and their properties are summarized in (2).

(1)

innovative verb	*base noun*	*meaning*
jikoru	jiko 'accident'	have a traffic accident
biyoru	biyooin 'hair salon'	go to a hair salon
memoru	memo 'memo'	take notes
guguru	guuguru 'Google'	conduct a Google search
makuru	makudonarudo 'McDonald's'	go to McDonald's
sutabaru	sutaabakkusu 'Starbucks'	go to Starbucks
egawaru	Egawa (former pitcher for the Tokyo Giants)	display selfish conduct

(2)
a. The root of an innovative verb must be at least 2-mora long.
b. The verb root must end in /r/.
c. The verb root must have accent on the final mora.
d. The meaning of the verb is contextually determined based on mutual knowledge that the interlocutors have.
e. An innovative verb is used playfully in a casual speech situation, and can sometimes serve as a secret language that is comprehensible only among in-group speakers.

Let us consider each of these properties. First, shortening is a very common morphological process in Japanese, especially in loanwords from English, and is frequently observed with innovative verbs. For instance, *makuru* (or *makudoru*) 'go to McDonald's' and *sutabaru* 'go to Starbucks' come from the loanwords *makudonarudo* and *sutaabakkusu*, respectively, but the verb root to which the inflectional suffix for the present tense *ru* is added, is clipped to two moras in the former and to three moras in the latter. It is extremely rare to find shortening resulting in a single-mora root. On the other hand, we find a verbal base as long as five moras like *gengogakuru* 'to discuss linguistics' (*gengogaku* 'linguistics'), in which no clipping is applied. The condition on length restricts only the lower end

'grizzle'. In this chapter we will focus on innovative verbs that are denominal although the analysis presented here applies to mimetic-based innovative verbs as well. For more details, see Tsujimura and Davis (2011).

of a root size while leaving a maximal limit open. In contrast, the minimum length requirement imposed on innovative verbs does not seem to be applicable to the category of conventional verbs: we find monomoraic verb roots such as *mi-ru* 'see', *i-ru* 'exist', *su-ru* 'do', *ne-ru* 'sleep', and *de-ru* 'get out'. The two-mora minimum, thus, does not follow from general principles of morphological well-formedness expected of conventional verbs in Japanese. Instead, it is specific for the formation of innovative verbs.

Second, the root form of innovative verbs has a specific phonological exponent that is not predicted by the general morphological pattern of conventional verbs. While we have tentatively assumed that the examples listed in (1) are identified in the present tense form with the inflectional morpheme *–ru* suffixed to the verbal root, a closer look at the inflectional paradigm that involves the past tense morpheme *–ta* reveals a different morphological boundary. The present tense suffix has two allomorphs, *−ru* and *–u*: the former is suffixed to vowel-ending roots (e.g. *tabe-ru* 'eat' and *yame-ru* 'stop'), and the latter to consonant-ending roots to avoid consonant clusters (e.g. *kaer-u* 'return', *sir-u* 'get to know', *nak-u* 'cry', and *yom-u* 'read'). When the past tense suffix *–ta* is added, verbal roots that end with /r/, such as *kaer-u* and *sir-u*, surface with a geminate: *kaet-ta* 'returned' and *sit-ta* 'got to know'. This in turn means that the /t/ before *–ta* indicates the presence of /r/ as the root-ending consonant of the verb. Interestingly, all past tense forms of the innovative verbs in (1) exhibit this geminate consonant.

(3)

present	*past*	*base noun before clipping*
jikoru	jikot-ta	jiko
biyoru	biyot-ta	biyooin
memoru	memot-ta	memo
guguru	gugut-ta	guuguru
makuru	makut-ta	makudonarudo
sutabaru	sutabat-ta	sutaabakkusu
egawaru	egawat-ta	egawa

The paradigm in (3) suggests that the morphological boundary of the present-tense forms in (1) must be *jikor-u*, *biyor-u*, *memor-u*, and so on, rather than *jiko-ru*, *biyo-ru*, and *memo-ru*; otherwise the past tense forms of these innovative verbs would be the ill-formed **jiko-ta*, **biyo-ta*, and **memo-ta*, respectively. The recognition of /r/ as the root-ending consonant in all of these examples, however, is peculiar in light of the fact that none of the base nouns, whether original or clipped, contains /r/ in the position relevant to our discussion. That is, the presence of /r/ as a root-ending consonant in these innovative verbs cannot be attributed to the base nouns on which they are built. It leads to the conclusion that the root-final /r/ characterizes innovative verbs as a unique sub-class of verbs.

The third property listed in (2) has to do with the uniform placement of accent on innovative verbs, once again the pattern that does not entirely follow general principles underlying the accentuation of conventional Japanese verbs. Native Japanese words exhibit a varying array of accentuation patterns, but in order to see

where the accent is located in a verbal root, it is important to make reference to the gerundive form. This is because there are some verbal suffixes that shift the accent originally assigned to a verbal root (Tsujimura 2014). The gerund form, typically suffixed with *–te*, does not influence an inherent root accent, and thus reflects the original accent placement of a verb root. The gerund forms of innovative verbs are given on the left in (4) while words on the right show corresponding nouns on which the innovative verbs are based. In addition to the examples in (1), a few more (the last two) are included in (4) to show that the vowel quality does not affect the uniform accent placement.

(4)	*innovative verbs (gerund)*	*base noun before clipping*
	jikót-te	jíko
	biyót-te	biyóoin
	memót-te	mémo
	gugút-te	gúuguru
	makút-te	makudonárudo
	sutabát-te	sutaabákkusu
	egawát-te	égawa
	kopít-te	kópii ‘copy’
	kaɸeorét-te	kaɸeore [accentless] ‘café au lait’

The root accent of innovative verbs is consistently placed on the last mora; and it is clear from the comparison between the two columns that the particular accent placement is not inherited from the base nouns. That is, regardless of how nouns are accented, their corresponding innovative verbs have a uniform pattern, i.e. root-final accent. Note that root-final accent is not characteristic for verbs in general. For instance, the verbs in (5), all in the gerund form, illustrate a variety of accent locations in conventional verbal roots.

(5)		
	tábe-te	‘eat’
	yorokón-de	‘get pleased’
	arawáre-te	‘appear’
	sawat-te [accentless]	‘touch’

The root-final accent of innovative verbs is therefore not a phonological property that originates from their corresponding base nouns or from a general pattern associated with native verbs. The accentuation property contributes to characterizing the innovative verb class, just as the length requirement and the root-final /r/ do.

The semantic property of innovative verbs as stated in (2d) should be discussed with their pragmatic characteristic in (2e) since the two are closely intertwined. Some of the innovative verbs that have been conventionalized display a finite number of meanings that are akin to dictionary definitions of existing lexical verbs. These include *memoru* ‘take notes’ (<*memo* ‘memo’), *kopiru* ‘make a copy’ (<*kopii* ‘copy’), and *hinikuru* ‘make a sarcastic remark’ (< *hiniku* ‘sarcasm’). However, those that have not yet gained such conventional status heavily rely on rich contextual information in order for them to be interpreted. Let us take

sutabaru (<*sutaabakkusu* 'Starbucks') for illustration. It is obviously related to the commercial franchise Starbucks, but its precise meaning depends on the situation in which the verb is used and on the information shared among the interlocutors at the time of the conversation. As such, *sutabaru* could have multiple, potentially an infinite number of, interpretations as long as a given interpretation has some relation to Starbucks. In perhaps the most general sense, *sutabaru* is understood to mean to go to Starbucks to buy coffee or to drink coffee there. In a little more explicit situation, *sutabaru* can mean to have specifically café latte at Starbucks; and yet for other speakers in another situation, particularly those of the younger generation, it means to relax while drinking coffee-like beverages at Starbucks. In these cases, what is consumed does not even have to be coffee (for instance tea or juice); nor does it necessarily involve any beverage (as when eating a scone or a muffin). Which meaning the speaker intends to convey is up to the specific situation relevant to the interlocutors, and is also determined by how much knowledge is shared by the speaker and the listener for the purpose of successful communication. Under this premise, furthermore, a new meaning could be assigned to *sutabaru*, even remotely, as long as that particular sense is based on the knowledge that the communication participants mutually have and that it has something to do with Starbucks. The number of interpretations that *sutabaru* potentially has is, thus, infinite, as long as there is room beyond conventionalized interpretations; and even conventionalized meanings could, in principle, be subject to expansion.

Another example that suggests the context-sensitive nature of interpreting innovative verbs is demonstrated by Koyano's (1993) explanation of *kaɸeoreru* (< *kaɸeore* 'café au lait'). The most straightforward interpretation that is inferred based on the primary function of the base noun, *kaɸeore*, is 'to drink café au lait', and this construal would be perfectly acceptable or even the preferred reading. Koyano, however, reports that female college students from whom he collected data, said its meaning to be 'to have a café au lait stain', a much narrower and more creative sense that can nevertheless be linked to the base noun. This highly specific construal of *kaɸeoreru* requires an exceedingly rich context that is probably available only among a close-knit and arguably very restricted community of speakers.

The specific interpretation of a given innovative verb may vary, however slightly, depending on the particular social context shared within a given speech community. At the same time, it should be pointed out that these examples suggest fluidity in assigning meaning to a verb derived from a single noun. That is, it is possible for an innovative denominal verb to have a variety of meanings as long as a core function of the parent noun is somehow reflected in the meaning, and as long as it constitutes common knowledge among the speech community, however narrowly such community may be defined. The range of potential meanings of an innovative verb in isolation is indefinite, but the verb selects the most salient functional meaning that is connected to the base noun and is relevant in context. That is, the determination of the unique meaning is made on the basis of the time, place, and circumstance in which a conversation takes place, following Grice's Maxims (Grice 1975) between speaker and listener.

The multiple possible meanings of an innovative verb are reminiscent of Clark and Clark's (1979) discussion of the semantics of innovative denominal verbs in English. Based on the highly contextualized meaning assignments observed with English denominal verbs, Clark and Clark argue for the need to distinguish innovative verbs with the special semantic property of "contextuals" from purely denotational verbs. In their terms, contextuals have "a *shifting* sense and denotation – one that depends on the time, place, and circumstances of their use" (p. 765; emphasis as in the original) whereas purely denotational verbs "have a *fixed* sense and denotation" (p. 768; emphasis as in the original). In Tsujimura and Davis (2011), we sided with Aronoff's (1980) opposing view that the word category of verb and pragmatic conventions should take care of the variety of denotations that innovative denominal verbs can have: the categorial identification of verb leads to states, events, or processes as the semantics of a given denominal verb, and pragmatic conventions like Grice's Maxims lead to choosing a specific interpretation that is suitable for a particular situation under which a conversation takes place. In the current analysis, however, we opt for specifically recognizing Japanese innovative verbs as contextuals. The primary reason is that the path along which Japanese innovative verbs acquire their interpretation is often extraordinarily narrow, and their situation-specific meanings do not demonstrate the lexical semantic patterns that are systematically observed for conventional native verbs. For example, verbs such as *sutabaru* (Starbucks), *makuru/makudoru* (McDonald's), *higashikokubaru* 'go to Miyazaki'[2] (former governor Higashikokubaru, who promoted tourism in his home prefecture Miyazaki), and many more examples like these lexicalize what proper names refer to, which becomes part of their meanings. This seems to be a unique characteristic that is available to what Clark and Clark call contextuals.

The functional role of an innovative verb is also not predictable from the categorial status as verb. Innovative denominal verbs are invariably used in a casual setting, and often bear a playful nuance; as such, they have frequently been identified to characterize youth language (e.g. Yonekawa 1989; Koyano 1993; Kamei 2003; Kato 2005; Yamaguchi 2007, among others). In this function, they are sometimes considered slang-like, and can also play a role as a type of secret language particularly when they are interpreted so context-specifically that those who do not share the unique social and cultural background knowledge would not be able to understand the connection between the base noun and the uniquely assigned meaning. The previously mentioned innovative verb, *kaɸeoreru* (< *kaɸeore* 'café au lait') 'to have a café au lait stain (on clothes)' is one such example. It is equally possible, furthermore, that base nouns are clipped to the extent that the original noun forms are not recognizable to those outside a close-knit speech community, perfectly serving their purpose as a secret language. It was mentioned earlier that

[2] *Higashikokubaru* has an additional meaning, 'to show up no matter how busy he is or even when he is not invited.' This meaning is supposed to reflect Governor Higashikokubaru's personal traits. It is of note that a trip to Miyazaki and an uninvited appearance may not inherently share anything common but both emerge as actual usages because they mirror some aspect related to Higashikokubaru.

some innovative verbs have been conventionalized with a stable fixed set of expected denotations, but even these relatively conventionalized verbs still maintain casual nuance, making their use in formal speech or writing inappropriate. The functional aspect of innovative verbs—casual style and playfulness—is a unique feature of verbs of this class.

As the discussion of these innovative verbs above makes evident, the properties listed in (2) should be captured as belonging to the form-meaning-usage complex as a whole, expressed by a morphological schema. We represent these properties of the innovative verb construction in (6), in which V' indicates an accented vowel.

(6) Innovative verb construction
<[. . . [(C)V(C)V]$_k$ . . .]$_{Ni}$ ↔ [SEM]$_i$> ≈
<[. . . [(C)V(C)V']$_k$-r]$_{Vroot\text{-}I}$ ↔ [contextually determined event/state in which SEM$_i$ is involved; casual style, playful]$_{SEMI}$>

In (6), the angle brackets designate a constructional schema. The symbol ≈ is used as in Booij (2010) to indicate a paradigmatic relationship between the two constructional schemata. [. . . [(C)V(C)V]$_k$ of the noun schema is copied in the innovative verb schema. Crucially, the accent indicated on the last vowel, V', and the root-final /r/ are properties of the innovative verb construction itself, not derivable from properties of the paradigmatically-related noun or from general characteristics of the phonology of Japanese. The circumscribed meaning to the right of the double arrow in the innovative verb schema reflects the role of context in determining the specific sense as we have detailed in our exposition above. Following Booij, this SEM level includes the pragmatic property of this construction, i.e. the casual and playful style. In sum, as demonstrated above, the properties listed in (2) should be captured jointly as a set of characteristics to be attributed to the innovative verb construction in (6).[3]

3 Truncated Hypocoristic Formation

The truncation of names illustrates how morphological forms with specific prosodic patterns are designated for particular social functions. One of the phenomena that is often discussed in conjunction with truncated names is the formation of hypocoristics or nicknames, as with the English suffix *–ie/y* [i]: examples include *Stephanie* ➔

[3]The construction schema in (6) may not seem to account for *sutabaru*, which is paradigmatically related to *sutaabakkusu* in (1), because the long vowel /aa/ is shortened in the verb form. Another example is found in *guuguru* ↔ *guguru* 'to conduct a Google search' and *jakuujii* 'jacuzzi' ↔ *jakujiru* 'to use jacuzzi'. As we noted in Tsujimura and Davis (2011: 804), this reflects a tendency that the last two moras of an innovative verb root does not consist of a long vowel. This tendency may lead to a modification that the last C in the [. . . [(C)V(C)V']$_k$-r]$_{Vroot}$ portion of the schema should always surface rather than be optional.

Stephie, Robert ➔ *Robbie, Margaret* ➔ *Maggie, Susan* ➔ *Susy, Rebecca* ➔ *Becky*, *Elaine* ➔ *Lainie*, and *Elizabeth* ➔ *Lizzy*. The common denominator in the form of these truncated nicknames is that their initial syllable, which is stressed, corresponds with the stressed part of the full names.

Truncated hypocoristics in Japanese are typically formed by the combination of truncation and suffixation of *–tyan*, and are generally used among family members and other in-group members within a close circle.[4] The truncated hypocoristic formation in Japanese, as is extensively described and analyzed by Poser (1990), Ito (1990), and Kubozono (1999), imposes a set of prosodic constraints on the form of clipped nicknames. While the suffix *–tyan* can be added to any first name in expressing endearment without truncation, the suffixation of *–tyan* to a truncated first name is more common, arguably increasing the degree of endearment and casualness. Truncated hypocoristics share two prosodic properties: (i) the truncated base to which *–tyan* is suffixed is 2-mora long;[5] and (ii) the initial mora of the truncated base is accented.

First, consider the pattern of truncation and suffixation in (7), where the first names in (7a) consist of three moras while those in (b) have four moras or more.

(7) a.

Chíkako	➔	chíka-tyan
Mákiko	➔	máki-tyan
Tókiko	➔	tóki-tyan
Humie	➔	húmi-tyan
Makoto	➔	máko-tyan
Kéiko	➔	kéi-tyan
Shigeru	➔	shíge-tyan
Yúuji	➔	yúu-tyan
Kénta	➔	kén-tyan

[4]The suffix *–tyan* appears in kinship terms like *(o-)too-tyan* ‘father’, *(o-)kaa-tyan* ‘mother’, *(o-)nii-tyan* ‘older brother’, *(o-)nee-tya*n ‘older sister’, *(o-)jii-tyan* ‘grandfather’, *(o-)baa-tyan* ‘grandmother’, *o-ji-tyan* ‘uncle’, and *o-ba-tyan* ‘aunt’ although these forms have corresponding terms with *–san* instead of *–tyan*. Additionally, there are words like *bot-tyan* ‘small boy, someone’s son’, *ojoo-tyan* ‘small girl’, and *aka-tyan* ‘baby’, also sharing the same suffix. However, these words are different from truncated hypocoristics in Japanese to be discussed in this section in that they do not involve a truncation process.

[5]When first names consist of two moras, truncation does not take place, yielding hypocoristic counterparts with *–tyan*, as in *Mari* ➔ *mari-tyan, Rika* ➔ *rika-tyan*, and *Jun* ➔ *jun-tyan*. The degree of endearment in these hypocoristics in comparison with truncated longer names is not clear to us. This is similar to the observation made by Booij and Audring (2017) that monosyllabic English names that do not have a correspondence to a longer form (e.g. *Paul*) lack a sense of endearment.

b. Saburoo ➔ sábu-tyan
Masátsugu ➔ mása-tyan
Sumíhare ➔ súmi-tyan
Kooshiroo ➔ kóo-tyan
Toméjiroo ➔ tóme-tyan
Heizoo ➔ héi-tyan
Yóojiroo ➔ yóo-tyan
Kínsuke ➔ kín-tyan

Regardless of the length of the base name, the hypocoristic form consists of two moras to which *–tyan* is suffixed. The clipped portion of the nickname in (7) corresponds to the first two moras of the full first name, and this is the most common pattern. However, the two moras in a hypocoristic do not have to match the first two moras of the full first name as long as the prosodic length of two moras is sustained. This is illustrated in (8).

(8) Ákiko ➔ áko-tyan
Mótoko ➔ móko-tyan, óko-tyan
Yóoko ➔ yóko-tyan

In these three-mora names and in more examples like them, the second mora is skipped, but nevertheless, the resulting hypocoristic names do consist of two moras. Note that a word-initial consonant may not surface in the corresponding hypocoristic, as is exemplified by *Mótoko* ➔ *óko-tyan*. Furthermore, the two moras that constitute a nickname, especially the second mora, do not have to find their corresponding moras in the full first name. (9) gives two types of such cases.

(9) a. Sáchiko ➔ sát-tyan
Étsuko ➔ ét-tyan
Yásuko ➔ yát-tyan

b. Mídori ➔ míi-tyan
Izumi ➔ íi-tyan
Másako ➔ máa-tyan

Each of the hypocoristics in (9a) ends up with a geminate consonant before the suffix. In these examples, only the first mora of the hypocoristic corresponds to that of the full name. The second mora of the hypocoristic is realized by the gemination of /t/ from the suffix *–tyan*. As for (9b), the vowel of the first mora is lengthened in each instance.

While the nature of the clipping differs among the forms in (7–9), what is shared by all is that the hypocoristic constituent before *–tyan* is two-mora long (or a trochaic foot, according to Kubozono 1999). Thus, truncated names that consist of one mora or three moras are excluded. For instance, we do not find **chi-tyan* for *Chikako*, **e-tyan* for *Etsuko*, **sumiha-tyan* for *Sumihare*, and **kooshi-tyan* for *Kooshiroo* as acceptable truncated hypocoristic forms. The only cases

where the nickname to which *–tyan* is suffixed consists of three or more moras are hypocoristics with the full first name suffixed by *–tyan*.[6]

Second, the accent placement on hypocoristics is identical throughout the examples given here. The three-mora first names in (7a) and (9) either have accent on the initial mora (e.g. *Chíkako, Yúuji, Sáchiko*) or are accentless (e.g. *Shigeru, Izumi*). Those names in (7b), which consist of four or five moras, have accent on the initial (e.g. *Yóojiroo, Kínsuke*) or second mora (e.g. *Masátsugu, Toméjiroo*), or have no accent (e.g. *Saburoo, Kooshiroo*). Despite the variation, however, the accentuation pattern of truncated hypocoristics on the right of the arrow is identical, i.e. accent invariably falls on the initial mora. This accent placement is not expected to follow from general principles pertinent to prosodic properties of Japanese words. The range of data given above, instead, clearly shows that the accent on the initial mora has to be specified in the hypocoristic template that consists of a two-mora base followed by the suffix *–tyan*. This also suggests that schemas themselves display output properties.

At this point, we may simply formalize the two prosodic properties discussed above into a templatic representation of (10) (where M' indicates that the initial mora is accented).

(10) M'M-tyan

However, there are several problems with the formal representation of (10). First, while the second mora in (10) can be any of the three instances of mora in Japanese, namely, a vowel that may or may not be accompanied by a preceding consonant, moraic nasal, and a geminate consonant,[7] the first mora is restricted to (C)V, disallowing the other two instances of mora in this position. Second, truncation of an original name is unidirectional, i.e. from left to right, and not the other way around. Moreover, the first mora of the original name corresponds to the initial mora of (10). Third, for first names with three moras or more, which have been our primary concern, there can be more than one pattern of choosing two moras out of the three or more moras in the original names. While (7) presents the most straightforward

[6]The only exceptions that we are aware of are cases in which the truncation results in three moras that contain a geminate consonant. Examples include A*kiko* ➔ *akko-tyan, Tokuko* ➔ *tokko-tyan, Yoshiko* ➔ *okko-tyan*, and *Motoko* ➔ *mokko-tyan*. As these examples suggest, many of the original first names of three-mora hypocoristics have high vowels /i, u/ between voiceless consonants, resulting in their devoicing. The environment for high vowel devoicing seems to correspond to the geminate consonant in these examples. As for cases like *Motoko* ➔ *mokko-tyan*, while the full name does not have any high vowel, Vance (2008) notes that non-high vowels often become devoiced between voiceless consonants although it happens much less consistently than with high vowels. In light of the fact that the second vowel of *Motoko* meets the environment of vowel devoicing, the three-mora hypocoristic form with a geminate consonant may be seen as phonologically derived from the suffixing of *–tyan* to the full name.

[7]A consonant serving as the second mora of a truncated hypocoristic is always realized uniformly as homorganic to the following consonant, but this constraint does not need to be stipulated in the formal representation of the construction because non-homorganic consonant clusters are not allowed in Japanese.

pattern of selecting the two leftmost adjacent moras of a full name, (8) shows a process that skips the middle of a three-mora name. Yet another pattern is in (9), where the second mora of the template of (10) does not find its identical segment in the original full name: the second mora position of (9a) is left for gemination, and (9b) for a vowel identical with that of the first mora.

(11) is the hypocoristic construction schema that addresses all these issues. M' indicates the mora is accented.

(11) Hypocoristic construction

$<[[(x)M(y)M]_k \ldots]_{Ni} \leftrightarrow [\text{ProperName}]_{SEMi}> \approx$

$<[[\ M'(M)]_k\text{-tyan}]_m \leftrightarrow [\text{endearment of SEM}_i]_{SEMm}>$

[(C)VCV] [(C)VC] [(C)VV]

The paradigmatic relationship between the proper name and the hypocoristic is represented by ≈.

The first problem stated above requires no separate stipulation because the restriction follows from the general prosodic principle in Japanese that words cannot begin with a moraic nasal or a geminate consonant.[8] The second problem regarding the left-to-right correspondence between the original name and the truncated form is guaranteed by the coindexing of k, which refers to the same set of moras that appear in both the proper name and its hypocoristic counterpart. The actual instantiations of the bimoraic portion are represented by the subschemas, [(C)VCV], [(C)VC], and [(C)VV]. This allows a given name to appear in more than one subschema. For instance, *Midori* can potentially have three hypocoristics: *mído-tyan, mít-tyan*, and *míi-tyan*.[9] As for the third problem, the variables *x* and *y*—*x* being null or a single consonant while *y* ranging from the zero to more segments—in the proper name noun construction allow for the phonological skipping of (8): the two moras in the hypocoristic do not have to be adjacent in the full name. This makes *ako-tyan* an acceptable hypocoristic of *Akiko*: (y) in the proper name schema corresponds to *ki* in *Akiko* while (x) is null, and (y) is skipped in the hypocoristic schema, surfacing as *ako-tyan*. An example in which the variable *x* is not null is the hypocoristic *oko-tyan* for the full name *Motoko* in (8): *oko-tyan* takes the subschema of [(C)VCV], without /m/ realized. (9) instantiates the case in which the second M in the proper name schema does not get realized in its hypocoristic form. When it happens,

[8]Possible exceptions exist but mostly in very casual speech. For instance, [nn] (in HL pitch) [nnn] [in LHL pitch] can be used for 'yes' and 'no' respectively; and *ppoi* 'like [X]' and *tte iu ka* 'or should I say', are considered elliptical, assuming that full nouns and statements precede the initial geminates.

[9]As Poser (1990) observes, these hypocoristics may have varying degrees of acceptability among different speakers.

the hypocoristic base takes the schema of [(C)VC] or [(C)VV]. In the [(C)VC] hypocoristic subschema, the second C is realized by the gemination of the /t/ in the suffix, as in *sat-tyan*; and in the [(C)VV] subschema, it surfaces as a lengthened vowel, as in *mii-tyan*.

4 Intensified Mimetic Adverbs

Mimetic words in Japanese present a rich system that is relevant to Construction Morphology, as is extensively discussed in Akita (2009). In this section we shall provide a Construction Morphology reanalysis of the intensified mimetic adverbs that Davis and Ueda (2002) discuss. The phenomenon serves as yet another instance that the Construction Morphology approach suitably captures word formation processes. Adverbs of the prosodic form CVCV-*ri*, such as *basa-ri* 'cut (something) with one slash', *huwa-ri* 'fluffily', and *yura-ri* 'swaying', consist of a mimetic base of two light syllables (CVCV) and the suffix *–ri*, and refer to 'quiet ending of the movement' (Hamano 1998: 106).[10] They are often followed by the quotative particle *–to* before modified verbs, as in *eda-o basa-ri to kiru* (branch-Acc *basari* quotative cut) 'cut a tree branch with one slash'.[11] A seemingly related form $C_1V_1C_0C_2V_2$-*ri*, which Kuroda (1979) in his original observation calls "intensified adverbs", is exemplified by *bassa-ri* and *hunwa-ri*, corresponding to the above-mentioned *basa-ri* and *huwa-ri*, respectively. As these examples illustrate, the epenthetic C_0 can be realized as a consonant that is identical to C_2 or as a moraic nasal /n/. Hamano (1998: 107) explains the role that the consonant C_0 plays as an intensifier, and goes on to say that "[s]emantically, the intensifier adds the sense of distinctiveness, emphasis, liveliness, or physical impact."

As Kuroda initially notes, however, intensified adverbs do not always show their matching $C_1V_1C_2V_2$-*ri* form.[12] For example, *kakki-ri* 'exactly', *yutta-ri* 'slowly', and *sinmi-ri* 'calmly' are existing adverbs, but we do not find *kaki-ri*, *yuta-ri*, and *simi-ri*, at least in their conventional use. Kuroda further states that in some cases where $C_1V_1C_0C_2V_2$-*ri* exists without its corresponding $C_1V_1C_2V_2$-*ri*, the reduplicated form of $C_1V_1C_2V_2$, i.e. $C_1V_1C_2V_2$-$C_1V_1C_2V_2$, may be found. Mimetic adverbs like *boya-boya* 'absently' and *haki-haki* 'crisply' correspond to *bonya-ri* and *hakki-ri* although *haki-ri* is not an existing form and perhaps *boya-ri* may not be as common as *bonya-ri* and *boya-boya*. On the other hand, Moriyama (2002) demonstrates in detail that there are dozens of mimetics of the $C_1V_1C_2C_2V_2$–

[10]Hamano (1998) further analyzes /r/ to "symbolize[s] smooth movement" while the vowel /i/ "seems epenthetic without any symbolic correlate" (p. 107). In Akita (2009) /-ri/ suffixed to a CVCV mimetic base where the second V is accented "connotes quietness" (p. 175).

[11]For the optionality of the quotative particle *–to*, see Akita and Usuki (2016) and Toratani (2006, 2017).

[12]The same observations are found in Tamori and Schourup (1999) and Moriyama (2002), among others.

ri pattern that do not find the corresponding $C_1V_1C_2V_2$ base or reduplicated $C_1V_1C_2V_2$-$C_1V_1C_2V_2$ counterpart (e.g. *doppuri, gašširi, gappori, nopperi, kukkiri*). That is, in terms of the formal characteristics, $C_1V_1C_0C_2V_2$-*ri* is independent of $C_1V_1C_2V_2$-*ri*, and the sense of intensification emerges solely from the augmented C_0 in the larger schema of $C_1V_1C_0C_2V_2$-*ri*. Below, we take the position that mimetics of the $C_1V_1C_0C_2V_2$-*ri* pattern do not necessarily have a paradigmatic relation to a possible CVCV base.

Following up on this observation regarding the lack of correspondence, Akita (2009) surveyed mimetic words of the $C_1V_1C_0C_2V_2$-*ri* pattern, focusing on the semantic property. He reports that 36.07% of them do not find their $C_1V_1C_2V_2$ match, and that this percentage is significantly greater compared with mimetics of other prosodic patterns, such as CVCV-CVCV and CVCVN, without a corresponding CVCV base. Drawing on this result, he concludes that the meaning of mimetics of the $C_1V_1C_0C_2V_2$-*ri* pattern cannot always be predicted from the meaning of a corresponding mimetic of the $C_1V_1C_2V_2$ pattern. To the extent that we understand it, he claims that the $C_1V_1C_0C_2V_2$-*ri* pattern is not clearly associated with any semantics. As a consequence, the precise meaning of a mimetic taking the $C_1V_1C_0C_2V_2$-*ri* pattern is unpredictable. In his own terms, "unpredictability is the main semantic property of the emphatic template" (p. 147), where his "emphatic template" refers to $C_1V_1C_0C_2V_2$-*ri*. Such an independent morphological status of $C_1V_1C_0C_2V_2$-*ri* notwithstanding, we do not agree with the assumption underlying Akita's conclusion that intensified or emphatic meanings should necessarily have semantic counterparts with non-intensified or non-emphatic states. For example, the English verb *shatter* as in *Tracy shattered the vase* and the adjective *excellent* inherently have an intensified meaning without implying the presence of an unintensified base. A parallel situation is found in the Arabic comparative we discuss in Davis and Tsujimura (2018). The Egyptian Arabic equivalent of 'more polite' ([azwa?]), for one, does not have an independent adjectival morphological form to mean 'polite'. As we have quoted earlier, the general semantic role of the augmented consonant C_0 is characterized by Hamano (1998: 107) as "the sense of distinctiveness, emphasis, liveliness, or physical impact." The manner in which intensified mimetic adverbs receive their precise interpretations seems "unpredictable", as Akita argues, but we agree with Hamano that the general nuance of what the intensifying function is meant to highlight is nonetheless present as an abstract meaning property. We further believe that this interpretation is consistent with what Kuroda (1979) originally intended to capture. It is this abstract nature of the semantic role that we consider here as attributable to the morphological $C_1V_1C_0C_2V_2$-*ri* schema itself.

To see a more comprehensive picture of intensified adverbs, we give existing samples in (12–14). For the sake of clear exposition, we add on the left the apparent $C_1V_1C_2V_2$ base forms that correspond to the intensified adverbs of the $C_1V_1C_0C_2V_2$-*ri* pattern although we maintain the claim that the two patterns have no derivational relation.

(12) a. kote kotte-ri ‘densely’
b. huku hukku-ri ‘lump, puffy’
c. koso kosso-ri ‘stealthily’
d. kiči kičči-ri ‘tightly’

(13) a. šobo šombo-ri ‘sadly’
b. koga koŋga-ri ‘brown’
c. boya boñya-ri ‘absently’
d. yawa yanwa-ri ‘gently’
e. gena genna-ri ‘fed up’
f. šimi šimmi-ri ‘calmly’

(14) a. fura furaa-ri ‘swaying’
b. yoro yoroo-ri ‘unsteadily’
c. nuru nuruu-ri ‘slimy’
d. tara taraa-ri ‘dripping’

The phonological realization of C_0 is either a geminate consonant or a moraic nasal, as briefly described earlier and demonstrated further in (12) and (13). These two situations are phonologically conditioned. If C_2 is voiceless, as in (12), it is realized as a geminate consonant. If C_2 is voiced (but not /r/), a homorganic coda (or moraic) nasal surfaces, as in (13). (14) demonstrates a situation that is somewhat different from (12) and (13), and yet it is also phonologically conditioned. In these base patterns, C_2 is invariably /r/ and cannot be geminated following a general principle of Japanese phonology, avoiding the pattern of (12). Nor is /r/ in mimetics prone to appear immediately after coda nasal. As Davis and Ueda (2002) note, Mester and Ito (1989) and Hamano (1998) suggest that there is an intriguing connection between the lack of nasal insertion before /r/ and the observation that /r/ fails to palatalize in the mimetic vocabulary of Japanese. These phenomena argue for /r/ being a placeless consonant at least with respect to the Japanese mimetic stratum. Consequently, the coda nasal cannot be assimilated to the place of articulation of the following /r/, preventing it from taking the pattern of (13). Instead of C_0 having a phonological exponent, then, V_2 becomes lengthened, giving rise to a somewhat different templatic pattern of $C_1V_1rV_2V_2$-*ri*. Davis and Ueda (2002) generalize all three instances of segment insertion into a case of mora augmentation since each of a geminate consonant, a coda nasal, and a lengthened vowel constitutes an instantiation of mora in Japanese.[13] Following Davis and Ueda, we can posit that the schema for the intensified mimetic adverbs consists of a $C_1V_1C_2V_2$-*ri* along with a floating mora. Specifically, the generalized schema can be expressed as $C_1V_1C_2V_2$-*ri* M, where M is a floating mora. It is purely the phonology (e.g. the constraint ranking from an optimality-theoretic perspective) that determines

[13]The concept of mora augmentation may be originated from Kuroda (1979), who called C_0 “a mora consonant.”

whether the floating mora is realized as a geminate (12), coda nasal (13), or vowel lengthening (14).

In addition to the schema that represents the formal characteristic, intensified adverbs exhibit a unique accentuation pattern: accent consistently falls on the mora immediately preceding the suffix *–ri*. (15) and (16) provide prosodic representations including the accent placement (V' indicates accent on that V) with a few examples of each pattern.

(15) $C_1V_1C_0C_2V_2$'-*ri*
kotté-ri (=12a)
hukkú-ri (=12b)
šombó-ri (=13a)
koŋgá-ri (=13b)

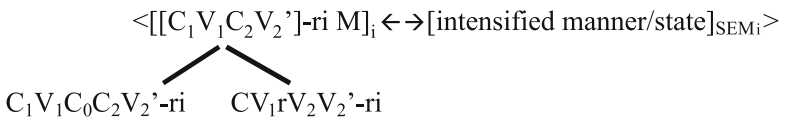
(16) $C_1V_1rV_2V_2$'-*ri*
huraá-ri (=14a)
yoroó-ri (=14b)

Hamano (1998: 34–35) observes that this accentuation pattern is somewhat surprising given that other adverbial mimetics take accent on heavy syllables, i.e. CVC or CVV. For instance, *páppa* (CV'CCV) and *píičiku* (CV'VCVCV) have their accents on the first moras as they each form a heavy syllable, following the general pattern typical of mimetic adverbs. In contrast, intensified adverbs in (15) do not fall under this generalization: the first syllable ($C_1V_1C_0$) is heavy but the accent is placed on the second (light) syllable (C_2V_2'). In (16), although the accent is on the heavy (i.e. second) syllable (rV_2 V_2'), it is on the second mora of that syllable rather than the first. We note that this departs from the general pattern which would place the accent on the first mora of the heavy syllable (CV'C or CV'V), as is demonstrated, for instance, by *píičiku*, which has its accent on the first mora of /pii/. The accentuation property of intensified adverbs may be ultimately attributed to the suffix *–ri*, as it seems to always attract the accent onto the stem-final mora, but nevertheless, since *–ri* is an integral part of these subschemas, we claim that the prosodic property belongs to the construction.

The output of the mora augmentation should result in either $C_1V_1C_0C_2V_2$'-*ri* or $CV_1rV_2V_2$'-*ri* with the specific accent placement on the mora immediately before *-ri*, and both of these prosodic representations are linked to the semantic function of intensification. The augmented mora in and of itself cannot be considered an exponent of the intensification meaning, because there is no inherent connection to an intensifying function for a vowel, coda nasal, or geminate consonant. They are simply exponents of a construction, but in accordance with the phonetic and phonological conditioning of the language. Nor can the suffix *–ri* be assigned the intensifier role, particularly in light of the fact that non-intensified adverbs such as *basa-ri* '(cut something) with one slash', *huwa-ri* 'fluffily', and *yura-ri* 'swaying' are also suffixed by *–ri*. This firmly suggests that the forms $C_1V_1C_0C_2V_2$-*ri* or $CV_1rV_2V_2$-*ri*, by virtue of having these specific prosodic shapes, give rise to their

role as intensified adverbs. Such connection between the prosodic form and the accompanying interpretation reside in the construction itself, as a holistic property. This is captured by the form-meaning pairing of the morphological construction below that includes the subschemas.

(17) Intensified mimetic adverb construction



The floating mora M is realized in one of the two subschemas. The subschema of $C_1V_1C_0C_2V_2$'-*ri* can emerge with C_0 as a geminate when C_2 is a voiceless consonant, as in *kotte-ri*, and as coda nasal when C_2 is a voiced (non-rhotic) consonant, as in *šombo-ri*. The second subschema of $CV_1rV_2V_2$'-ri is realized when C_2 is a rhotic consonant /r/, as in *furaa-ri*.

5 Innovative Prenominal Noun Modifiers

Our last example involves inflectional morphology that pertains to an innovative variant that can be more adequately accommodated in Construction Morphology. The parts of speech category that has been labelled as adjectival noun or nominal adjective exhibits a set of interesting properties. First, this lexical category shares a semantic property with adjectives. For instance, adjectival nouns such as *benri* 'convenient', *kirei* 'pretty', and *rikoo* 'clever' describe attributes of entities, and the semantic property is parallel to that of adjectives such as *ooki-* 'big' and *taka-* 'expensive'. Second, adjectival nouns as predicates pattern with nouns such as *sushi* 'sushi' as in (18b), but not with adjectives as in (18c), in their inflectional paradigm.

(18)

	a. *adjectival nouns*	b. *nouns*	c. *adjectives*
Present	benri-da	sushi-da	ooki-i
Past	benri-datta	sushi-datta	ooki-katta
Neg. pres.	benri-ja nai	sushi-ja nai	ooki-ku nai
Neg. past	benri-ja nakatta	sushi-ja nakatta	ooki-ku nakatta

Third, these words exhibit an independent morphosyntactic characteristic that does not follow from the categorial status as nouns or as adjectives. When serving as prenominal modifiers, they take the suffix *–na*, as in (19a). This departs from the standard pattern of the genitive case particle *–no*, expected of nouns, as in (19b); and, it is also different from the inflectional pattern of *–i*, expected of adjectives as in (19c) (Uehara 1998; Iwasaki 2002; Tsujimura 2014).

(19) a. *adjectival nouns*
benri-**na** hako
convenient-NA box
'a convenient box'

b. *nouns*
sushi-**no** hako
sushi-Gen box
'a box for sushi'

c. *adjectives*
ooki-**i** hako
big box
'a big box'

As Uehara (1998) discusses at length, some lexical items show an ambiguous behavior in their prenominal modification between the adjectival noun pattern and the noun pattern. This is exemplified by *heiwa* 'peace' in (20), modified from Uehara (1998: 121).

(20) a. heiwa-na kuni
peace-NA country
'a peaceful country'

b. heiwa-no shisha
peace-Gen messenger
'a messenger of peace'

Other words that display this ambiguous behavior include *kenkoo* 'health' and *wazuka* 'a little'. In all instances, the ambiguous prenominal modification patterns are widely attested. Uehara claims that the difference between the two types in (20) is semantic, and that "...*na* imposes a property profile and *no* imposes a thing profile on the denotation of lexical element" (p. 122). Using a construction schema, he claims that [...+ *na*] represents a phonological form that is paired with the meaning of 'property' (p. 125). While previous morphological analyses (e.g. Kageyama 1982; Miyagawa 1987) relied on the category of adjectival noun as its inherently given property, Uehara's construction treatment does not make reference to its categorial status as an inherent property, allowing for some degree of flexibility in the morphological and semantic nature of the element that precedes *na/no*. His analysis implies that any noun in the schema of [...+ *na*] could receive the property interpretation. The example in (20) serves as one such instance. Furthermore, Uehara provides interesting cases of "entrenched coercions" as in (21) (p. 129) whereby the construction imposes a certain interpretation on the noun that occurs with *na*.[14]

[14] See Audring and Booij (2016) for the role of coercion effects in Construction Morphology.

(21) a. yakuza no shoobai → yakuza na shoobai
gangster Gen business gangster NA business
'business owned by gangsters' 'dishonest, worthless business'

b. gesu no kangae → gesu na kangae
lower-class people Gen idea lower-class people NA idea
'lower-class people's idea' 'a vulgar thought'

c. aji no koto → aji na koto
flavor Gen matter flavor NA matter
'matter regarding flavor' 'piquant [impressive/witty] things'

In the examples on the right of the arrow, the nouns *yakuza* 'gangster', *gesu* 'lower-class people', and *aji* 'flavor' before *na* do not necessarily refer to the properties that are attributable to the nouns, as is most clearly indicated by (21c). There is a degree of semantic bleaching compared to the meaning of *aji* in isolation: a property interpretation is imposed on the noun *aji*, i.e. coerced, to the extent that a unique meaning is entrenched in this particular construction.

Uehara's construction analysis of X-*na* has a further implication for the extended form-meaning-usage complex that seems to be developing in recent years. As Takahashi (2009) discusses, when X is a full-fledged noun including proper names, such as *Oosaka-na hito* (Osaka-*na* person) and *nyuusu-na kotoba* (news-*na* word), the first noun provides an attributive property in describing the second noun, just as an attributive adjective does; but the nature of the attributive property may or may not be directly ascribed to the denotation of the first noun. Instead, the modifying noun is often assigned contextually determined interpretations that can vary depending on the range of mutual knowledge that interlocutors have. Furthermore, specific interpretations also rely on particular situations in which these phrases occur, and as such they are subject to a variety of readings. The first noun in this construction can in principle be given an infinite number of interpretations. This is reminiscent of the description of Clark and Clark's (1979) "contextuals", which has been claimed to be an important characteristic of the innovative verb construction discussed in Sect. 2. In addition, what separates these instances of the N-*na* N construction from more conventionalized examples, including those entrenched coercion cases in (21) above, is that the innovative use has been increasingly common in magazine titles and headings in a wide range of social media. Growing productivity, thus, supports the construction approach to the N-*na* N pattern in a broader sense than what Uehara (1998) originally proposed.

While the nature of the prenominal modifying noun (i.e. the first N of the construction) does not seem to be limited to any particular type, some of the nouns that appear in the scheme more frequently include *wain* 'wine', *suiitsu* 'sweets', *okashi* 'sweets', *otona* 'adult', and *showa* 'Showa (era)'. Examples of these nouns are given in (22).

(22) a. Wain-na resutoran-o sagasoo. [magazine heading]
wain-NA restaurant-Acc let's search
'Let's search for a wine restaurant.'

wain-na hibi/nichijoo/jikan/hitotoki/kibun/yoru [blog]
wain-NA days/every day/time/brief moment/mood/evening

b. suiitsu-na jikan [online advertisement]
sweets-NA time

okashi-na jinsei [title of a book (food memoir and recipes)]
sweets-NA life

okashi-na jikan [name of the TV program in which pastry shops
sweets-NA time are introduced]

c. otona-na pinku [online advertisement of a fashion magazine]
adult-NA pink

Otona-na machi-o burari. [online travel magazine)
adult-NA town-in leisurely visit

d. Shoowa-na huniki-no kissaten-ga sukidesu. [TV interview]
Showa-NA atmosphere-Gen café-Nom like
'I like cafés with a Showa atmosphere.'

Kanda-no shoowa-na ikkaku-ni Oomiya-yoogashiten-wa aru.
[essay in magazine]
Kanda-Gen showa-NA corner-at Omiya pastry shop-Top exist
'Omiya Pastry Shop is located at the Showa corner in Kanda.'

In each occurrence of N-*na* N in (22), the first N picks out some property in relation to the noun's denotation, but crucially, its specific interpretation within the N-*na* N form goes beyond that, leaving much room for creative, contextualized readings that can be reached based on subjective experiences according to a particular time and space. For example, *wain-na resutoran* 'wine restaurant' in (22a) does not refer simply to restaurants that serve wines but it may additionally suggest that the targeted restaurants are relatively expensive with elegant décor. *Suiitsu-na jikan* in (22b) was found in the internet advertisement for a boutique pastry shop at a luxury hotel in Tokyo, and similar phrases in (22b) are amply attested. The loanword *suiito* 'sweet' has been more or less conventionalized as a *na*-taking adjectival noun, as in *suiito-na tabemono* (sweet-NA food) and *suiito-na ongaku* (sweet-NA music). Its plural form, *suiitsu*, is used as a noun to refer to (Western-style) cakes and pastries. In the headline of the advertisement, *suiitsu-na jikan* does not mean just the time when one eats a piece of cake; rather, it refers to

the time and the manner in which individuals, especially females, spend a leisurely afternoon tasting fancy-looking pastries at an elegant bakery or a café. Where we normally expect to see the more conventional pattern of *suiitsu-no jikan* with a rather expected meaning, *suiitsu-na jikan* in its apparently non-conventional marked form of inflectional mismatch would allow potential consumers to experience the subjective imagination that is evoked by sweets.

In addition to the examples in (22c), we find phrases like *otona-na taioo* (adult-NA response) that occurs in opposition to *kodomo-na taido* (child-NA attitude): both modifying nouns, *otona* 'adult' and *kodomo* 'child', are interpreted using the "property" analysis of Uehara: the modifying noun, *otona*, refers to the type of response that is expected of an adult, namely, a mature response, whereas *kodomo* contrastively implies the opposite attitude typical of children, i.e. an immature, childish attitude. In fact, one of the dictionary definitions of *otona* 'adult' refers to mature demeanor as is expected of adults. The examples in (22c), however, seem to have even more nuanced interpretations to fit the precise context. In the fashion advertisement in which *(atarashii) otona-na pinku* '(new) adult pink' appears, *otona-na pinku* is further elaborated on and referred to as *kawaii-dake-ja nai "otona-no pinku"*, which can be translated into "the 'adults' pink' that is not just cute". Note that the paraphrase has the standard prenominal pattern of nouns with the Genitive case *-no*, *otona-no* 'adult-GEN'. This suggests that the shade of pink that is described as *otona-na* has a more chic tone than what the color pink typically strikes us to be.[15]

The Showa era (1926–1989) brings back numerous memories, positive and negative, especially to a number of baby-boomers. The attribute underlying *shoowa-na* in (22d) does not refer to what existed in the era, which *shoowa-no* would, but instead, *shoowa-na* makes available various dimensions as to what the Showa era means—or could mean—and that language users can extend. For instance, *shoowa-na ikkaku* in the second example of (22d) may remind some of the speakers of the historical period by the old building structure of the neighboring houses or by the size and spacing of the buildings. Preceding this phrase, however, is the additional description of the neighborhood where there remains a soba noodle shop whose business has been passed down for generations and a restaurant that specializes in

[15]In a similar vein, the second example in (22c), *otona-na machi*, has a narrow interpretation: it refers to Ginza as a shopping area filled with exclusive, high-end stores. The "property" reading of *otona* 'adult' in this case seems quite stretched from the conventional denotation of the noun *otona*, but the exact nature of the connection between an aspect of *otona* in the context of Ginza as a shopping site is left up to language users to determine. That is, such flexibility and subjectivity of interpretations of the prenominal N modifiers is part of the N-*na* N construction that distinguishes it from the N-*no* N pattern.

chicken sukiyaki. In this particular context, restaurants of long establishments and those of rare specialty cuisine capture the corner in Kanda to be symbolic of the historical epoch.[16]

The ways in which N-*na* is interpreted has been likened to Clark and Clark's "contextuals" earlier. This is because the exact nature of the interpretations of the attributive nouns in the N-*na* N of the examples that we have been discussing takes contextually rich paths to creative interpretations that are often based on individuals' subjective experiences. The question of whether participants of a conversation share the same amount of relevant information could largely determine whether the intended message is successfully communicated. On the creative side of this continuum are the examples in (23) whose interpretations call for far richer contextual information than standard property meanings based on the fixed denotations of the nouns.

(23) a. hogei-e karee-na ooen [Asahi Newspaper]
whale-catching-toward curry-NA support

b. jazu-na hito
jazz-NA person

(23a) is a headline that appeared in the newspaper Asahi, but its explanation in the text indicates that it is not exactly a property ascribed to curry that directly describes the support for whale catching, as one might expect. The article, instead, elaborates that there have been movements that endorse the whale-catching industry by promoting curry and fried food that uses whale meat as ingredients. Without this explanation, the headline would leave the reader in the dark as to how any characteristic quality of curry has anything to do with whale catching.

Example (23b), as it was used by the entertainer Tamori, involves an even more meandering way of describing a person by making a connection with jazz. In an interview posted on the internet (http://littleboy.hatenablog.com/entry/2015/08/21/120007), Tamori had been known to use *jazu-na hito* as a superior praise for someone, but the meaning of the phrase was not transparent to those who heard him use it. Tamori then explained that there is no music called jazz; there are *jazu-na hito*, and when these people play music, that music becomes jazz. He goes on to say that a *jazu-na hito* does not desire for improvement, but lives richly and intensely for the moment, while those who desire to improve today live for tomorrow. A *jazu-na hito* is *jazu-na* even without jazz. This exchange lucidly distinguishes between *jazu-NA hito* and *jazu-NO hito* in that the meaning of the former does not make much, if at all, reference to any property of jazz as most of us know it, namely, as a music genre. Importantly, Tamori's interpretation of *jazu-na* is based on his internalized and personal image from which a connection to jazz emerges, not vice versa, and

[16]Other examples like those in (22) include *suupaa-hiiroo-na sekai* (super-hero-*na* world), *toogarashi-na aitsu* (red pepper-*na* guy), and *enka-na aitsu* (enka [traditional-style Japanese popular songs]-*na* guy), among others, each of which calls for a specific interpretation that is appropriate for a particular context and situation, although it is possible to assign a more general "property" interpretation.

as such it is not immediately transparent to other language users without his own elaboration on how he construes the word. Once explained, the participants of the interview get to share—and seem to agree with—Tamori's perspective in this almost unique context.

While, as Uehara (1998) analyzes, the construction of N-*na* N imposes the "property" interpretation on the first noun as an underlying concept, the innovative use of the same construction that extends its application to the commercial world and other venues with similar communicational purposes exhibits a far less transparent meaning than what the noun's fixed denotation points to. Based on the detailed descriptions above of how exactly the "property" interpretation is reached, it should be clear that the often narrowly identified property reading does not come directly from the fixed denotation of the noun, where the noun can be recognized as purely denotational in Clark and Clark's terms. Instead, it comes from "a shifting sense and denotation" that is showcased by the noun that serves as a contextual. Crucially, a wide range of unconventional interpretations of a noun as an instance of contextuals emerges when it appears in one of the patterns representing the inflectional paradigm for adjectival nouns, namely, X-*na* N.

The socio-pragmatic function of drawing potential consumers' attention arguably stems from the unexpected juxtaposition of *–na* with nouns whose inflectional pattern calls for the genitive case particle *–no* instead of *–na* in this morphosyntactic configuration. The seeming mismatch, however, is mitigated as a novel use of the sequence by viewing the N-*na* N pattern as a construction in which its form and meaning are a paired property. The potentially free range of interpretation whose specific nature can largely be determined by context and the shared knowledge of the interlocutors in particular situations (especially in commercially rich contexts) cannot be predicted by each of the components that comprise the construction. As we have repeatedly noted, even the (fixed) denotations of nouns could face a challenging distance from an intended property reading, which may not be arrived at without considering the extra-linguistic context, as has been demonstrated in the range of examples above. Thus, the interpretation of the modifying noun and the social effect of the form on the language user's mind are tightly linked to this construction. The form with the inflectional suffix *–na*, which enters into the inflectional paradigm of the adjectival noun category, constitutes an integral part of the construction, leading to a property interpretation for a prenominal modification pattern built around contextual nouns.

In (24) we represent the construction schema that lays out the formal and semantic properties of the N-*na* N construction.

(24) N-*na* N construction

$<[[[x]_{Ni}\text{-no}]_N\ [y]_{Nj}]_{Nk} \leftrightarrow [SEM_j$ with relation R to $SEM_i]_{SEMk}> \approx$

$<[[[x]_{Ni}\text{-na}]_{AN}\ [y]_{Nj}]_{Np} \leftrightarrow [SEM_j$ with contextually determined property that profiles some aspect of $SEM_i]_{SEMp}>$

N-*no* N and N-*na* N are in a paradigmatic relation. In the N-*na* N construction schema, the category of the first noun is identified as adjectival noun (AN) due to its inflectional marking *–na*. Its categorial identification of adjectival noun imposes

the general property meaning. As we have elaborated on the examples above, the specific interpretation of the now adjectival noun is far narrower and more nuanced by contextual information particular to the situation. Such contextually determined meaning of the adjectival noun is the semantic and pragmatic property that is imposed by the construction. This is compatible with a type of coercion that Audring and Booij (2016) refer to by the term "override" based on Michaelis (2003). In "override" the construction acts as a strong force on an individual word so as to modify the interpretation of the coerced item. Such a contextually determined overridden meaning is the heart of the semantic property imposed by the construction.

6 Conclusion

In this article we have discussed four types of morphological phenomena in Japanese: the formation of innovative verbs, truncated hypocoristic formations, intensified mimetic adverbs, and innovative prenominal noun modifiers. It is difficult to ascribe their formal and semantic characteristics to general grammatical principles recognized in the language; nor are the formal and semantic (including the pragmatic aspect) properties explained independently of each other. As such, these morphological phenomena have been demonstrated to be best captured within the model of Construction Morphology.

In discussing these language-specific instantiations of Construction Morphology, we wish to emphasize several points. First, in innovative verbs, truncated hypocoristics, and intensified mimetic adverbs, accent is located uniformly within each construction. The accentuation property, being specific to a construction, is not predictable by general phonological rules or by default considerations. As such, it can only be dealt with by an output-based schema. Second, several of the constructions make use of paradigmatic relations and subschemas in a way similar to that developed in Booij (2010) and Booij and Audring (2017). These technical formalisms provide methodological tools relevant to descriptive and explanatory levels of analysis. Finally, the innovative pre-nominal modifier construction exemplifies the "override" mechanism discussed in Audring and Booij (2016) as a crucial concept that highlights form and meaning jointly comprising a single construction. Put together, our discussion of these morphological constructions in Japanese illuminates the conceptual and technical advantages that Construction Morphology can bring to the type of phenomena that present challenges to derivation-based theories.

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References

Akita, K. 2009. A grammar of sound-symbolic words in Japanese: Theoretical approaches to iconic and lexical properties of mimetics. Ph.D. dissertation, Kobe University.

Akita, K., and T. Usuki. 2016. A constructional account of the 'optional' quotative marking on Japanese mimetics. *Journal of Linguistics* 52: 245–275.

Aronoff, M. 1976. *Word formation and generative grammar*. Cambridge, MA: MIT Press.

———. 1980. Contextuals. *Language* 56: 744–758.

Audring, J., and G. Booij. 2016. Cooperation and coercion. *Linguistics* 54: 617–637.

Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O. Pfeiffer, and F. Rainer, 109–132. Amsterdam: John Benjamins.

———. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 34–44. Somerville: Cascadilla Press.

———. 2009a. Constructions and lexical units: An analysis of Dutch numerals. *Linguistische Berichte.* Sonderheft 19: 1–14.

———. 2009b. Compounding and construction morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

Booij, G., and J. Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41 (S2): 277–302.

Clark, E., and H. Clark. 1979. When nouns surface as verbs. *Language* 55: 767–811.

Croft, W. 2001. *Radical construction grammar*. Oxford: Oxford University Press.

Davis, S., and N. Tsujimura. 2018. Arabic nonconcatenative morphology in construction morphology. In *The construction of words, Advances in construction morphology*, 315–339. Cham: Springer.

Davis, S., and I. Ueda. 2002. Mora augmentation processes in Japanese. *Journal of Japanese Linguistics* 18: 1–23.

Grice, H.P. 1975. Logic and conversation. In *Syntax and semantics III: Speech act*, ed. P. Cole and J.L. Morgan, 41–58. New York: Academic Press.

Hamano, S. 1998. *The sound-symbolic system of Japanese*. Stanford/Tokyo: CSLI Publications/Kurosio Publishers.

Ito, J. 1990. Prosodic minimality in Japanese. *Chicago Linguistic Society* 26: 213–239.

Iwasaki, S. 2002. *Japanese*. Amsterdam: John Benjamins.

Kageyama, T. 1982. Word formation in Japanese. *Lingua* 57: 215–258.

Kamei, H. 2003. *Wakamonokotobajiten.* [Dictionary of youth language] Tokyo: Nihon Hoosoo Shuppan Kyookai.

Kato, C. 2005. *Wakamonokotobajiten.* [Dictionary of youth language] Nagoya: Chuubu Nihon Kyooiku Bunkakai.

Koyano, T. 1993. *Joshidaisei yoogo no kiso chishiki* [Basic knowledge of female college students' vocabulary] Osaka: Osaka University of Foreign Studies.

Kubozono, H. 1999. Mora and syllable. In *The handbook of Japanese linguistics*, ed. N. Tsujimura, 31–61. Oxford: Blackwell.

Kuroda, S.-Y. 1979. *Generative grammatical studies in the Japanese language*. New York: Garland Publishing.

Mester, A., and J. Ito. 1989. Feature predictability and underspecification: Palatal prosody in Japanese mimetics. *Language* 65: 258–293.

Michaelis, L. 2003. Word meaning, sentence meaning and construction meaning. In *Cognitive perspectives on lexical semantics*, ed. H. Cuyckens, R. Dirven, and J. Taylor, 163–210. Amsterdam: Benjamins.

Michaelis, L., and K. Lambrecht. 1996. Toward a construction-based theory of language functions: The case of nominal extraposition. *Language* 72: 215–247.

Miyagawa, S. 1987. Lexical categories in Japanese. *Lingua* 81: 29–51.
Moriyama, K. 2002. "CVQCVri"-gata no onomatope. [On mimetics of the "CVQCV*ri*"-pattern] *Journal of International Student Center* 10: 53–71. Nagasaki University.
Poser, W.J. 1990. Evidence for foot structure in Japanese. *Language* 66: 78–105.
Takahashi, K. 2009. The noun-na noun construction as a marker of communality and interpersonal engagement. Paper presented at the 19th Japanese/Korean linguistics conference. University of Hawai'i at Manoa.
Tamori, I., and L. Schourup. 1999. *Onomatope: Keitai to imi*. [Onomatopoeia: Form and meaning]. Tokyo: Kurosio Publishers.
Toratani, K. 2006. On the optionality of *to*-marking on reduplicated mimetics in Japanese. In *Japanese/Korean Linguistics*, vol. 14, 415–422. Stanford: CSLI Publications.
———. 2017. The position of to/Ø-marked mimetics in Japanese sentence structure. In *The grammar of Japanese mimetics: Perspectives from structure, acquisition, and translation*, ed. N. Iwasaki, P. Sells, and K. Akita, 35–72. London: Routledge.
Tsujimura, N. 2010. On the pattern of innovative verbs. Paper presented at the workshop on the lexicon. The National Institute for Japanese Language and Linguistics, Tokyo.
———. 2014. *An introduction to Japanese linguistics*. 3rd ed. Oxford: Wiley Blackwell.
Tsujimura, N., and S. Davis. 2008a. A construction approach to innovative verbs in Japanese. Paper presented at the 5th international conference on construction grammar. University of Texas at Austin.
———. 2008b. Innovative morphology: A case of verbal conjugation in Japanese. Paper presented at the 6th international conference on practical linguistics of Japanese. San Francisco State University.
———. 2010. Japanese innovative verbs as a morphological construction. Paper presented at the 14th International Morphology Meeting. Budapest.
———. 2011. A construction approach to innovative verbs in Japanese. *Cognitive Linguistics* 22: 797–823.
Uehara, S. 1998. *Syntactic categories in Japanese: A cognitive and typological introduction*. Tokyo: Kurosio Publishers.
Vance, T. 2008. *The sounds of Japanese*. Cambridge: Cambridge University Press.
Yamaguchi, N. 2007. *Wakamonokotoba ni mimi o sumaseba*. [If you listen to youth language] Tokyo: Kodansha.
Yonekawa, A. 1989. *Shingo to ryuukoogo* [New words and trendy words] Tokyo: Nanundo.

The *Hulle* and *Goed* Constructions in Afrikaans

Gerhard B. van Huyssteen

Abstract Over the past more than 100 years, Afrikaans associative plural constructions – especially constructions with *hulle* ('they') and *goed* ('things/stuff; good') as right-hand components – have been studied from both diachronic and synchronic perspectives, but with the main interest in their origins, and what they could tell us about the genesis of Afrikaans. One school of thought claims that they both have Germanic roots, while the other school maintains that both are creole constructions. No definitive conclusions have been reached. Moreover, there is no consensus on whether these constructions should be regarded as noun phrases, compounds, or derived words. The most recent synchronic description of the *hulle* construction was published in 1969, and the last synchronic description of the *goed* construction in 1989. In the absence of corpus data, unsubstantiated claims about these constructions abound in the literature. This article presents a synchronic, corpus-based, constructionist description of these two Afrikaans constructions. They are characterised as hybrid constructions on a scale between compounds and derivations, while some remarks on their productivity are made. Based on detailed analyses of their right- and left-hand components, the article concludes with a categorisation network of the schemas and subschemas of these constructions.

Keywords Afrikaans · Associative plural · Cognitive grammar · Construction morphology · Compounding

1 Introduction

Afrikaans is generally categorised typologically as a West Germanic, Low Franconian language, originating from seventeenth century colloquial Dutch. Regarding its genesis, two main schools of thought persist: those that claim that Afrikaans can

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be traced back mainly to seventeenth century varieties of Dutch (the Germanists), and those that claim that pidgins or creoles once spoken in the Cape Colony later developed into Afrikaans and its dialects (the Creolists) (De Kleine 1997). Following from this, Den Besten (1989: 239) proposes a convergence model: "... two types of Dutch, European and Pidgin Dutch, gradually coalesced to yield Afrikaans and its dialects", with the bases for Pidgin Dutch mainly Khoekhoe, Creole Portuguese and Pasar Malay.

Associative plural (APL) constructions (Daniel and Moravcsik 2013; Moravcsik 2003) in Afrikaans regularly feature in the debates between the Germanists and Creolists. High-level schemas for, plus prototypical examples of the two Afrikaans APL constructions and two related coordinate constructions found in the literature (Kempen 1969) are presented in (1) to (4); the generic semantic interpretation of Daniel and Moravcsik (2013) is used here as a point of departure.[1]

(1) **Schema 1: *hulle* construction (APL)**
$[[x]_{Ni}$-*hulle*$_{PN.3PL}]_{N.APLj} \leftrightarrow [SEM_i$ AND OTHER PEOPLE ASSOCIATED WITH $SEM_i]_j$
pa-hulle
dad-they
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

(2) **Schema 2: *goed*$_1$ construction (APL)**
$[[x]_{Ni}$ (-)*goed*$_{PN.INDF.PL}]_{N.APLj} \leftrightarrow [SEM_i$ AND OTHER PEOPLE ASSOCIATED WITH $SEM_i]_j$
pa-goed (or *pa·goed*)
dad-they (or dad·they)
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

(3) **Schema 3: *x en hulle* construction (coordinate)**
$[[x]_{Ni}$ *en*$_{CNJ}$ *hulle*$_{PN.3PL}]_{NP.COORDj} \leftrightarrow [SEM_i$ AND OTHER PEOPLE ASSOCIATED WITH $SEM_i]_j$
pa en hulle
dad and they
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

(4) **Schema 4: *x en dié* construction (coordinate)**
$[[x]_{Ni}$ *en*$_{CNJ}$ *dié*$_{PN.DEM}]_{NP.CCOORDj} \leftrightarrow [SEM_i$ AND OTHER PEOPLE ASSOCIATED WITH $SEM_i]_j$
pa en dié
dad and these
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

[1]Standard abbreviations and conventions of the Leipzig glossing rules are used. Morpheme boundaries are demarcated with a central dot (following Bauer 2003), although the hyphen is also used sometimes in glosses to mark morpheme boundaries (e.g. *pa-hulle* 'dad-3PL').

Regarding Schema 2 (henceforth the $goed_1$ construction), we need to distinguish two other, non-APL constructions with *goed*, viz. the $goed_2$ and $goed_3$ constructions:

(5) **Schema 5: $goed_2$ construction**
[[x]$_{Ni}$*goed*$_{ADJ}$]$_{Nj}$ ↔ [SEM$_i$WHO IS IMPORTANT/DEAR TO ME]$_j$
pa·goed
dad·good
'my dear/good dad'

(6) **Schema 6: $goed_3$ construction**
[[x]$_{Ni}$*goed*$_{N.MASS}$]$_{Nj}$ ↔ [THINGS/STUFF RELATED TO SEM$_i$]$_j$
kooi·goed
bed·things or bed·stuff
'bedding (like sheets, duvets, etc.)'

In its general usage:

– *hulle* functions as a third-person plural pronoun that can be translated with 'they' (as subject), or 'them' (as object) (glossed with 3PL);
– *goed* functions as:
  (a) an indefinite plural pronoun (Ponelis 1979: 103, but elsewhere also referred to as a pronominal), translated with 'things' or 'stuff' (glossed with APL);
  (b) a mass noun, translated and glossed mostly with 'things', but also sometimes 'stuff'; or
  (c) an adjective, translated and glossed with 'good'.

To illustrate just one of the complexities regarding these constructions, a brief introductory note on $goed_2$ is in order. The $goed_2$ construction is used to refer hypocoristically or emphatically to referent [x], and has a singular interpretation (unlike the $goed_1$ construction). Compare the example in (7) about a legend that was retold from one female to the next in the lineage of the family; note the anaphoric usage of *sy* ('she.3SG') with the antecedent *ouma·goed*, clearly signaling a singular interpretation of the antecedent.

(7) *Ek het dit die eerste by my ouma·goed ge·hoor, en* ***sy*** *het ge·sê dit kom van háár ouma·goed* (Lombard 2014) [2]
I have it the first from my grandma·good PST·hear, and **she** have PST·say it come from her grandma·good
'I have heard it first from my dear grandma, and **she** said that it came from her dear grandma'

In this regard, Den Besten (2001: 52) states: "I do not regard the hypocoristic use of *-goed* … as being part of the associative phenomenon … This usage

[2] In the remainder of this article, all examples are from the VivA (2017) corpus collection, unless stated otherwise (as in this case).

probably came about through secondary reinterpretation of the associative *-goed* on the basis of Afr. [adjective] *goed* 'good' …". Van Rensburg (p.c.), who was the project leader of a large-scale project that described Orange River Afrikaans (the geolect of Afrikaans that originates from speakers of Cape Khoekhoe and Nama, and which is today used mainly in its spoken form), additionally states that the $goed_2$ construction is not only used hypocoristically, but also (and especially) reverently. He mentions the case of *kaptein·goed* ('captain·good'), which is used to refer to, or even to address the leader of a socio-economic group. In the remainder of this chapter, I will assume that these two studies on the genesis of Afrikaans are correct, and will not regard $goed_2$ synchronically as an APL construction.

Over the past more than 100 years, these constructions have been studied[3] from both diachronic and synchronic perspectives, but with the main interest in what they (and the similarities and differences between them) can tell us about the genesis of Afrikaans. The Germanists claim that they both have Germanic roots, either in Dutch compounds with *goed* 'goods/things' as right-hand member (like (6) above), or Frisian coordinate constructions like *heit-en-hjar* ('dad-and-them'), and *heit-en-dy* ('dad-and-these') (Sipma 1913). The Creolists maintain that both are creole constructions, with roots either in Cape Khoekhoe, Nama,[4] Malayan, or African languages. No definitive conclusions have been reached, and this article does not aim to contribute directly to this debate.

The most recent synchronic description of the $goed_1$ and $goed_2$ constructions was done by Links (1989), while the last synchronic description of the *hulle* construction was published in 1969 by Kempen (although Den Besten's (1996) study could also be considered a synchronic description, albeit more theoretical in its aims). Kempen (1969) states that *pa-hulle* (in (1) above) and *pa-goed* (in (2) above) are fully equivalent in meaning, but that the latter is regarded "socially lower", and that it could be "ignored as untranslated Khoekhoe" (Kempen 1969). In some of the other literature similar claims about these constructions are often made in passing, but not substantiated with corpus-based data. Moreover, there is not consensus on whether the *hulle* and $goed_1$ constructions should be regarded as noun phrases (Den Besten 1996; Smith 1940),[5] compounds (Booij 2010: 66; Kempen 1969), derived words (Deumert 2004), or indeed as "an oddity" (Moravcsik 2003).

From the literature on associative constructions in general, two main views on the semantics of these constructions have emerged. On the one side, Daniel and Moravcsik (2013) postulates an asyndetic coordinate interpretation as in (8) below. Moravcsik (2003) identifies the *hulle* (and per implication $goed_1$) construction as an

[3]See Table 9 in the Appendix for an overview of the most important literature on the APL constructions.

[4]Following Güldemann (2008), I use the names Cape Khoekhoe and Nama (locally known as Khoekhoegowab) as the two languages of the Khoe language family relevant to this discussion.

[5]Den Besten (1996, 2001), within his theoretical framework, calls these constructions determiner phrases, and not noun phrases. In the remainder of this article, except where I quote Den Besten, I will only refer to noun phrases, since the more general theoretical debate about these terms has no fundamental bearing on the discussions here.

associative plural construction, which she defines as "constructions whose meaning is 'X **and** X's associate(s)', where all members are individuals, X is the focal referent, and the associate(s) form a group centering around X" [my emphasis – GBVH]. She points out that "associative plurals fall between ordinary morphological plurals and conjoined nominals" (2003: 472), and that "both collective and distributive readings are possible" (2003: 488).

On the other side, Vassilieva (2008) proposes a subordinate interpretation: "An associative plural is a nominal expression **that refers to a group** by naming its most salient member. The construction is used to introduce a new group into discourse, a group that is understood to be inherently (or contextually) associated with its named protagonist." [my emphasis – GBVH]. This view was already introduced by Den Besten (1996), and is formalised in (9). Although the difference between these two interpretations is subtle, it is pivotal for a proper understanding of the *hulle* and *goed*$_1$ constructions, as will be argued in this chapter.

(8) [X AND OTHER PEOPLE ASSOCIATED WITH X] or [X AND X'S ASSOCIATES]
(9) [THE GROUP SURROUNDING AND INCLUDING X]

The main aim of this chapter is to present a synchronic, corpus-based, constructionist description of these Afrikaans constructions. From a construction morphology (Booij 2010) and cognitive grammar (Langacker 2008) perspective, various schemas and subschemas are identified, clearly indicating where the constructions overlap but also diverge. It is illustrated that there are many misconceptions about these two constructions, especially regarding their meaning in actual, modern usage.

In Sect. 2, an overview of the corpus data is provided. Section 3 presents information on the frequency and productivity of these constructions, as well as possible answers to why the *hulle* construction seems to be "winning" over the competing *goed*$_1$ construction. For a proper characterisation of the *hulle* and *goed* constructions, it is necessary to understand the differences between *hulle* as a plural pronoun, and the various senses of *goed*, as well as the component structure they combine with. In Sect. 4 *hulle* and *goed* as right-hand components of these constructions are analysed in detail, while a description of the left-hand components is provided in Sect. 5. Section 6 aims to give an answer on whether these constructions should be analysed as subschemas of noun phrases, compounds, or derived words, or perhaps rather as new nodes in a construction network. Based on these detailed analyses, the article concludes with a categorisation network of the schemas and subschemas of these constructions.

2 Data

The primary source of data for this research is the collection of corpora available on the online corpus portal of the Virtual Institute for Afrikaans (VivA 2017). This collection is made up of seven different corpora, comprising in total more

Table 1 Primary data sources (VivA 2017)

Subcorpus[a]	Description	# Words[b]
NCHLT	Government documents mined from webpages of the various departments of the South African government	2,229,214
MM	News articles and blogs published on the website of the online media house Maroela Media	8,980,702
LAPA	Books (mostly fiction) published by the publisher Lapa Uitgewers	6,741,480
PK	Books (fiction and non-fiction) published by the publisher Protea Boekhuis	7,576,367
RSG	News bulletins broadcasted between 2005 and 2015 on the radio station Radio Sonder Grense, and published on their website	12,292,487
TK	Stratified corpus consisting of various genres of written (formal) SAfr, such as academic publications, newspaper texts, literary works, religious texts, etc.	47,321,344
WKJ	Informal blogs published on watkykjy.co.za	1,232,715
	Total	**86,374,309**

[a]Explanation of abbreviations available in the section References
[b]Word counts on 27 January 2017

than 86 million words (see Table 1). The majority of texts in these corpora can be considered edited texts (e.g. from publishers), and represents contemporary written standard Afrikaans (SAfr). A small portion of the Taalkommissie corpus is explicitly categorised as fiction (∼5,8 million words), while two other corpora (NWU/Lapa and PUK/Protea, together 14,3 million words) also contain fictional texts. We can assume that we might find some examples, but by far not a proper representation of (spoken) dialectical Afrikaans (DAfr) in these subcorpora of the VivA corpus collection.

The usage of written data, even for DAfr that occurs most often in spoken form, bears commenting on. When using written data, and especially edited texts, one should tread carefully. For instance, we cannot say that *ma-hulle* is a coordinate compound because it is styled like other coordinate compounds in Afrikaans (i.e. conjunctively with a hyphen). However, we could say that *ma-hulle* is conceptualised or interpreted by language users as a coordinate compound, and it is therefore styled analogously to other coordinate compounds.

Of course, the orthographic tradition of a specific word, or more generally of a language, also comes into play. *Ma-hulle* might be styled conjunctively with a hyphen because that is just the way it has been written arbitrarily over a long period. Similarly, Afrikaans (like Dutch) has a long-standing tradition to write words in word groups and phrases as separate words (see 15.1 and 15.25 in AWS[11]), while compounds are written conjunctively with or without a hyphen (see 15.2 in AWS[11]). While these rules are in themselves also arbitrary, it does hold true that words that are interpreted as compounds in edited texts (like most of our corpora, but also in orthographic transcriptions of spoken corpora), are written conjunctively. The

styling of words in such corpora therefore also provides information on how the structuring of these words was interpreted by authors, text editors, transcribers, etc.

In synchronic linguistics, the orthographic (or graphemic) realisation of language is often shunned as unimportant and of no concern when discussing language processing. Berg (2013: 387) points out that "[w]riting ... plays a relatively minor to non-existent role in morphological theories", perhaps because the orthography is often considered "less natural or even artificial ... [as it] is regulated at will by a regulating committee" (Neef 2012: 5). However, Langacker (2008: 15) sets the framework for an alternative perspective when he argues that sounds, gestures and orthographic representations should all be seen as overtly manifested features of constructions, which play a crucial symbolising role in such form-meaning pairings. Regarding morphology, Berg (2013: 388) takes a strong stance when he says that "any description of morphology is incomplete without reference to the morpho-graphemic level". This viewpoint is slowly becoming more popular in morphological circles: Berg's article was published in the journal *Morphology*, and Bauer et al. 2013 dedicate a whole chapter to orthography in their book on English morphology. As part of the data collection process, aspects related to the various orthographical variants have been kept in mind, and will be commented on throughout the chapter.

The primary data are words ending in *hulle* (n = 2319) or *goed* (n = 5327, of which 76 could be regarded as $goed_1$ or $goed_2$ constructions; see Table 2 in Sect. 3). Irrelevant material was removed (e.g. data with *vergoed* 'remunerate'), while obvious spelling errors were normalised (e.g. **briegoed* > *breigoed*; **segued* > *sêgoed*). The data were manually analysed and annotated by myself; however, to minimise subjective interpretations of the meaning of the constructions (see below), an experienced postgraduate student did the semantic annotations, which were subsequently verified by myself. The following levels of annotation were used:

– Form: All strings were split in constituents (e.g. *wasgoed* > *was* + *goed*), and all left-hand constituents were tagged with part-of speech categories (e.g. verb, proper noun, mass noun, etc.), with more specific categories for person names (i.e. first name, surname, title name, nickname, and kinship name, as well as combinations of these). In cases where the left-hand constituents could be unambiguously interpreted as multiword units, these were conjoined and annotated as such (e.g. *oom Phil-hulle* > *oomPhil-hulle*; *Kyle Brown-hulle* > *KyleBrown-hulle*). Hyphens were annotated as linkers (LK).

Table 2 Comparison of construction frequencies (VivA 2017)

Construction	Frequency
hulle	2,319
$goed_1$	25
$goed_2$	51
$goed_3$	5,251
Total	**7,646**

– Meaning: Where the referents of these constructions were people, they were annotated on more specific levels, viz. gender (male/female); generic relation (parent/grandparent/sibling/spouse/child/extended family[6]); and specific relation (father/mother, grandfather/grandmother, brother/sister, husband/wife, son/daughter, uncle/aunt, nephew/niece, brother-in-law/sister-in-law). In addition, all strings were considered a priori as compounds, and were manually annotated per the categories of Ó Séaghdha (2008), as operationalised in Verhoeven et al. (2014).
– Entrenchment: Based on all the sublemmas under the lemma **-goed** in the Woordeboek van die Afrikaanse Taal (WAT 2017), all examples that could be deemed entrenched to some degree, were identified. In addition, all hapax legomena were identified.

Since we can assume that the VivA corpora are skewed towards more formal SAfr, other sources that were used to verify or supplement the main data set include:

– **LAC**: Leipzig Afrikaans Corpus (Projekt Deutscher Wortschatz 2017), comprising 165,594,102 words in texts mined from the internet.
– **PCSA**: Ponelis Corpus of Spoken Afrikaans (Ponelis 1976), containing 502,420 words of spoken data from face-to-face dialogue, lectures and radio interviews, sampled in the 1970s.
– **HCSA**: Historical Corpus of Standard Afrikaans (Kirsten 2015), a stratified corpus of non-fiction texts written in SAfr, comprising 1,032,180 words in total, divided into four periods: 1911–1920 (242,686 words); 1941–1950 (263,838 words); 1971–1980 (262,386 words); and 2001–2010 (263,270 words) (Kirsten 2016: 67).
– **JLAFC**: Jana Luther's Afrikaans Fiction Corpus (Luther 2017) is a personal corpus (not available for distribution) of Afrikaans literary and popular novels and short stories, edited and published between 1996 and 2017. The corpus contains 17,903,824 words, and comprises texts written in both SAfr and DAfr.
– **Google**: Searches using Google have been used for what Fletcher (2007) calls "web hunting", i.e. to find examples of constructions that might have been mentioned in scholarly literature, but that don't occur (or occur with a very low frequency) in any of the other available corpora. Since "[t]he query, search and ranking optimization techniques [search engines] have adopted can either assist or sabotage a scholar's quest" (Fletcher 2007), frequency counts from Google results are never used, unless the data have been carefully curated, following the protocol outlined by Van Huyssteen (2017).

[6]The kinship names *oom/omie/oompie/uncle* 'uncle' and *tannie/tante/tant/ta'/ant/antie/auntie* 'aunt' are used in Afrikaans to refer to members of your extended family (e.g. your mother's sister), as well as older people with whom the speaker is (informally) acquainted (e.g. friends of your parents). Since it was not always clear from the immediate context what the exact relationship is, these were all categorised under "extended family". All variants were normalised to *oom* and *tante* respectively.

The complete, annotated dataset is available at gerhard.pro/software.

3 Competing Constructions: Productivity and Frequency

The question that will be addressed in this section is whether the two APL and two coordinate constructions are – synchronically speaking – competing constructions, and if not, why not.

Firstly, it is of significance that no corpus evidence could be found for the two coordinate constructions (see (3) and (4) above) and their variants (see (10) and (11) below) observed by Kempen (1969) in the Swartland area in South Africa. Informal enquiries on Facebook, and personal communications with inhabitants of the Swartland area also yield no evidence of the existence of these constructions. Why this observation is of significance, is that Nienaber (1994) and Den Besten (1996, 2001) build many of their arguments about the diachronic development of the *hulle* construction on these observations of Kempen (1969). If no evidence of these constructions can be found, bar one observation by only one linguist, we might need to also reconsider the arguments of Kempen (1969), Nienaber (1994) and Den Besten (1996, 2001) about the diachrony of these constructions (and their subsequent claims about the genesis of Afrikaans, based on these constructions). However, such an endeavour falls outside the scope of this synchronic study. For purposes of this article, we can conclude that these coordinate constructions – and especially their variants – are extinct in modern SAfr (and even DAfr), and are therefore not considered further.

(10) **Development and variants of schema 3: *en hulle* construction**
pa en hulle (and variants such as *Jakob en hulle* 'Jakob and they') >
pa-en-hulle > *pa-n-hulle* > *paanhulle* > *paanulle*

(11) **Development and variants of schema 4: *en dié* construction**
pa en dié (and variants such as *Jakob en dié* 'Jakob and these') >
pa-en-dié > *pa-en-doe(n)* > *pa-n-doe(n)* > *paandoe(n)* > *paando(n)*

Do we notice other similar shifts in the usage and productivity of the two APL constructions? At the beginning of the twentieth century, Du Toit (1905) observes that the *hulle* and $goed_1$ constructions were well established in the so-called coloured community (i.e. the main speakers of Khoekhoe Afrikaans at the time), but that only the *hulle* construction could be heard in the so-called white community, and importantly, that it could only be heard "sporadically" (Du Toit 1905: 86). If we ignore the aspects related to different speech communities, does this fact still holds true more than a 100 years later?

If we compare the frequencies of the *hulle* and *goed* constructions (see Table 2), we notice that the *hulle* construction (n = 2319) occurs almost ten times more in the corpora than its competitor, the $goed_1$ construction (n = 25). Comparing $goed_1$ and $goed_2$ constructions with the $goed_3$ construction, the latter (n = 5251) occurs much more frequently than its former two counterparts.

Table 3 Productivity measures (Baayen and Lieber 1991)

	-hulle	*-goed*$_1$	*-goed*$_2$	*-goed*$_3$	*-heid*
Hapax (#)	494	9	11	196	5,247
Total (#)	2,319	25	51	5,251	249,531
Productivity measure (*P*)	0.21	0.36	0.22	0.04	0.02

However, if we compare the productivity measures of these constructions (see Table 3), we see that the *goed*$_3$ construction is much less productive than the others. Productivity is measured here in the narrow sense (Baayen and Lieber 1991) as $P = n_1/N$, where P is the productivity measure; n_1 the total number of hapaxes that contain the component; and N the token frequency of all words with that component. P is smaller for unproductive processes, and larger for productive ones. If we compare these productivity measures with that of the assumedly highly productive nominalising suffix *-heid* (Kempen 1969: 481), we see that *-heid* and *goed*$_3$ constructions are comparable, in contrast with the much more productive *hulle* and *goed*$_{1/2}$ constructions. Therefore, although *goed*$_3$ is more promiscuous (see Sect. 5) than the other constructions, it is less productive.

The question is therefore: Why do we find – more than a century later – that the *hulle* construction occurs almost a hundred times more in our corpora of written Afrikaans than the competing, probably much older – according to Nienaber (1994: 62) – *goed*$_1$ construction? In her analysis of a relatively small, balanced corpus of historical texts of SAfr, all written between 1911 and 2010 (i.e. HCSA, comprising circa 1 million words in total; see Sect. 2), Kirsten (2016: 184–185) makes two observations:

– There is no evidence of the *goed*$_1$ and *goed*$_2$ constructions in HCSA, which she ascribes to the fact that these two constructions are used mainly in Orange River Afrikaans (therefore in DAfr, and not in SAfr).
– It seems as if the *hulle* construction sees a steady growth in SAfr: from only one instance in the period 1911–1920, to eight instances in the period 1941–1950, to 63 instances in the period 1971–1980 (but with only 16 instances in the period 2001–2010). She concludes that her corpus might be too small to reach reliable conclusions about the *hulle* construction.

Two more pieces of evidence can contribute to support Kirsten's preliminary observations:

– It is a well-known thesis that the translation of the Christian Bible often plays an important role in the codification process of languages, and this was especially true for the codification and standardisation of Afrikaans (Naudé 2005). A search in the online 1933/-53 translation of the Bible[7] produces no hits for the *hulle* or *goed*$_{1/2}$ constructions; in the 1983 Afrikaans translation though, 36 hits for the

[7] Available at www.bybel.co.za

hulle construction occur, and still none for the $goed_1$ and $goed_2$ constructions. Like Kirsten's evidence, this evidence is also meagre, but it resonates well with her observation of a growing trend for the *hulle* construction, while $goed_{1/2}$ constructions remain absent in formal, written SAfr.

– One of the most influential factors in the codification process of SAfr as we know it today, was the establishment of a spelling committee for Afrikaans in 1914, which is today known as the "Taalkommissie" (henceforth TK). The first TK was tasked with the compilation of spelling rules for Afrikaans, supplemented with a list of words. The first edition of this orthography, today still known as the *Afrikaanse woordelys en spelreëls* ('Afrikaans word-list and spelling rules'; henceforth AWS), was published in 1917 (AWS^1), and the eleventh edition was published in 2017 (AWS^{11}).
  In the first five editions of the AWS, there are no traces to be found of either the *hulle* or $goed_{1/2}$ constructions. This is not completely surprising, since the early codification process of Afrikaans relied heavily on Dutch – to such an extent that scholars refer to a period of Dutchification (Uys 1983; Van Rensburg to appear), and Dutch-centrism (Nienaber 1994). Since none of these three constructions were known in Dutch, one can assume that the TKs at the time steered clear of officiating such expressions. It is only in the 1953 edition (AWS^6) that we find the first lemma with *hulle*, viz. *ma-hulle* (mom-3PL), and in the 2009 edition (AWS^{10}) *pa-hulle* (dad-3PL) additionally. The $goed_{1/2}$ constructions are officially recognised with two lemmas as SAfr in the 2017 edition (AWS^{11}), each with two styling variants: *ma-goed/magoed*; and *pa-goed/pagoed* (alongside *ma-hulle* and *pa-hulle*).

It seems therefore that the period of Dutchification and Dutch-centrism in the first half of the twentieth century had an important influence on the growth of the *hulle* construction compared to that of the $goed_{1/2}$ constructions, since the former was experienced as more "Dutch-like" (Nienaber 1994: 65). Influential linguists like W. Kempen, T.H. le Roux, J.J. Smith and H.J.J.M. van der Merwe served during this period on the TK, and their views of the $goed_{1/2}$ constructions as "perversions" (Van der Merwe 1964), or Khoekhoe-isms that could be ignored as "untranslated Khoekhoe" (Kempen 1969: 294),[8] must have had an influence on the normative work of those TKs. In the twenty-first century, the methodology and underlying philosophy of the TK have changed to become more corpus-driven, and more inclusive of all the varieties of Afrikaans (see frontmatter of AWS^{10} and AWS^{11}). However, only time will tell if the recognition of the $goed_{1/2}$ constructions in AWS^{11} will have an impact on the frequency of these constructions in SAfr.

[8]For references to these linguists' research on the *hulle* and $goed_{1/2}$ constructions, see Table 9 in the Appendix.

4 Component Structures: Right-Hand Components

Since we have four remaining constructions (i.e., excluding the coordinate constructions in (3) and (4)) that are related to each other in different ways, and since the right-hand components of three of these constructions are identical in orthographical form (i.e. *goed*), it will be useful to distinguish semantically between these different right-hand components. They are the following (with examples of their independent usage):

(12) ***hulle***
POS: third-person plural pronoun; **Translation**: 'they' (subject), 'them' (object)
. . . nadat ***skap·e*** *in die nabygeleë begraafplaas opgemerk is waar****hulle****kunsblomme eet*.
'. . . since **sheep·PL** have been spotted in the nearby cemetery where **they** were eating artificial flowers.'

(13) ***goed₁***
POS: indefinite plural pronoun; **Translation**: 'they' (subject), 'them' (object)
Die jakkalse naai nie ons skap·e nie, hulle eet die fokken ***goed****!*
The jackals screw not our sheep PART.NEG, they eat the fucking **things**!
'The jackals don't screw our sheep, they fuckin' eat **them**!'

(14) ***goed₂***
POS: adjective (postnominal, or predicative); **Translation**: 'good'
Alle lewensstyle, ***goed*** *of sleg, word dus bo kritiek verhef.*
All lifestyles, **good** or bad, are thus elevated above any criticism.

(15) ***goed₃*****(I)**
POS: non-plural mass noun; **Translation**: 'stuff'
. . . ***goed*** *soos ros·e en skap·e en sampioen·e . . .*
'. . . **stuff** like rose·PL and sheep·PL and mushroom·PL . . . '

(16) ***goed₃*****(II)**
POS: plural mass noun; **Translation**: 'things/goods'
. . . geen wonder jy kon nie behoorlik loop met die ***goed*** *nie, die hakke is myl hoog . . .*
'. . . no wonder you couldn't walk on these **things**, their heels are a mile high

The difference between the various right-hand components of these constructions could be explained in terms of specificity (i.e. the level of instantiation that is foregrounded), focusing (i.e. the inherent boundedness, internal homogeneity, and salience of subparts within the scope of the structure), and perspective (i.e. grounding within the current discourse space) (Langacker 2008; Taylor 2002). Once we understand their respective conceptualisations, we could have a better understanding of the constructions that they favour.

To illustrate these general constructs, consider the following examples:

(17) *Hoe vang mens **skaap**?*
'How does one catch **a sheep**?'

(18) *. . . terwyl hy besig was om **skaap** te red wat in watergat beland het.*
'. . . while he was saving **a sheep** that fell in a waterhole.'

(19) *Minstens 600 **skap·e** het doodgebrand . . .*
'At least 600 **sheep·PL** burned to death . . .

(20) *Hy sê **vee** is in kwarantyn geplaas . . .*
'He said **livestock** was put in quarantine . . .'

(21) *Die siekte veroorsaak letsels en sere aan diere soos beeste en **skap·e** . . .*
'The illness causes lesions and sores on animals like cattle and **sheep·PL** . . .'

The meanings of lexical items are construed at different levels of specificity: the higher the level of specificity, the more schematic its construal is, and conversely, the lower the level of specificity, the more granular it is. In this regard, Langacker (2008: 264–272) distinguishes between type and instance conceptions within a lexical item's domain of instantiation: type conceptions profile entities at a higher, more schematic level (the type plane; Langacker 2000: 270), while instance conceptions foreground distinguishing locations in the domain of instantiation (the instance plane; Langacker 2000: 270). In example (17) *skaap* 'a sheep' is construed as a type conception in its domain of instantiation – it refers to any sheep, whatever its size or gender, wherever in the world. In contrast, *skaap* 'a sheep' in example (18) refers to a specific sheep in a distinct location, in a specific waterhole; this is the prototypical construal of a singular count noun. In Fig. 1 this difference in construal is illustrated by the solid line around the activated domain of instantiation (DI): in the case of *skaap* as a type (marked by "t" in Fig. 1a), the construal is less specified, unlike the case where *skaap* refers to a specific instance (marked by a dot in Fig. 1b). In its type conception, *skaap* is therefore more schematic, since it abstracts away from the specifics of different sheep.

The difference between singular count nouns, plural count nouns, and mass nouns centres around the inherent boundedness of the profiled entity. A singular count noun (like *skaap* in (18)) profiles a thing (used here in a technical sense – Langacker 2008: 98) that is prototypically discretely bounded, and hence replicable and countable. The plural of a count noun (see *skape* in (19)) profiles more than one of the same discrete, salient objects as a gestalt, which in its entirety is not discretely bounded, but rather amorphous and not inherently limited (Langacker 2008: 131). In Fig. 1c this amorphous boundedness of plurals is indicated with a dashed line, enclosing an unspecified number (indicated by ellipses) of instances (indicated by circles with dots). The enclosed instances are heterogeneous to some degree, since they are still discernible from each other (and hence countable).

Like count noun plurals, a non-plural mass noun (*vee* in (20)) also profiles an amorphous region in the domain of instantiation, and is therefore not countable

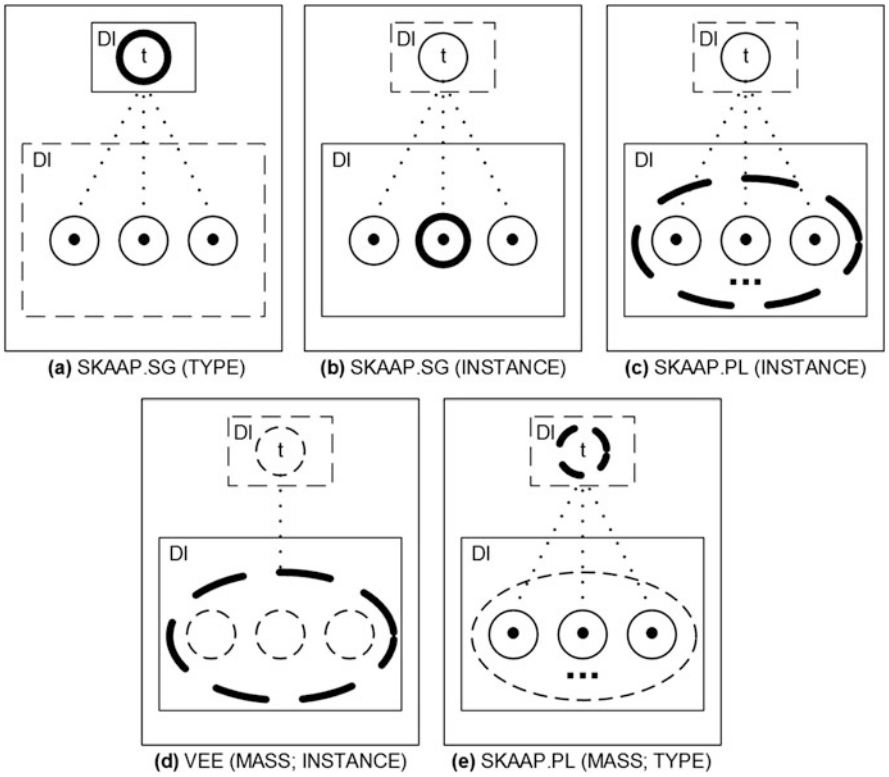

Fig. 1 (**a**) Count noun, singular, type (*skaap*); (**b**) Count noun, singular, instance (*skaap*); (**c**) Count noun, plural, instance (*skape*); (**d**) Mass noun, singular, instance (*vee*); (**e**) Mass noun; plural; type (*skape*)

and replicable. However, unlike plurals, the enclosed instances are homogenous and undiscernible (indicated with dashed lines in Fig. 1d). Another prototypical example to illustrate this, is the non-plural mass noun *water*, which profiles a homogenous mass with undiscernible parts. It is only perhaps for the chemist who looks at a sample of water under a microscope, that water consists of distinct particles.

Based on this similarity between count noun plurals and non-plural mass nouns, it is not surprising that plurals can function as mass nouns (like *skape* in (21)). In this case, the plural profiles an amorphous region in the type plane, while the instances are still discernible (i.e. heterogenous) but not salient (Fig. 1e). The word *skape* profiles a type of animal, similar to *diamonds* profiling a type of mineral in *gold is forever, diamonds not*.

The difference between a count noun and proper name (or any other named entity for that matter) is that the latter incorporates grounding in its conceptualisation, and thus singles out a discourse referent (Langacker 2008: 310). The participants (speaker(s) and hearer(s)) in a particular speech event that takes place at a specific

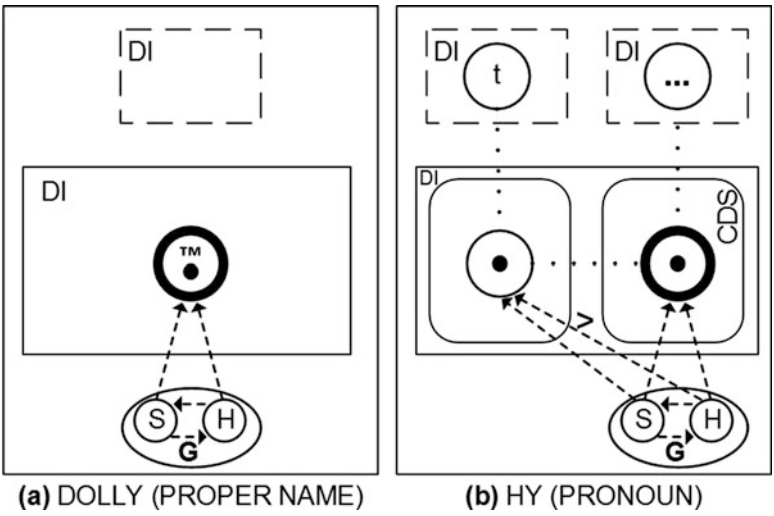

Fig. 2 (**a**) Proper name (*Dolly*); (**b**) Pronoun, singular (*hy*)

time in a specific place, share the current discourse space (CDS), which is defined as "everything presumed to be shared by the speaker and hearer as the basis for discourse at a given moment" (Langacker 2008: 281). Consider the following examples:

(22) *In die geval van* ***Dolly*** *is gebruik gemaak van Skotse Swartkop-ooi se oösiet*.
In the case of **Dolly**, the oocyte of a Scottish blackface ewe was used.

(23) *Die* ***skaap*** *is 'n herkouer, wat beteken dat* ***hy*** *sy kos opbring* ...
'The **sheep** is a ruminant, which means that **he** regurgitates his food ...'

The use of a proper name (like *Dolly* in (22)) assumes that the speaker and hearer shares a CDS where the topic under discussion (in the immediate preceding discourse frame) is cloning of animals, and not, for example, American female country music singers. In Fig. 2a the grounding elements (speaker S and hearer H) are included in the construed space, indicating with dashed arrow that they have a shared view of the thing that is being named. In addition to this thing being discretely bounded in a specific location, it also has a (unique) name (indicated by the symbol ™). Of course, other things can also have this "trade mark", but in the CDS this proper name refers to a specific referent. Note that the type plane is in principle unspecified, since the name *Dolly* itself singles out the only instance in the CDS (Langacker 2008: 317).

Similarly, pronouns also rely for their conceptualisation on the incorporation of the CDS, more specifically the immediate preceding discourse frame. To understand the singular personal pronoun *hy* in (23), we need to understand that a singular sheep (*skaap*) has already been profiled in the previous discourse frame (the first

part of the sentence, indicated by the left-hand block in Fig. 2b). The grounding elements share not only the identification of this thing in the previous discourse frame, but also know that it is identical to the thing in the CDS (indicated with a dotted correspondence line). While the *skaap* in the previous discourse frame is an instance of the type *skaap* (indicated with a "t" in the type plane), the type specification of *hy* remains schematic (indicated with ellipses in the type plane). Figure 2b represents the prototypical interpretation of a singular pronoun.

With this background knowledge, we can now give a more precise semantic characterisation of *hulle* and the different senses of *goed*. As a third-person plural personal pronoun, *hulle* (as in (12)) profiles a grounded, amorphous region in the CDS, where the enclosed entities are heterogenous, discernible and still salient with reference to the previous discourse frame. The pronoun *hulle* is used to refer to people, animals, plants, or inanimate things, although the third-person neuter pronoun *dit* can also be used to refer to animals, plants and inanimate things, but not people (Ponelis 1979: 591–593). Figure 3a gives a depiction of *hulle* as the right-hand component of the *hulle* construction (i.e. not as an independent word in a sentence). The entities that *hulle* refers to, are linked to the previous discourse frame with a dotted correspondence line. Here *hulle* is shown as an subject pronoun (nominative): *hulle* is the trajector (tr; the element being focused on, or the actor) in a simplex relationship, while it is the landmark (lm; the patient) when used as object pronoun (accusative) (Langacker 2008: 73).[9] Note that when *hulle* is used as a right-hand component in the *hulle* construction, it makes schematic reference to the left-hand component (e.g. *ma*), which serves to elaborate (or characterise) the right-hand component in finer detail (Langacker 2008: 198). This schematic element is called an elaboration site (henceforth e-site), and is indicated by hatching in these diagrams; the line arrow points to the element that specifies, or "fills" the e-site. In the case of *hulle*, the e-site refers to any nominal – its left-hand component needs to be a grounded noun(phrase), since the referents in the previous discourse space are also grounded by the grounding elements, and are part of the construal of *hulle*.

In example (13), we see that $goed_1$ can be used as an indefinite plural pronoun (or at least in a manner that resembles indefinite pronouns; also referred to as a pronominal), and especially most often as *dié goed* 'these things' and *sulke goed* 'such things'. Ponelis (1979: 103) points out that *goed* has a plural reading in this usage, as opposed to the singular interpretation of *iets* 'something'. In this sense, $goed_1$ is translated with *they* (as subject) and *them* (as object), illustrating the overlap between $goed_1$ and *hulle*. Example (13) could be reformulated just as well as in (24), where *die goed* is replaced with *hulle*. These two can therefore be seen as near synonyms, mostly only differing in terms of sociolinguistic dimensions. Hence, $goed_1$ is also depicted by Fig. 3a.

[9] Similar to English *they*, *hulle* can also be used as a generic indefinite pronoun, as in ***Hulle*** *sê ′n vrou se intuïsie is betroubaar* … '**They** say a woman's intuition is reliable …'. In such a case, *hulle* profiles an unbounded region in the type plane similar to Fig. 1e. Since this generic sense, as well as *hulle* as a possessive pronoun don't occur in the *hulle* construction under discussion, we don't need to concern ourselves further with its conceptualisation.

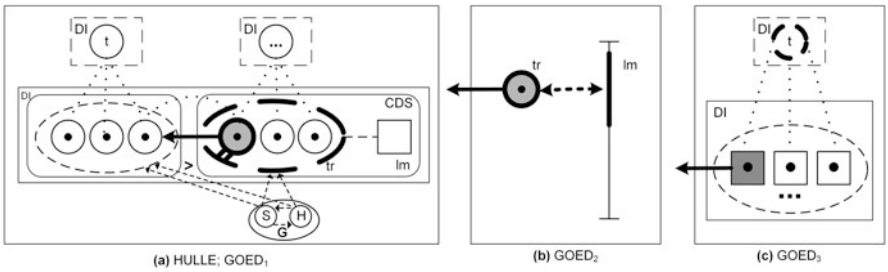

Fig. 3 (**a**) *hulle* or $goed_1$; (**b**) $goed_2$; (**c**) $goed_3$

(24) *Die jakkalse naai nie ons skap·e nie, hulle fokken eet* ***hulle****!*
The jackals screw not our sheep PART.NEG, they fucking eat **them**!
'The jackals don't screw our sheep, they fuckin' eat **them**!'

The diachronic reanalysis process of *goed* that was responsible for the development of $goed_2$ (i.e. as a postnominal adjective in a compound), as well as a detailed semantic characterisation thereof, falls outside the scope of this article (see Sect. 1). Figure 3b will suffice to illustrate its adjectival nature (Langacker 2008: 102), specifically as a gradable, scalar, bounded adjective (Paradis 2001). As a postnominal modifier (i.e. as right-hand component), $goed_2$ in this construction is similar to *general* in *attorney-general*, or *emeritus* in *archbishop emeritus*. It is therefore also not completely surprising that only the $goed_2$ construction allows further morphological processes (also like *attorney·**s**-general*), viz. compounding with *hulle* (e.g. *pa·goed-hulle* dad·good-3PL; Den Besten 2001). However, such compounds are very rare in our data: There are two instances in the primary data, one in JLAFC (which happens to be the same example as one found in the primary data), and nothing else in any of the other corpora. A Google search with *pagoed-hulle* and *magoed-hulle* (and their orthographic variants) resulted in four unique hits. However, Van Rensburg (p.c.) points out that, from his personal observations, expressions like *pagoed-hulle* and *kaptein·goed-hulle* (captain·good-3PL) occur frequently in spoken Orange River Afrikaans. Based on the available corpus data though, I am inclined to conclude that even the hypocoristic $goed_2$ construction does not really allow further morphological processes in written language.[10]

In addition, *goed* also functions as a non-plural mass noun, profiling an amorphous region (cf. Fig. 1d) that encloses any number of unspecified and even unrelated entities, including people, animals, plants, and inanimate objects, just like *hulle*. In this non-plural mass noun sense (see (15)), $goed_3$ is best translated with *stuff* (notwithstanding subtle differences in formality), while in its plural mass noun sense (as in (16)), it is mostly translated with *things* (cf. Fig. 1e).

[10]Constructs like *ma·goete* and *ma·goeters* should not be analysed as plural forms of *ma·goed/-t*, but rather as orthographic variants of $goed_2$, since they refer hypocoristically to only one referent.

In compounds, *goed$_3$* functions mostly (but not exclusively) as a plural mass noun, since it profiles an amorphous region in the type plane: *mess·e·goed* knife·LK·things 'cutlery' profiles a kind of equipment, not a collection of knives. But unlike its singular counterpart, as a plural mass noun *goed$_3$* makes reference to identifiable, discrete and heterogeneous instances, thereby having an e-site that can be elaborated by any entity (the square block in Fig. 3c), including things (nouns), temporal processes (verbs), atemporal relations (adjectives and prepositions), etc. (Langacker 2008: 98–99).

Given this plural mass noun sense, it is somewhat surprising that *goed* also has plural forms, viz. *goedere*, *goete*, and *goeters*, which are almost always interchangeable with the singular form. HAT (2015) indicates that the plural form *goedere* has been lexicalised to such an extent that it now only refers to commercial products, while *goete* and *goeters* are used in informal contexts to refer to people, animals or things "which you can't or don't want to name precisely". WAT (2017) specifies that these two forms are often used with some degree of contempt, and that *goete* could even be perceived as coarse. Whether this still rings true for its usage in modern day Afrikaans (the volume of the WAT covering the letter G was published in 1957) remains to be investigated, but what is true is that it conveys some emotive value, whether ameliorative or pejorative. We can safely assume that the meaning and usage of *goedere*, *goete*, and *goeters* have become specialised, and that none of them should be considered additive plurals of *goed*.[11]

From this general characterisation of the lexical items *hulle* and *goed*, we can summarise some similarities and differences:

- Both *hulle* and *goed* profile an amorphous (unbounded) region in either the type plane or instance plane. They can therefore both refer to specific instances in the CDS, or more generically to types of those instances.
- In the case of *hulle* and *goed*$_3$, the entities enclosed by the unbounded region are discernible, salient, and heterogeneous. In the non-plural mass noun sense of *goed*, the enclosed entities are not discernible, not salient, and homogenous.
- While *hulle* functions only as a pronoun (and grounding elements are therefore part of its conceptualisation), *goed* can also function as a (generic) indefinite plural pronoun.

5 Component Structures: Left-Hand Components

Any synchronic description of the *hulle* and *goed*$_{1/2}$ constructions should at least account for (or provide counter-evidence for) the prototypical subschemas summarised in Table 4. These subschemas are based by and large on the examples

[11] The same process seems to be occurring in English. Compare for instance one of the definitions for *stuffs* at urbandictionary.com: "When you have the stuffs, then you got the top quality, whether it be green or white, natural or man-made, the finest stuffs: *That guys, he sells the real stuffs*."

Table 4 Token frequency counts of left-hand components in the *hulle*, $goed_1$ and $goed_2$ constructions (VivA 2017)

Category of $[x]_{NPi}$	Example	*hulle*		$goed_1$		$goed_2$	
N: First name	*Jakob*	1,098	•	9	•	7	•
N: Surname	*Botha*	110		0		0	
N: Surname.PL	*Bothas*	0	•	0		0	
N: Kinship name	*Oom/pa*	753	•	6	•	31	•
N: Kinship name.PL	*Ooms*	0	•	0		0	
N: Title name	*Meester*	58	•	0	•	5	•
N: Animal's first name	*Boel*	0	•	0		0	
N: Place name/locative reference	*Tweerivier*	0	•	2	•	0	
N: Temporal reference	*Saterdagaand*	0		0	•	0	
NP: First name + surname	*Jakob Richards*	62		0		0	
NP: Kinship name + first name	*Oom Jakob*	179	•	2	•	6	
NP: Kinship name + first name + surname	*Oom Jakob Richards*	7		0		0	
NP: Kinship name + surname	*Oom Richards*	3		0		0	
NP: Title name + first name	*Mevrou Heidi*	10		0		2	
NP: Title name + surname	*Professor Richards*	18		0		0	
NP: Hypocoristic particle + first name	*Ou Jakob*	20	•	0	•	0	
NP: Hypocoristic particle + kinship name	*Ou oom*	1		0		0	
PN: 2SG/PL (reverential)	*u*	0	•	0		0	
PN: 3PL	*Ons/julle/hulle*	0		3	•	0	
PN: Demonstrative/interrogative	*Watse/watter*	0		3	•	0	
		2,319		25		51	

• = Category mentioned in previous literature

provided by Kempen (1969), but also supplemented with categories from other literature. All categories that were found in any of the literature are marked with a black dot next to the corpus counts.[12] The noteworthy cases are therefore the ones with black dots but without corpus evidence, or the ones with corpus counts but without black dots.

Table 5 summarises the types of left-hand components that combine with $goed_3$ as right-hand component. While $goed_1$ and $goed_2$ combine only with grounded nominals (e.g. person names, kinship names and title names), $goed_3$ is much more promiscuous (Taylor 2002; Van Huyssteen 2010): It combines with words in many of the major part-of-speech (sub-)categories, especially count nouns (n = 2,177), verbs (n = 2,011), and adjectives (n = 555). However, if we look at the type:token

[12]Kempen (1969) also mentions that he heard *Piet-ons* Piet-us 'Piet and I/Piet and we' in the Namaqualand area. No evidence of such a construction could be found in any of the written or spoken corpora, and are therefore not included in the table, or in the rest of the discussions.

Table 5 Token and type frequency counts of left-hand components in the *goed*$_3$ construction (VivA 2017)

Category of [x]$_{Zi}$	Example	Meaning	Token (#)	Type (#)	TTR	
Count noun	*Skottel*	Mass	2,177	104	0.05	•
	Mens	Generic	0	0		•
Mass noun: General	*Tee*	Mass	100	15	0.15	
Mass noun: Material	*Silwer*	Mass	45	19	0.42	
Abstract noun	*Kultuur*	Mass	41	19	0.46	
Proper name: Person	*Schreuder*	Mass	1	1	1.00	
Proper name: Place	*Boston*	Mass	4	4	1.00	
Proper name: Other	*FBI*	Mass	4	4	1.00	
Noun phrase	*Groot tand*	Mass	22	12	0.55	
Verb	*Rook*	Mass	2,011	114	0.06	•
Verb phrase	*Vuur maak*	Mass	56	23	0.41	•
Adjective	*Lekker*	Mass	555	27	0.05	•
Preposition	*Binne/onder*	Mass	229	2	0.01	
Loan word	*Girlie*	Mass	6	5	0.83	
			5,251	**349**	**0.07**	

• = Category mentioned in previous literature; TTR = Type/token ratio

ratio (Plag 2003: 52) of these three categories in the last column of Table 5, it is particularly low: 0,05, 0,06 and 0,05 respectively. This suggests that many of these words might have been lexicalised.

If we consider the data in Table 4, most of the emerging constructions (i.e. constructions that have not been attested in the literature) are not surprising, as they are subschemas of previously identified, more general schemas. For example, *oom Jakob-hulle* (uncle Jakob-3PL) is merely a combination of the two well-known schemas [[x]$_{N.KINSHIP}$ *-hulle*]$_{APL}$ and [[x]$_{N.FIRST}$ *-hulle*]$_{APL}$. The same principle applies to NPs consisting of title names with first names or surnames (e.g. *professor Richards-hulle*).

The cases that are mentioned in previous literature but that do not occur in our corpus data, are more interesting. About these cases, we can make a few general remarks.

As we have already noticed from Table 2 in Sect. 3, the *goed*$_2$ construction's hypocoristic/reverential interpretation is clearly more prevalent than the *goed*$_1$ construction's plural interpretation: 51 cases of *goed*$_2$, versus 25 of *goed*$_1$ (a ratio of 70:30). In the literature, cases like *meester-goed* (master-APL) are often mentioned to illustrate the construction's associative meaning, but from the corpus data it is clear that the construction as a whole profiles a singular referent more prototypically. The corpus data suggest that this reinterpretation process might have developed even further in recent years, or perhaps previous researchers overestimated the associative interpretation of the *goed*$_{1/2}$ construction. Van Rensburg (p.c.) is even of opinion that especially associative *pa-goed* and *ma-goed* have been cited (and recycled) by linguists who have not necessarily had access to first-hand (corpus) data, and

it therefore resulted in an overestimation of *pa-goed* and *ma-goed* as associative plurals (instead of singular hypocoristic/reverential expressions).

This possibility that the *goed*$_{1/2}$ construction should most often be interpreted hypocoristically/reverentially (rather than associatively), might be linked to the fact that it doesn't seem to combine with the hypocoristic particle *ou* 'old' – contra to what is often stated in the literature. Perhaps hypocoristic *goed* is a strong enough marker of a hypocoristic meaning, so that the combination with *ou* becomes unnecessary.

Another subschema that is discussed by Donaldson (1993: 126) and mentioned by others, is *u-hulle* (2SG/PL-3PL), where *u* is a reverential pronoun, unmarked for number (similar to *you*). This construction could not be found in any of the corpora, except for two cases in LAC. Even a Google search could only provide two examples in the first 130 hits. We should therefore be careful to use *u-hulle* as a prototypical example of the *hulle* construction, since it seems to be rather rare.

It will be pointed out in Sect. 6 that, contrary to Den Besten's (1996) claims, there is no evidence in our data that plural surnames can function as left-hand components of the *hulle* construction (e.g. *die Steenkamp·s-hulle* the Steenkamp·PL-3PL 'the Steenkamp family'). Although never mentioned in the literature, singular surnames occur frequently (n = 110) in the data. Similarly, in contrast with the literature, no instances could be found of plural kinship names and plural common nouns as left-hand constituents (e.g. die *oom·s-hulle* the uncle·PL-3PL; *die hond·e-hulle* the dog·PL-3PL).

From the available corpus data, it emerges that *hulle* and *goed*$_{1/2}$ almost exclusively combine with human referents. Contrary to Kempen's (1969) claims, there are no examples where these components combine with animal names (e.g. *Boel-hulle,* where *Boel* is the name of an animal). Links (1989: 32) mentions *Saterdag·aand-goed* Saturday·evening-APL 'roundabout Saturday evening', but no similar examples could be found in our data. Only two examples (both identical, and both in the same document) have a locative referent, viz. *Kheis-goed se mens* Kheis-APL PART.GEN person 'person from the Kheis region'. Kempen (1969: 291) mentions *Tuine-hulle* Gardens-3PL 'the team from the area/school Gardens' as a possible (metonymic) extension of the general *hulle* schema; however, no similar examples occur in the primary corpus data, as well as in any of the secondary corpora. Again, despite Van Rensburg's (p.c.) observation that *goed*$_1$ often combines with place names in spoken Orange River Afrikaans, I am inclined to conclude that the *hulle* and *goed*$_{1/2}$ constructions seems to be choosy regarding their left-hand components, which are mostly human referents (at least in written language).

It should also be noted that the *hulle* and *goed*$_{1/2}$ constructions are generally considered in the literature to be informal (e.g. Webb 1989). Kempen (1969: 292) uses a biblical context to claim that one would not find examples like *Christus-hulle* Christ-3PL 'Christ and his disciples', thereby illustrating the colloquial nature of this construction. However, there are a total of 30 examples in our data where *hulle* combines with a Biblical first name in religious contexts; see examples (25) and (26). This evidence confirms that the *hulle* construction have grown in its range of usage contexts to include formal genres, as was argued in Sect. 3.

Table 6 Profiled kinship referent's relation to speaker

Relation	Example	*-hulle*		*-goed*	1/2	Total
		Male	Female	Male	Female	
Parent	*pa/ma*	217	331	20	12	**580**
Larger family	*oom/tante*	172	83	9	1	**265**
Grandparent	*oupa/ouma*	51	41	2	0	**94**
Sibling	*broer/suster*	27	18	0	1	**46**
Child	*seun/dogter*	1	1	0	0	**2**
Spouse	*man/vrou*	1	0	0	0	**1**
		469	**474**	**31**	**14**	**988**

(25) *Joganan-hulle het die Here nie gehoorsaam nie* ...
Johanan-3PL have the Lord not obey PART.NEG ...
'So they [Johanan and his companions] entered ... in disobedience to the Lord ...' (Jer 43:7; The Holy Bible, New International Version)

(26) *Josafat-hulle is die volgende môre vroeg uit* ...
Jehoshaphat-3PL is the next morning early out ...
'Early in the morning they [Jehoshaphat and his companion] left ...'
(2 Chron 20:20; The Holy Bible, New International Version)

Other observations that can be made based on a semantic characterisation of the input categories, are about the profiled referents in these constructions. Table 6 gives an overview of those constructions where the kinship name [x] refers to a family member of the speaker. The constructions with parents as referents (e.g. *pa-hulle* or *ma-goed*) account for more than half of the cases, while *oom* 'uncle' and *tante* 'aunt' (cf. footnote 6) for more than a quarter of the data. This is not surprising, since the use of integrated appellatives (which are based on title names and kinship names) is a well-known phenomenon in Afrikaans (Jenkinson 1982). Our data confirms that roughly the same distributions can be observed for the *hulle* and *goed* constructions, although relative to constructions with *oom*, cases like *tante-goed* (and variations thereof) seems to be rarer than their counterpart *tante-hulle*.

Table 7 gives a summary of all the gender roles that could be identified from the data; this include not only kinship names, but also cases with first names, or cases where it was clear from the context whether the referent is male or female (e.g. *Pistorius-hulle* refers to the Paralympic athlete Oscar Pistorius and his legal team, and is therefore assigned a male interpretation). In the *hulle* and $goed_{1/2}$ constructions the profiled referents are predominantly male in two-thirds of all cases. This will make for a strong argument to explicitly include a node pertaining to male referents in the final categorisation network (see Sect. 7).

Table 7 Gender of profiled referents

Gender	*-hulle*	Ratio	*-goed*$_{1/2}$	Ratio	Total
Male	1,507	0.65	44	0.65	**1,551**
Female	812	0.35	24	0.35	**836**
	2,319		68		2,387

6 Schemas and Subschemas

It was pointed out in Sect. 1 that there is still no consensus on whether the *-hulle* and *goed*$_1$ constructions should be regarded as noun phrases, compounds, derived words, or new nodes ("an oddity") in a construction network. The aim of this section is to answer the question what these constructions are subschemas of. Are they compounds? If so, what kind of compound? If not, are they suffixal constructions? Or are they indeed new nodes in a construction network?

Den Besten (1996) provides three reasons why the *hulle* and *goed*$_1$ constructions should not be analysed as compounds, but rather as pronominals consisting of double NPs. He argues that the *hulle* construction is a "syntactic collocation" of an NP and the plural pronoun *hulle*, because:

(27) **Reason 1**: The x in [[x] *-hulle*] can be a coordinated NP, as in *Brian **en** Jakob-hulle* 'Brian **and** Jakob-3PL', rendering the analysis [[*Brian en Jakob*]$_{\text{NP}}$ *-hulle*]$_{\text{APL}}$;

(28) **Reason 2**: Such coordinated NPs can contain determiners as in ***die** Van der Merwe·s en **die** Steenkamp·s-hulle* **the** Van der Merwe·PL and **the** Steenkamp·PL-3PL 'both of the families, also together with others' (Den Besten's translation), rendering the analysis [[*die Van der Merwes en die Steenkamps*]$_{\text{NP}}$ *-hulle*]$_{\text{APL}}$.

(29) **Reason 3**: *Hulle* can be added to a simple NP of the type DET + N, as in ***die** kind·ers-hulle* **the** child·PL-them, rendering the analysis [[*die kinders*]$_{\text{NP}}$ *-hulle*]$_{\text{APL}}$; and

All three these reasons for discarding a potential morphological analysis could be refuted based on alternative bracketing, careful analysis of real-world data, and taking facts about Afrikaans morphology into consideration. For example, *Brian en Jakob-hulle* is inherently ambiguous: It could be analysed as either [[*Brian en Jakob*]$_{\text{NP}}$ *-hulle*]$_{\text{APL}}$ (as Den Besten (1996) postulates), or just as well as [*Brian en* [*Jakob-hulle*]$_{\text{APL}}$]$_{\text{NP}}$. Compare the following examples where the latter structure is more obvious (if not natural) than the previous, and there are therefore no grounds for rejecting *Jakob-hulle* as a potential compound:

(30) *Die Uil·e en Piet-hulle staan buite* ...
The Owl·PL and Piet-3PL stand outside ...
'The group of boys who call themselves the Owls, together with Piet and his crowd stand outside ...'

(31) *Jy en Tom-hulle is natuurlik ook ge·nooi.*
You and Tom-3PL is naturally also PST·invite.
'You, Tom, and his crowd are of course also invited.'

Nonetheless, it is not at all rare for a complex NP (such as a coordinated NP) to function as a left-hand constituent in Afrikaans compounds and derivations. Compare examples (32) to (35) with the structure $[\ [x]_{NPi}\ [y]_{Nj}]_{Nk} \leftrightarrow [\text{SEM}_j$ WITH RELATION R TO $\text{SEM}_i]_k$ (so-called compounding compounds), or examples (36) to (39) with the structure $[\ [x]_{NPi}\ [y]_{suffj}]_{Nk} \leftrightarrow [\text{SEM}_j$ WITH RELATION R TO $\text{SEM}_i]_k$ (so-called parasynthetic compounds):

(32) *doring-in-die-vlees-goed*
thorn-in-the-flesh-stuff
'stuff that bothers me'

(33) *bek-en-klou·seer*
mouth-and-hoof·sore
'hoof-and-mouth disease'

(34) *Waarheid-en-Versoeningskommissie*
Truth-and-Reconcilliation-commission
'Truth and Reconcilliation Commission'

(35) *Kuns en Kultuur-uitkoms·te*
Arts and Culture-outcome·PL
'outcomes of the subject Arts and Culture'

(36) *heen-en-weer·tjie*
backward(s)-and-forward(s)·DIM
'short visit'

(37) *oor-en-weer-prat·ery*
to-and-fro-talk·NMLZ
'chatting'

(38) *traak-my-nie·agtig*
touch-me-not·ADJZ
'heedless, negligent, inattentive'

(39) *laag-by-die-grond·s*
close-to-the-ground·ADJZ
'banal'

With *hulle* we also find forms that are orthographically and structurally similarly to these examples, thus not excluding a potential morphological analysis:

(40) *ou-Melitie-hulle*
old-Melitie-3PL
'ol' Melitie and her family'

(41) *Ver-Oupa-hulle*
Far-Granddad-3PL
'granddad and grandma who live far away'

(42) *wat-se-naam-hulle*
what-PART.GEN-name-3PL
'what's-his-name's crowd'

Pertaining to Den Besten's (1996) second and third argument against a morphological analysis, we should note firstly that neither cases like *die Steenkamp·s-hulle* (i.e. [*die* [[x]$_{\text{N.SURNAME}}$ [y]$_{\text{SUF.PL}}$] -*hulle*]$_{\text{APL}}$), nor cases like *die kinders-hulle* (i.e. [*die* [[x]$_{\text{N}}$ [y]$_{\text{SUF.PL}}$] -*hulle*]$_{\text{APL}}$) occur in the corpus data. Both Den Besten (1996: 15) and Donaldson (1993: 136) mention the possibility of a plural surname as a left-hand constituent in the *hulle* construction, but no evidence for this subschema could be found in our primary data.[13] Similarly, no instances could be found of plural kinship names and plural common nouns as left-hand constituents (e.g. *die oom·s-hulle* the uncle·PL-3PL; *die hond·e-hulle* the dog·PL-3PL), contrary to what is mentioned by, inter alia, Den Besten (1996) and Kempen (1969). Although Den Besten's (1996) argument doesn't focus on the plural marking of the left-hand constituent, the fact that we don't find left-hand constituents with plural marking in the data, opens up a stronger argument for a morphological analysis, since word-formation processes like compounding and derivation in Afrikaans mostly only allow singular forms as left-hand constituents.

Nonetheless, according to Den Besten's (1996) argument in reason 2 and 3, determiners like possessive pronouns (e.g. *my* in (43)), and definite articles (e.g. *die* in (44)) should be analysed as part of the *hulle* construction. Such an analysis is necessitated by his view that the *hulle* construction is pronominal, as illustrated by the fact that *my pa-hulle* or *die dominee-hulle* as a whole can be substituted by the single pronoun *hulle*.

(43) ***My pa-hulle*** *behoort tevrede te wees.* > ***Hulle*** *behoort tevrede te wees.*
my dad-3PL should content to be. > they should content be.
'My dad and mom / my dad and his friends should be content.'

(44) … ***die dominee-hulle*** *het die oggend daar aangekom …* > ***hulle*** *het die oggend daar aangekom*
… the reverent-3PL have the morning there arrived … > they have the morning there arrived
'… the reverent and his associates arrived there that morning …'

If we look at the part-of-speech categories of the left-hand collocates of the *hulle* construction (see Table 8, where collocate frequency $\geq$ 20) we notice that such NPs indeed very often include possessive pronouns (PN.POSS; n = 447), the

[13] However, note that singular surnames (e.g. *Botha-hulle* Botha-3PL) occur frequently in the data (n = 110; see Table 4 in Sect. 5), even though this subschema is never mentioned in the literature.

Table 8 Left-hand collocates of the *hulle* construction

POS category	Examples	Frequency
PREP	*by/vir/met/na*	601
PN.POSS	*my/haar/sy/jou*	447
CNJ	*en/of/as*	132
V	*is/het*	106
PN.REL	*dat/wat*	96
PART	*ou*	21
DET	*die*	20
		1,423

hypocoristic particle *ou* (PART; n = 21), and the definite determiner *die* (DET; n = 20) as grounding elements in the NP. As I have argued from a semantic point of view in Sect. 4, the presence of these grounding elements in the vicinity of the *hulle* and *goed* constructions is not surprising at all, but that doesn't mean that they have to be analysed as part of these constructions (like Den Besten (1996) does), as I will argue below.

From a morphological point of view, there is no need to analyse these left-hand collocates as part of the *hulle* and *goed* constructions. While Den Besten's (1996) bracketing renders the schema in (45), another analysis could just as well render a nonpronominal analysis as in (46) (where the NP as a whole can be replaced with a pronoun, but not the APL construction alone). Den Besten's argument against a morphological analysis hinges on his conclusion that an "asyndetic coordination analysis does not work" (1996: 17), and although I agree with him that an asyndetic coordination interpretation is not appropriate for these constructions, I don't agree that a morphological analysis is not possible, as I will argue below.

(45) $[\,[\,[a]_{DET}\ [x]_{N}\ ]_{NP}$ *-hulle*$]_{APL}$

(46) $[\,[a]_{DET}\ [\,[x]_{N}$ *-hulle*$]_{APL}\ ]_{NP}$

Literature on associative plurals most often follow some form of coordinate interpretation of these constructions (cf. (8) above). This definition might lead us to consider the *hulle* and *goed*$_1$ constructions as coordinate compounds, similar to (47). Moreover, coordinate nominal compounds are usually styled in Afrikaans with a hyphen between the two constituents, similar to *ma-hulle*.

(47) **Schema 7: coordinate compound** (Van Huyssteen and Verhoeven 2014)
$[\,[x]_{Zi}\ [y]_{Zj}]_{Zk} \leftrightarrow [SEM_i \text{AND/OR } SEM_j]_k$, where Z = N/V/ADJ/ADV/PREP
digter-skilder
poet-painter
'poet (and) painter'

There are several reasons why such an analysis would not be appropriate for the *hulle* and *goed*$_1$ constructions:

- Like in English (Plag 2003: 138–139), Afrikaans compounds usually have leftward stress, while nominal coordinate compounds have rightward stress (i.e. *digter-skilder*). Den Besten (1996) states about the *hulle* construction (but also applicable to $goed_{1/2}$ constructions) that "main stress does not fall on *hulle* but on X" – similar therefore to, for example, subordinate compounds.
- Coordinate compounds require that both constituents should have the same part-of-speech subcategory (e.g. person name + person name; transitive verb + transitive verb), and that the resulting compound also has the same part-of-speech subcategory. As is evident from Sects. 4 and 5, this is not the case in the *hulle* and $goed_{1/2}$ constructions. On a very high level of abstraction, one could say that the *hulle* construction is an elaboration of a nominal + nominal compound (where a nominal is defined as a grounded NP; Langacker 2008: 310), but the more precise, lower-level part-of-speech categorisation reveals that the *hulle* and $goed_1$ constructions should not be regarded as coordinate compounds.
- Afrikaans coordinate compounds, like their Dutch equivalents (Booij and Van der Wouden 2016), usually have final plural marking (e.g. *digter-skilder·s* poet-painter·PL 'poet-painters'), although double plural marking is also possible (e.g. *digter·s-skilder·s* poet·PL-painter·PL 'poets-painters'). Despite claims in the literature that the left-hand component in the *hulle* and $goed_1$ constructions can be a plural, we haven't found any evidence in our data of such an extension of the schema (see Sect. 5).
- Moreover, coordinate compounds without plural marking (*digter-skilder*) always have a singular interpretation ('s/he is a poet and painter), unlike the *hulle* and $goed_1$ constructions that always have plural interpretations. In this sense, these constructions are more like true Sanskrit itaretara dvandva compounds (Egenes 2003: 211–212) of the kind *mātā-pitarau* mother-father 'parents'. However, the constituents in these dvanda compounds are always singular, unlike the *hulle* and $goed_1$ constructions.
- Most importantly, coordinate compounds are in essence asyndetic, expressing an AND relationship between the two constituent. Den Besten (1996: 16) points out that the *hulle* construction is usually "translated as 'X and his/her/their folks', although that is somewhat imprecise". He continues to argue that "*Pa-hulle* in the reading 'Dad and his folks' does not mean 'Dad and THEM' (or 'Dad and STUFF' for the $goed_1$ construction) (i.e. asyndetic coordination) because there is no independent reference for *hulle* 'them' or *goed* 'stuff'. In order to make the referential properties of *hulle* and *goed* explicit we should rather rephrase 'Dad and his folks' as something like 'the group surrounding and including Dad'" (Den Besten 1996; cf. (9) above). In supporting this interpretation, we can then conclude that the *hulle* and $goed_1$ constructions should not be analysed as coordinate compounds, but perhaps rather as subordinate compounds, similar to (48).

(48) **Schema 8: subordinate compound** (based on Van Huyssteen and Verhoeven 2014)

[$[x]_{Zi}$ $[y]_{Zj}]_{Zk}$ ↔ [SEM_jWITH RELATION R TO $SEM_i]_k$, where the Z of [x] = N/V/ADJ/ADV/NUM/PREP/P/Sw; and the Z of [y] = N/ADJ/V/V-NMLZ/V-ADJZ/Sw[14]

sjokolade·koek

chocolate·cake

'chocolate cake' = [CAKE CONTAINING CHOCOLATE]

Since subordinate compounds usually carry left-hand stress, this analysis corresponds to the stress patterns of the *hulle* and all the *goed* constructions. The $goed_3$ construction can be analysed readily and unproblematically as a subordinate compound: *kooi·goed* bed·things 'bedding' is simply paraphrased as [THINGS RELATED TO/USED ON BED] (cf. schema in (6) above). However, it would be futile to attempt to analyse the $goed_2$ construction as a noun + adjective compound, unless one regards it as a left-headed compound, which would be rare (though not exceptional) in Afrikaans. Such an analysis, however, does not account for the fact that *goed* doesn't mean 'good' anymore, but rather 'important' or 'dear'.

A subordinate compound analysis of the *hulle* and $goed_1$ constructions also brings us closer to Den Besten's (1996) and Vassilieva's (2008) semantic interpretation of associative constructions, as postulated in (9) above. A small-scale, informal pole[15] on a Facebook group for Afrikaans language practitioners also confirms this interpretation: 87% of the 52 respondents considered the subordinate interpretation [THE GROUP INDIVIDUALS WHICH X IS PART OF] most natural, while 13% chose the coordinate interpretation [X AND OTHERS ASSOCIATED WITH HIM/HER]. Nobody chose the asyndetic option [X AND THEY/THEM].

However, two problems remain with such a subordinate compound analysis. There is still no independent reference (Den Besten 1996) for *hulle* or $goed_1$. If we respect the inheritance principle, the analysis would imply the subschemas:

[$[x]_{Ni}$ -$hulle_{PN.3PL}]_{N.APL}$ ↔ [**THEY** WITH SALIENT MEMBER $SEM_i]_k$,
[$[x]_{Ni}$ (-)$goed_{PN.INDF.PL}]_{N.APL}$ ↔ [**STUFF/THEY** WITH SALIENT MEMBER $SEM_i]_k$.

In addition, the problem regarding the possessive pronouns, the hypocoristic particle *ou*, and the definite determiner *die* is still not resolved by such an analysis (cf. the schema in (46) above).

[14] Sw = semi-word.

[15] https://www.facebook.com/groups/taaltameletjies/permalink/1407068472741388/

The solution proposed here is that *hulle* and $goed_{1/2}$ should be analysed as suffixoids on the continuum between syntax and morphology, and compounding and derivation (Van Goethem 2008). Booij (2005: 114) defines affixoids as "morphemes which look like parts of compounds, and do occur as lexemes, but have a specific and more restricted meaning when used as part of a compound". Additionally, Booij and Hüning (2014) characterise affixoids "as the lexically specified parts of constructional idioms ... [i.e.] schemas for subsets of compounds in which one of the slots is lexically fixed." The notion holds that the independent lexeme *goed* ('they; things/stuff; good') occurs regularly in the $goed_{1/2}$ construction, which is seen as a constructional idiom where the right-hand slot is lexically fixed (with *goed*). *Goed* then develops a specialised, dependent meaning (i.e. [GROUP WITH SALIENT MEMBER SEM_i] and [SEM_i, WHO IS IMPORTANT/DEAR TO ME]), so that it might eventually grow into a bound morpheme (mostly derivational first, then inflectional). Given the idea of a hierarchical lexicon, these constructions could then be considered primarily as subschemas of the subordinate compound construction (schema 8; following Booij's (2010) interpretation), and simultaneously of the more general category-preserving suffixal construction (schema 9).

(49) **Schema 9: category-preserving suffixal construction**
$[\ [X]_{Zi}\ [y]_{SUF.CN}]_{Zk} \leftrightarrow [SEM_{SUF}$ RELATED TO $SEM_i]_k$
huis·ie
house·DIM
'small house'

Importantly, when *hulle* and $goed_{1/2}$ are characterised as affixoids in constructional idioms, we should note that this doesn't imply a new category of morphemes or word-formation processes. Rather, within the framework of construction morphology, it affords us the opportunity to acknowledge and describe phenomena that lie in-between affixes and lexical words, and in-between compounding (e.g. schema 8) and derivation (e.g. schema 9). As Booij and Hüning (2014) put it: "The term 'affixoid' is a useful descriptive term to denote the phenomenon of bound meanings for words when embedded in complex words", and that it "does not force us to make an absolute distinction between compounding and derivation".

Such an analysis provided a solution for the independent referential problem, since the specialised meaning of *hulle* and $goed_1$ in these constructions developed into [GROUP], while $goed_2$ developed into [WHO IS IMPORTANT/DEAR TO ME]. The group or person is then specified by the referent [X], to render the respective meanings [GROUP WITH SALIENT MEMBER X] and [X, WHO IS IMPORTANT/DEAR TO ME].

Also, if viewed as affixoids, it opens the potential to analyse them as phrasal affixes (Anderson 1992) that also attach to NPs, similar to the English genitive (e.g. *King George's birthday*, or *my dad's book*), or the Dutch genitive (*Koning Willem-*

Alexander·s verjaardag ‘King Willem-Alexander’s birthday’, or *mijn vader·s boek* ‘my dad’s book). Although much rarer in Afrikaans, phrasal affixes are not exceptional; compare for instance examples (36) to (42), as well as (50) to (52).

(50) *Ho Tsji Minh·stad·t·er*
Ho Chi Minh·city·LK·NMLZ
‘inhabitant of Ho Chi Minh City’

(51) *ter tafel ge·leg·d·e (mosie) < (mosie) ter tafel lê*
on table PTCP·lay·PTCP·ATTR (motion) < (motion) on table lay
‘(motion) has been tabled/submitted’ < ‘to table/submit (motion)’

(52) *voor die hand ligg·end < voor die hand lê*
before the hand lie·PTCP < before the hand lie
‘obvious’ < ‘to make obvious’

Furthermore, Stevens (2005) argues that the notion of affixoids is especially useful for describing and understanding morphological change, while Booij (to appear) also points out that “morphology often derives historically from syntax,” resulting in transitional cases like the *hulle* and $goed_{1/2}$ constructions. Some traces in our data suggest that *hulle* might already be more grammaticalized than what was previously not even considered by other scholars. Compare the reduced (enclitic) forms *’le* and *-le* of *hulle*, which combines with NPs containing kinship names and person names ending in [a:] in the following examples:

(53) *Sy ma·**’le** het ge·skei . . .*
His mom·3PL have PST·divorce . . .
‘His parents got divorced . . . ’

(54) . . . *in haar ma**-’le** se kamer* . . . (JLAFK)
. . . in her mom-3PL PART.GEN room . . .
‘. . . in her parent’s room . . . ’

(55) . . . *ek en An Trooi sit by Sanna**-’le** . . .* (JLAFK)
. . . I and Aunt Trooi sit with Sanna-3PL . . .
‘. . . Aunt Trooi aan I sit with Sanna and her crowd . . . ’

(56) *Waa·’s Kanna**-le** dan?*
Where·is Kanna-3PL then?
‘Where’s Kanna and her crowd then?’

There are only five such examples in all the available corpora of edited texts, but a Google search revealed that it is seemingly a productive form in unedited texts, like on social media. Forty-six examples with *ma* ‘mom’, and 29 with *pa* ‘dad’ were found, as in (57) below (by a famous Afrikaans pop singer, posting a photo of her and her family):

(57) *Ek en @bobbyvjaarsveld en @derickhougaard Anna, Sion, en my pa·**'le!***
I and @bobbyvjaarsveld and @derickhougaard Anna, Sion, and my dad·3PL!
'Me, Bobby, Derick, Anna, Sion, and my parents!'

This development is not surprising. Vassilieva (2008: 345) points out that Daniel (2000: 47–48) "observed that group expressions used as associative markers tend to show signs of phonetic reduction when compared to their independent lexical counterparts, which is a tell-tale sign that we are dealing with lexicalization of functional heads." As is clear from the examples above, Daniel's observation also rings true for Afrikaans, although in the view held in this chapter, it is a tell-tale sign of the grammaticalization (rather than lexicalisation) of the *hulle* construction.

Revised schemas of the initial schemas (Sect. 1) are presented in (58) to (61). Note that the *hulle* and $goed_{1/2}$ constructions are represented as constructional idioms, where *hulle* and $goed_{1/2}$ are fixed as right-hand constituents. The respective schemas also represent the specialised meanings that have developed in these constructions. Schemas 3 and 4 are not repeated here, since no evidence for the existence of those constructions could be found.

(58) **Schema 1 (revised): *hulle* construction (APL)**
$[\ [x]_{Ni}$-*hulle*$]_{N.APLj} \leftrightarrow [$GROUP WITH SALIENT MEMBER SEM$_i]_j$
pa-hulle
dad-they
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

(59) **Schema 2 (revised): *goed*$_1$ construction (APL)**
$[\ [x]_{Ni}$ (-)*goed*$]_{N.APLj} \leftrightarrow [$GROUP WITH SALIENT MEMBER SEM$_i]_j$
pa-goed (or *pa·goed*)
dad-they (or dad·they)
'dad and mom; dad, mom and my other siblings; dad and his friends, etc.'

(60) **Schema 5 (revised): *goed*$_2$ construction**
$[\ [x]_{Ni}$*goed*$]_{Nj} \leftrightarrow [$SEM$_i$WHO IS IMPORTANT/DEAR TO ME$]_j$
pa·goed
dad·good
'my dear/good dad'

(61) **Schema 6: *goed*$_3$ construction**
$[\ [x]_{Ni}goed_{N(mass)}]_{Nj} \leftrightarrow [$THINGS/STUFF RELATED TO SEM$_i]_j$
kooi·goed
bed·things or bed·stuff
'bedding (like sheets, duvets, etc.)'

7 Summary

Based on the general formal and semantic characterisation of the *hulle* and *goed* constructions in Afrikaans, I conclude that the *hulle* and $goed_{1/2}$ constructions should be analysed as constructional idioms, in-between subordinate compounds and category-preserving suffixal constructions, while the $goed_3$ construction is a subschema of subordinate compounds. The words of Lowe (2013) sums it up: "Linguistic categorization is rarely neat, insofar as linguistic phenomena rarely fit absolutely into the boxes we construct for them. While there is something theoretically elegant about being able to say that the [*hulle* and *goed* constructions are] purely [compounds], or purely [affixal], the evidence does not support either absolute analysis." [My adaptations – GBVH.].

Since "... the lexicon consists of a network of constructions on different levels of abstraction, ranging from very abstract schemas to individual words" (Hüning and Booij 2014), we can postulate a categorisation network that not only includes high-level, schematic nodes, but also specific linguistic expressions (e.g. highly entrenched instances like *pagoed* and *magoed*). In Fig. 4, when a subschema is fully compatible with a higher-level schema (i.e. an elaboration of that schema), it is indicated with a solid arrow; when it conflicts to some degree (i.e. an extension of that schema), it is indicated with a dashed arrow (Langacker 2008: 17–18). Perceived degrees of prototypicality (also based on frequency counts) are indicated with the thickness of lines: the thicker a line, the more prototypical the subschema. Similarities between schemas are indicated with dotted lines. For convenience of arrangement and surveyability, not each and every lexicalised item, or even finer details of some schemas, are included here.

In future, this categorisation network could be expanded to include diachronic information about the various linguistic sources of these constructions. As Booij (to appear) points out: "... it is important to understand the differences and similarities between phrasal and morphological constructions, and it may not always be easy to make this distinction due to this historical source of compounds." In my opinion, the constructionalization approach of, amongst others, Hilpert (2013), and Traugott and Trousdale (2013), holds much promise to better our understanding of the constructional changes involved in the genesis of these constructions.

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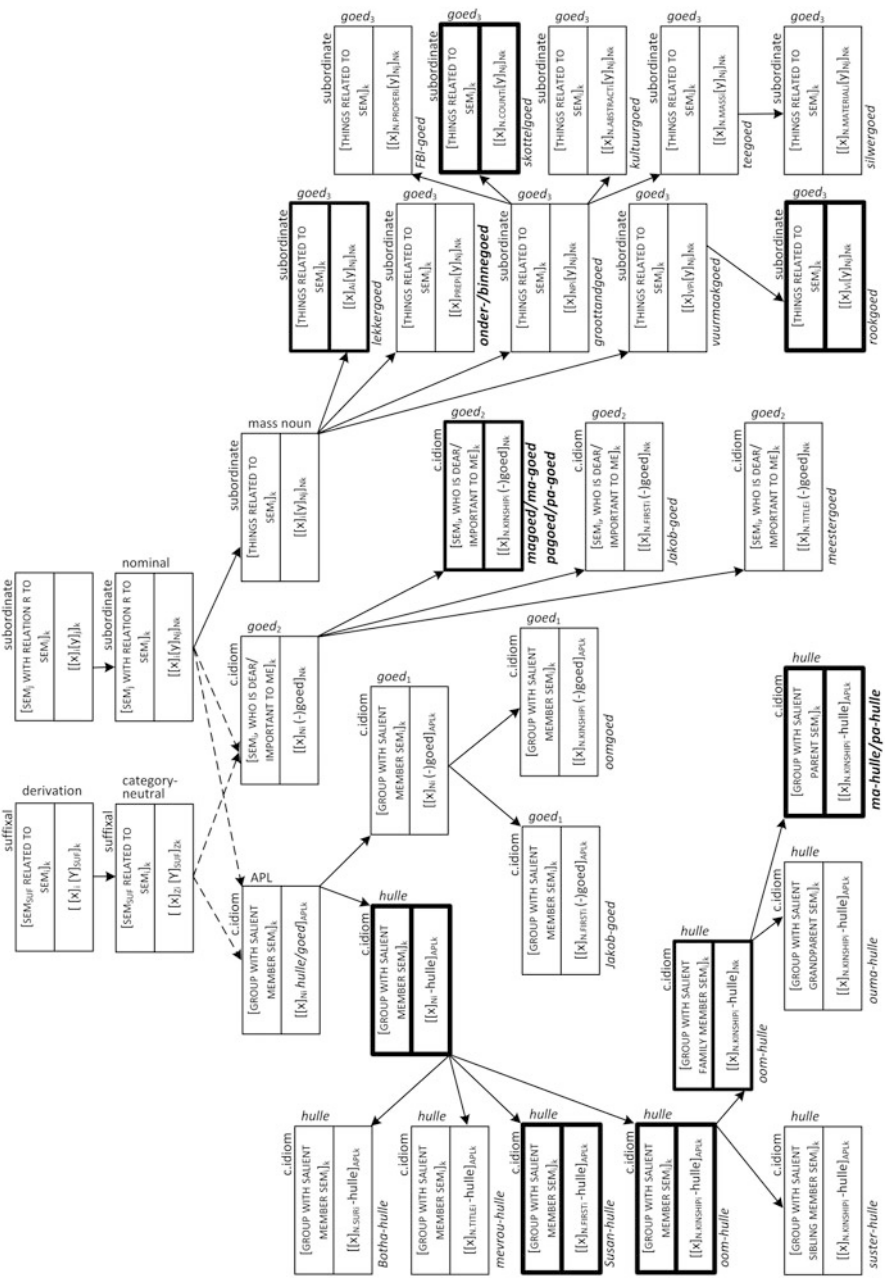

Fig. 4 Categorisation network

Appendix

Table 9 Overview of literature on the associative plural in Afrikaans

Source	Focus	Approach	Stratum	Construction
Booij (2010)	*hulle*	Synchronic	–	Morphological (compound)
Bosman (1923)	*hulle*	Diachronic	Creole (Khoekhoe)	–
Bouman and Pienaar (1946)	*hulle*	Synchronic	–	Morphological (compound)
Bouman (1926)	*hulle*	–	Creole	–
Combrink and Spies (1994)	*hulle*	Synchronic	–	(Orthography)
Daniel and Moravcsik (2013)	*hulle*	Synchronic	–	Morphological (periphrastic)
Den Besten (1989)	*hulle*	Diachronic	Creole (Khoekhoe)	–
Den Besten (1996)	***hulle***	**Synchronic Diachronic**	**Creole (Khoekhoe)**	**Syntactic**
Den Besten (2001)	***hulle/goed***	**Diachronic**	**Creole (Khoekhoe; Malay)**	**Syntactic**
Deumert (2004)	*hulle/goed*	Diachronic	Creole	Morphological (suffix)
Donaldson (1993)	*hulle*	Synchronic	–	Morphological (compound: p. 50; suffix: p. 136)
Du Toit (1905)	***hulle/goed***	**Synchronic[a] Diachronic**	**Creole (Malay/Indo-** Portuguese; also Khoekhoe)	**hulle: Syntactic goed: Morphological**
Eksteen (1984)	*goed*	Synchronic	–	Morphological (suffix)
Hesseling (1905)	*hulle*	Diachronic	Creole (Malay/Indo-Portuguese)	Syntactic
Hesseling (1923) [1899]	*hulle*	Diachronic	Creole (Malay/Indo-Portuguese)	Syntactic
Jenkinson (1982)	*hulle*	Synchronic	–	Morphological
Jenkinson (1984)	*hulle/goed*	Synchronic[a]	–	Morphological
Kirsten (2016)	*hulle*	Synchronic	–	–
Kempen (1946)	***hulle***	**Diachronic**	**Germanic (Frisian)**	**Morphological (compound)**
Kempen (1969)	***hulle/goed***	**Synchronic Diachronic**	**Germanic (Frisian)**	**Morphological (compound)**
Le Roux (1923)	*hulle*	Diachronic	Creole (West African slaves)	Morphological

(continued)

Table 9 (continued)

Source	Focus	Approach	Stratum	Construction
Le Roux (1926)	*hulle/goed*	Diachronic	Creole (West African slaves)	Morphological (inflection)
Le Roux (1939)	*hulle*	Diachronic	Creole (West African slaves)	Morphological (inflection)
Le Roux (1947)	*hulle*	Diachronic	Creole (West African slaves; also Khoekhoe)	Morphological (inflection)
Links (1989)	*goed*	Synchronic[a]	Creole (Khoekhoe)	Morphological (compound)
Nienaber (1994)	***hulle/goed***	**Diachronic**	**Creole (Khoekhoe)**	**–**
Odendal (1976)	*hulle*	Synchronic	–	–
Ponelis (1993)	*hulle*	Diachronic	Creole	Syntactic
Rademeyer (1938)	*goed*	Synchronic	–	Morphological
Smith (1940)	*hulle*	Diachronic	Germanic (Frisian)	Syntactic (Orthography)
Smith (1962)	*hulle*	Diachronic	–	Syntactic (Orthography)
Valkhoff 1966	*hulle*	Diachronic	Creole (Malay/Indo-Portuguese)	–
Valkhoff (1972)	*hulle*	Diachronic	Creole (Malay/Indo-Portuguese)	–
Van der Merwe (1964)	*hulle/goed*	Diachronic	Germanic (Frisian)	Lexical
Van Rensburg (1989)	*hulle*	Diachronic	Creole (Khoekhoe)	–
Van Rensburg (1998)	*hulle/goed*	Diachronic	Creole (Khoekhoe)	–
Vassilieva (2008)	*hulle*	Synchronic	–	Syntactic
Webb (1989)	*hulle/goed*	Diachronic	Creole (Khoekhoe)	Morphological (inflection)

[a]Indicates data-driven studies (e.g. based on field work); a dash indicates that the feature is not relevant, or that it is not clear what the author's stance is on the matter; references in boldface deals primarily/exclusively with the associative plural

References

Anderson, S.R. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.

AWS[1]: Le Roux, T.H., Malherbe, D.F., and Smith, J.J. 1917. *Afrikaanse woordelijs en spelreëls*. 1st ed. Commissioned by the South African Academy for Language, Literature and Arts. Bloemfontein: Het Volksblad-Drukkerij.

AWS[6]: Taalkommissie (comp.), commissioned by the South African Academy for Science and Arts. 1953. *Afrikaanse woordelys en spelreëls*. 6th ed. Cape Town: Nasionale Boekhandel.

AWS[10]: Taalkommissie (comp.), commissioned by the South African Academy for Science and Arts. 2009. *Afrikaanse woordelys en spelreëls.* 10th ed. Cape Town: Pharos.

AWS[11]: Taalkommissie (comp.), commissioned by the South African Academy for Science and Arts. 2017. *Afrikaanse woordelys en spelreëls.* 11th ed. Cape Town: Pharos.

Baayen, R.H., and R. Lieber. 1991. Productivity and English derivation: A corpus-based study. *Linguistics* 29: 801–844.

Bauer, L. 2003. *Introducing linguistic morphology*. 2nd ed. Edinburgh: Edinburgh University Press.

Bauer, L., R. Lieber, and I. Plag. 2013. *The Oxford reference guide to English morphology*. Oxford: Oxford University Press.

Berg, K. 2013. Graphemic alternations in English as a reflex of morphological structure. *Morphology* 23: 387–408.

Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O.E. Pfeiffer, and F. Rainer, 109–132. Amsterdam: John Benjamins.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. to appear. Compounds and lexical phrases in Dutch: Complementarity and competition. In *Complex lexical units: Compounds and phrases*, ed. B. Schlücker. Mannheim/Berlin: IDS/Mouton de Gruyter.

Booij, G., and M. Hüning. 2014. Affixoids and constructional idioms. In *Extending the scope of construction grammar*, ed. R. Boogaart, T. Colleman, and G. Rutten, 77–106. Berlin: Mouton de Gruyter.

Booij, G., and Van der Wouden, T. 2016. *Coordinative compounds*. Taalportaal. http://taalportaal.org/taalportaal/topic/pid/topic-13998813295676713. Accessed 3 Mar 2017.

Bosman, D.B. 1923. *Oor die ontstaan van Afrikaans*. 2nd ed. Amsterdam: Swets en Zeitlinger.

Bouman, A.C. 1926. Onderzoekingen over Afrikaanse syntaxis. *Annale van die Universiteit van Stellenbosch* IV-B(3 November): 1–72.

Bouman, A.C., and E.C. Pienaar. 1946. *Afrikaanse spraakkuns*. Stellenbosch: Pro Ecclesia.

Combrink, J.G.H., and J. Spies. 1994. *Sakboek van regte Afrikaans*. Cape Town: Tafelberg.

Daniel, M. 2000. *Tipologija Associativnoj Mnozhestvennosti* [Typology of Associative Plurality]. Doctoral dissertation, Russian State University for Humanities, Moscow.

Daniel, M., and E. Moravcsik. 2013. The associative plural. In *The world atlas of language structures online*, ed. M.S. Dryer and M. Haspelmath. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/chapter/36. Accessed 5 Feb 2017.

De Kleine, C. 1997. The verb phrase in Afrikaans: Evidence of creolization? In *The structure and status of pidgins and creoles: Including selected papers from the meeting of the Society for Pidgin and Creole Linguistics*, ed. A.K. Spears and D. Winford, 289–307. Amsterdam: John Benjamins.

Den Besten, H. 1989. From Khoekhoe foreigner talk via Hottentot Dutch to Afrikaans: The creation of a novel grammar. In *Wheels within wheels: Papers of the Duisburg symposium on Pidgin and Creole languages*, ed. M. Pütz and R. Dirven, 207–249. Frankfurt am Main: Peter Lang.

———. 1996. Associative DPs. *Linguistics in the Netherlands* 13: 13–24. https://doi.org/10.1075/avt.13.04bes.

———. 2001. The complex ancestry of the Afrikaans associative constructions. In *Taallandskap: Huldigingsbundel vir Christo van Rensburg*, ed. A. Carstens and H. Grebe, 49–58. Pretoria: Van Schaik.

Deumert, A. 2004. *Language standardization and language change: The dynamics of Cape Dutch*. Amsterdam: John Benjamins.

Donaldson, B.C. 1993. *A grammar of Afrikaans*. Berlin: Walter de Gruyter.

Du Toit, P.J. 1905. *Afrikaansche studies*. Ghent: Siffer.

Egenes, Th. 2003. *Introduction to Sanskrit, Part 1*. 3rd ed. New Delhi: Motilal Banarsidass.

Eksteen, L.C. 1984. *'n Beeld van Afrikaanse woorde*. Pretoria: Academica.

Fletcher, W.H. 2007. Concordancing the web: Promise and problems, tools and techniques. *Language and Computers: Corpus Linguistics and the Web* 59: 25–45. https://doi.org/10.1163/9789401203791_004.

Güldemann, T. 2008. A linguist's view: Khoe-Kwadi speakers as the earliest food-producers of southern Africa. *Southern African Humanities* 20 (1): 93–132.

HAT. 2015. *Handwoordeboek van die Afrikaanse taal*, ed. J. Luther, F. Pheiffer, and R.H. Gouws, 6th ed. Cape Town: Pearson. Retrieved from https://www.microsoft.com/en-gb/store/apps/windows.

HCSA, and J. Kirsten. 2015. *Historiese korpus van Standaardafrikaans 1.0*. Vanderbijlpark: Noordwes-Universiteit.
Hesseling, D.C. 1905. *Het Negerhollandsch der Deense Antillen: Bijdrage tot de geschiedenis der Nederlandse taal in Amerika*. Leiden: Sijthoff.
———. 1923. *Het Afrikaans.* 2nd ed. Leiden: N.V. Boekhandel en Drukkerij.
Hilpert, M. 2013. *Constructional change in English: Developments in allomorphy, word formation, and syntax*. Cambridge: Cambridge University Press.
Hüning, M., and G. Booij. 2014. From compounding to derivation. The emergence of derivational affixes through 'constructionalization'. *Folia Linguistica* 42 (2): 579–604.
Jenkinson, A.G. 1982. As ek jy is en jy is hy, wie is ons? In *Wat sê jy?: Studies oor taalhandelinge in Afrikaans*, ed. G.J. van Jaarsveld, 99–126. Johannesburg: McGraw-Hill.
———. 1984. Deel II: Die Afrikaans van die Griekwas – 'n taalkundeperspektief: Morfologie. In *Finale verslag van 'n ondersoek na die Afrikaans van die Griekwas van die tagtigerjare*, ed. C. van Rensburg, 229–253. Pretoria: RGN.
JLAFC, and J. Luther. 2017. *Afrikaanse fiksiekorpus 1.0*. Cape Town: Personal collection.
Kempen, W. 1946. Samestellinge met "hulle" nie Kreools nie? *Die Huisgenoot*, 20–21; 56, 15 March.
———. 1969. *Samestelling, afleiding en woordsoortelike meerfunksionaliteit in Afrikaans*. Cape Town: Nasou.
Kirsten, J. 2016. *Grammatikale verandering in Afrikaans van 1911–2010*. Unpublished doctoral thesis. Vanderbijlpark: North-West University.
Langacker, R.W. 2000. *Grammar and conceptualization*, Cognitive Linguistics Research. Vol. 14. Berlin: Mouton de Gruyter.
———. 2008. *Cognitive grammar: A basic introduction*. Oxford: Oxford University Press.
LAC: Projekt Deutscher Wortschatz. 2017. *Afrikaans corpus*. Leipzig: Universität Leipzig, Abteilung Automatische Sprachverarbeitung. http://corpora.uni-leipzig.de/en.
LAPA: Lapa-uitgewers & CTexT. 2017. NWU/Lapa corpus 1.1. Potchefstroom: CTexT, North-West University. http://viva-afrikaans.org. Accessed 27 Jan 2017.
Le Roux, J.J. 1923. *Oor die Afrikaanse sintaksis I: Woordgroepe en volsin*. Amsterdam: Swets en Zeitlinger.
Le Roux, J.J. 1926. Ismes in Afrikaans. In *Gedenkboek ter ere van die Genootskap van Regte Afrikaners (1875–1925)*, ed. ASB-kommissie, 329–364. Potchefstroom: Afrikaanse Studentebond.
Le Roux, J.J. 1939. *Praatjies oor ons taal*. Kaapstad: Nasionale Pers. http://hdl.handle.net/10394/8405.
———. 1947. Die bou van die Afrikaanse taal. In *Kultuurgeskiedenis van die Afrikaner Volume 2*, ed. C.M. van den Heever and P. de Villiers Pienaar, 40–72. Kaapstad: Nasionale Pers.
Links, T. 1989. *So praat ons Namakwalanders*. Cape Town: Tafelberg.
LK: Projekt Deutscher Wortschatz. 2016. *Afrikaans corpus*. Leipzig: Universität Leipzig, Abteilung Automatische Sprachverarbeitung. http://corpora.uni-leipzig.de/en. Accessed 27 Jan 2017.
Lombard, J., ed. 2014. *Die ding in die riete*. Cape Town: Tafelberg.
Lowe, J.J. 2013. English possessive's: Clitic and affix. In *LSA annual meeting extended abstracts*, 4. Retrieved from http://www.linguisticsociety.org/sites/default/files/3524-6826-1-SM.pdf
MM: Maroela Media and CTexT. 2017. NWU-Maroela Media corpus 1.1. Potchefstroom: CTexT, North-West University. http://viva-afrikaans.org. Accessed 27 Jan 2017.
Moravcsik, E. 2003. A semantic analysis of associative plurals. *Studies in Language* 27 (3): 469–503.
Naudé, J.A. 2005. Translation and cultural transformation: The case of the Afrikaans Bible translations. In *Translation and cultural change: Studies in history, norms and image-projection*, ed. E. Hung, 19–42. Amsterdam: John Benjamins.
NCHLT: Department of Arts and Culture and CTexT. 2017. Afrikaans NCHLT text corpora. Potchefstroom: CTexT, North-West University. https://doi.org/ISLRN: 544-932-849-161-3. Accessed 27 Jan 2017.

Neef, M. 2012. Graphematics as part of a modular theory of phonographic writing systems. *Writing Systems Research* 4 (2): 214–228.
Nienaber, G.S. 1994. Pa-hulle is kreools. Suid-Afrikaanse tydskrif vir taalkunde supplement 21: 14–67.
Odendal, F.F. 1976. Oor die aanspreekvorme in Afrikaans. In *Gedenkbundel H.J.J.M. van der Merwe*, ed. W.J. de Klerk and F.A. Ponelis, 105–113. Pretoria: Van Schaik.
Ó Séaghdha, Diarmuid. 2008. *Learning compound noun semantics*. PhD thesis, University of Cambridge, Cambridge.
Paradis, C. 2001. Adjectives and boundedness. *Cognitive linguistics* 12 (1): 47–64.
PCSA, and F.A. Ponelis. 1976. Ponelis Korpus van Gesproke Afrikaans 1.0. Stellenbosch: Universiteit Stellenbosch.
PK: Protea Boekhuis & CTexT. 2017. PUK/Protea Boekhuis corpus 2.1. Potchefstroom: CTexT, North-West University. http://viva-afrikaans.org. Accessed 27 Jan 2017.
Plag, I. 2003. *Word-formation in English*. Cambridge: Cambridge University Press.
Ponelis, F.A. 1979. *Afrikaanse sintaksis*. Pretoria: Van Schaik.
———. 1993. *The development of Afrikaans*. Frankfurt am Main: Peter Lang.
Rademeyer, J.H. 1938. *Kleurling-Afrikaans: die taal van die Griekwas en Rehoboth-Basters*. Amsterdam: Swets en Zeitlinger.
RSG: Radio Sonder Grense & CTexT. 2015. RSG Afrikaans corpus 2.0. Potchefstroom: CTexT, North-West University. http://viva-afrikaans.org. Accessed 27 Jan 2017.
Sipma, P. 1913. *Phonology & grammar of modern West Frisian; with phonetic texts and glossary*. London: Oxford University Press.
Smith, J.J. 1940. Bespreek J.J. le Roux se Praatjies oor ons Taal. *Ons Eie Boek* 62(Junie): 18–20.
———. 1962. *Op ons taalakker*. Pretoria: Van Schaik.
Stevens, Ch.M. 2005. Revisiting the affixoid debate. On the grammaticalization of the word. In *Grammatikalisierung im Deutschen*, ed. T. Leuschner, T. Mortelmans, and S. de Groodt, 71–83. Berlin/New York: Mouton de Gruyter.
Taylor, J.R. 2002. *Cognitive grammar*. Oxford: Oxford University Press.
TK: Taalkommissie van die Suid-Afrikaanse Akademie vir Wetenskap en Kuns. 2011. Taalkommissie corpus 1.1. Potchefstroom: CTexT, North-West University. http://viva-afrikaans.org. Accessed 27 Jan 2017.
Traugott, E.C., and G. Trousdale. 2013. *Constructionalization and constructional changes*. Oxford: Oxford University Press.
Uys, M.D. 1983. *Die vernederlandsing van Afrikaans*. Unpublished D. Litt. thesis, University of Pretoria, Pretoria.
Valkhoff, M.F. 1966. *Studies in Portuguese and Creole*. Johannesburg: Wits University Press.
———. 1972. *New light on Afrikaans and "Malayo-Portuguese"*. Louvain: Peeters.
Van der Merwe, H.J.J.M. 1964. Taalbeïnvloeding en taalvermenging. In *Inleiding tot die taalkunde*, ed. H.J.J.M. van der Merwe, 214–236. Pretoria: Van Schaik.
Van Goethem, K. 2008. *Oud-leerling* versus *ancien élève*: A comparative study of adjectives grammaticalizing into prefixes in Dutch and French. *Morphology* 18: 27–49.
Van Huyssteen, G.B. 2010. (Re)defining component structures in morphological constructions: A cognitive grammar perspective. In *Cognitive approaches to word-formation*, ed. A. Onysko and S. Michel, 59–60. Berlin: Mouton de Gruyter.
———. 2017. Opname- en elimineringskriteria vir die Afrikaanse Woordelys en Spelreëls: Die geval emeritus. Deel 2. *Tydskrif vir Geesteswetenskappe* 57 (2): 346–368.
Van Huyssteen, G.B., and B. Verhoeven. 2014. A taxonomy for Afrikaans and Dutch compounds. In *Proceedings of the 25th international conference on Computational Linguistics (COLING 2014): The first workshop on Computational Approaches to Compound Analysis (ComAComA)*, 31–40. Dublin. http://gerhard.pro/publications
Van Rensburg, Ch. 1989. *'n Verkenning van Afrikaans: Gister*. Bloemfontein: Patmos.
———. 1998. *Op soek na Afrikaans*. Bloemfontein: UOVS.
———. to appear. *Die Taalkommissie se eerste honderd jaar*. Pretoria: Protea Boekhuis.

Vassilieva, M. 2008. A syntactic analysis of nominal and pronominal associative plurals. *University of Pennsylvania Working Papers in Linguistics* 14(1): 339–352. http://repository.upenn.edu/cgi/viewcontent.cgi?article=1042&context=pwpl

Verhoeven, B., G.B. Van Huyssteen, M.M. Van Zaanen, and W. Daelemans. 2014. *Annotation guidelines for compound analysi*, CLiPS Technical Report Series (CTRS) number 5. ISSN: 2033-3544. Antwerp: University of Antwerp.

VivA: Virtual Institute for Afrikaans. 2017. *Corpus portal*. http://viva-afrikaans.org. Accessed 27 Jan 2017.

WAT: *Woordeboek van die Afrikaanse Taal*. 2017. Stellenbosch: Buro van die WAT. In *VivA Woordeboekportaal* [VivA dictionary portal] (App) (1.2). https://www.microsoft.com/en-gb/store/apps/windows. Accessed 20 Feb 2017.

Webb, V.N. 1989. *Griekwa-Afrikaans binne intertaalkonteks*. Pretoria: Linguistic Society of Southern Africa.

WKJ: WatKykJy. 2017. Watkykjy.co.za corpus 1.1. WatKykJy.co.za. Retrieved from http://viva-afrikaans.org. Accessed 27 Jan 2017.

Part IV
Diachronic Case Studies

Schema Unification and Morphological Productivity: A Diachronic Perspective

Luise Kempf and Stefan Hartmann

Abstract Unified schemas which allow for deriving multiply complex word-formation products are a central concept in Construction Morphology (CxM). Based on examples such as *un*-V-*able* formations in English, it has been argued in the framework of Construction Morphology that unified schemas (in this case: [*un*[V-*able*]$_A$]$_A$) can be conceived of as short cuts in coining new complex words. In this paper, we explore three prospective cases of schema unification and discuss what kind of evidence supports the assumption of unified schemas. The first two case studies are diachronic in nature. Drawing on corpus analyses of data from the Early New High German period (1350–1650) and from the early stages of New High German, we show how the developments of the complex patterns diverge from the developments of their counterparts. To this end, we analyze the frequency and productivity of the (sub-)constructions and assess the semantics of the word-formation products. Firstly, nominalization with the suffix *-ung* has been shown to undergo a diachronic decrease in morphological productivity. However, unified schemas such as [*Be*-X-*ung*]$_N$ or [(PREF)-X-*ierung*]$_N$ are shown to be still productive, e.g. *Beplankung, Belaberung, Vercomedianisierung* (from www.wortwarte.de, a collection of neologisms). In a similar vein, complex derivation of the type [*un*-V-*lich*]$_{ADJ}$ 'un-V-able' is shown to have remained productive for a longer period of time than its simplex parent schema [V-*lich*]$_{ADJ}$. Moreover, many *un*-V-*lich* derivatives historically precede their unprefixed counterparts, or lack them altogether (*unwiderstehlich* 'irresistible', but **widerstehlich*). Our third case study explores present day German pseudo-participles (*bebrillt* 'bespectacled') using web data.The

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complex pattern can be shown to diverge stylistically from its parent schemas and also to provide semantically more uniform derivatives. Overall, our results show that the concept of unified schemas can help explain important differences in the development of the individual subpatterns in terms of morphological productivity and in terms of semantic aspects of the word-formation constructions.

Keywords Complex schema · Constructionalization · Parasynthetic formation · Productivity · Pseudo-participles · Schema unification

1 Introduction

Multiply complex word-formation products like *unforgettable* or *decaffeinated* pose a challenge to theories of morphology. As Plag (2005: 38) points out, the question emerges "how they are derived and what their internal structure may be." For instance, a derivative like *reorganization* could be analyzed as [*re*-[*organize-ation*]] or as [[*re-organize*-]*ation*] (cf. Plag 2005: 40). The analysis proves even more problematic in the case of so-called parasynthetic formations like *decaffeinate*, where neither *caffeinate* nor **decaffein* are attested before the complex derivative was coined (cf. Plag 1999: 110). Construction Morphology (CxM) therefore assumes multiply complex word-formation schemas, so-called unified schemas (cf. Booij 2010: 41–50). In CxM, word-formation products are seen as constructions, i.e. form-meaning pairings at various levels of abstraction (cf. e.g. Goldberg 2006). In a CxM framework, derivational patterns can be conceived of as partially filled constructional schemas with an open slot. Consider, for example, the schema [*un*-A]$_{A}$, which is instantiated in word-formation products like *unknown*, *unworthy*, and *undead*, or [V-*able*]$_{ADJ}$, which is instantiated in formations like *doable* and *believable*. As word-formation products can themselves serve as bases for word-formation patterns, it seems reasonable to assume that in the case of patterns that frequently go together, language users will "make use of short cuts in coining new complex words" (Booij 2007: 38). For instance, the aforementioned patterns [*un*-A]$_{A}$ and [V-*able*]$_{A}$ can be unified as in (1) (from Booij 2010: 42).

(1) [un-A]$_{A}$ + [V-able]$_{A}$ = [un-[V-able]$_{A}$]$_{A}$

This idea is informed by theoretical assumptions and empirical findings from cognitive psychology. Booij (2010: 5, 41) relates the concept of constructions to Rumelhart's (1980) concept of schemas, which, like constructions, are conceived of as having variables (open slots), representing knowledge at all levels of abstraction. In addition, and most importantly for the question at hand, constructions can embed within one another. Booij (2007: 38) also points to the empirically well-supported

hypothesis of production compilation (cf. Anderson et al. 2004), i.e. the idea that if a task is repeated multiple times, the representations of the individual productions involved are combined to ensure a smooth and rapid execution of the task.

In this paper, we argue that historical language data can provide additional support for the assumption of multiply complex word-formation schemas. For some word-formation patterns, it has been observed that their complex subschema became more productive over time and/or remained productive for a longer period of time than the corresponding simplex subschema (cf. e.g. Kempf 2016). In Sects. 2.1 and 2.2 of this paper, we systematically investigate two German word-formation patterns where this seems to be the case, namely nominal derivation with *-ung* and adjectival derivation with *-lich*. Corpus-based quantitative assessments of productivity are complemented by an in-depth analysis of a sample of the data, in which the first attestations of the derivatives in the sample are assessed using multiple sources (corpora and dictionaries). Section 2.3 discusses a further case study, investigating so-called pseudo-participles like *bebrillt* ('wearing glasses', lit. 'be-glassed'), for which no corresponding verb exists (**bebrillen*), on the basis of data from the largest currently available corpus of web data, DECOW14AX. This pattern is particularly interesting for our study because it arguably offers the most convincing arguments for the assumption of complex schemas. Most importantly, the pattern exhibits specific semantic properties (cf. Booij 2010: 45) that make the assumption of a complex schema seem superior both to a purely analogy-based explanation and to accounts that recur to unattested, but theoretically possible, "virtual" words. In Sect. 3, we discuss how the findings from the three case studies feed back into a constructionist theory of morphology and morphological change.

2 Case Studies

2.1 Case Study 1: Complex ung-Nominals

Our first case study investigates the development of German *ung*-nominalizations with a complex base, as compared to *ung*-nominals with a simplex base. In particular, we will focus on the pattern [PREF-X-*ung*], e.g. *Bespaßung* 'entertainment' (< *Spaß* 'fun'). The suffix *-ung* (< Old High German *-ingo/–ungo*) derived nouns from other nouns in its very early stages (cf. e.g. Paul 1897: 703; Horlitz 1986: 480). However, it very soon came to derive deverbal nouns, e.g. *Bewegung* 'movement' from *bewegen* 'to move' (cf. e.g. Pimenova 2002). Drawing on a corpus of Early New High German (ENHG, 1350–1650), Demske (2000) has already argued that while *ung*-nominalization experiences a steep increase in token frequency, its morphological productivity has decreased considerably from ENHG to New High German (NHG, 1650–today). She understands morphological productivity in terms of Baayen's (e.g. 1993, 2009) measure of "category-conditioned" or "potential productivity", i.e. the ratio of hapax legomena to the total number of tokens

belonging to a construction. Hartmann's (2016) quantitative analysis based on the Mainz Early New High German Corpus (MzENHG, Kopf 2016) and the GerManC corpus (Durrell et al. 2007) has lent further support to this hypothesis.[1]

However, if one looks at neologisms in *-ung* attested, for example, in *Wortwarte*, an online collection of neologisms found in the web which is updated on a daily basis, it seems that complex new formations occur quite frequently. These neologisms tend to follow the pattern [Prefix/Particle + Nominal or adjectival Base + *ung*], e.g. *Aufkalkung* 'up-chalk-ing', *Bebeutelung* 'be-bag-ing', *Beranzung* 'be-satchel-ing', *Entphilologisierung* 'dephilologization', *Verdenkmalung* 'monumentization', *Zerstreuselung* (roughly:) 'turning to crumbles', which might point to the conclusion that this particular sub-construction of *ung*-nominalization is still productive. This would also be in line with Demske's (2000: 399) observation that in present-day German, neologisms in *-ung* are restricted to denominal and deadjectival verbs with resultative meaning, such as *Vergreisung* ('aging', from *Greis* 'very old man'), *Verschneckung* ('snailing', from *Schnecke* 'snail') or *Verblödung* ('becoming stupid', from *blöde* 'dumb'). As pointed out in the Introduction, we suggest that the "detour" via the verb that Demske takes is not necessary if we assume a complex schema. However, the assumption that a complex (sub-)schema has been reanalyzed from instances of a word-formation pattern is only plausible if the subschema is somehow salient. In the simplest case, we can assume a correlation between high (type) frequency and the salience of a schema (Taylor 2002: 291; see Schmid 2007 for a more nuanced discussion on the notion of salience). We will therefore test the hypotheses that over time, (a) *ung*-nominals with complex bases have become more *frequent* (in terms of type and token frequency) as compared to simplex *ung*-nominals, and (b) *ung*-nominalization with complex bases becomes more *productive*, which should be reflected in the proportion of complex *ung*-nominals among hapax legomena and/or words first attested in the respective corpus period (for a discussion of hapax-based vs. first-attestation-based measures of productivity, see Kempf 2016).

To test these hypotheses, we use data from three different corpora:

(a) the Mainz Early New High German corpus (Kopf 2016), which consists of 80 texts covering the time span from 1500 to 1710. In sum, the corpus comprises c. 300,000 running word forms;
(b) the GerManC corpus (Durrell et al. 2007), which comprises about 600,000 words from 1650 to 1800;
(c) a balanced 1-million-word sample of the German Text Archive (*Deutsches Textarchiv*, DTA), covering six 50-year-periods from 1600 to 1900 (see Hartmann (2018) for more details).

The 21,163 *ung*-nominals (tokens; 2076 types) in the aggregated data from the three corpora have been annotated for whether their bases are prefixed or particle

[1] A reviewer correctly points out that this measure is not without problems. For an in-depth discussion of this issue (including the application of additional measures) see Hartmann (2018).

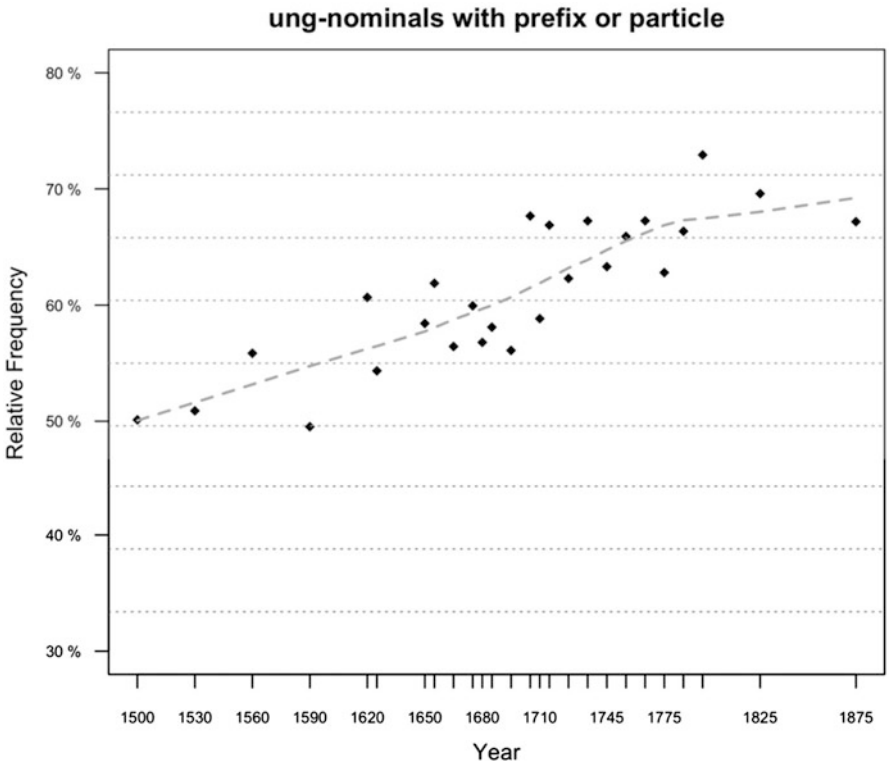

Fig. 1 Frequency of *ung*-nominals (tokens) with a prefixed or particle verb as base relative to the total number of *ung*-nominals in the respective corpus period

verbs. As Figs. 1 and 2 show, *ung*-nominals with complex bases (here: prefixed or particle verbs as base) become more prominent in terms of token frequency in the aggregated data from all three corpora. While they already make up for about half of the attestations at the beginning of the period under investigation, their share increases to around two thirds in the nineteenth century data. However, this is largely due to some derivatives which significantly gain in frequency. If we use type rather than token frequencies, the pattern is already much less clear, even though there is still a slight decrease in the relative frequency of types with simplex bases, relative to the total number of types in *-ung* (see Fig. 2). If we only take hapax legomena into account, or *ung*-nominals that are not attested in any previous corpus period, no clear pattern can be detected at all. Instead, the proportion of *ung*-nominals with complex bases remains quite consistently at the same, fairly high level in these cases. Thus, the data confirm hypothesis (a) introduced above (complex *ung*-nominals become more frequent), while they do not confirm hypothesis (b) (complex bases become more prominent as bases for newly coined *ung*-nominals). This might indicate that the preference towards complex bases already has developed in the time preceding these three corpora.

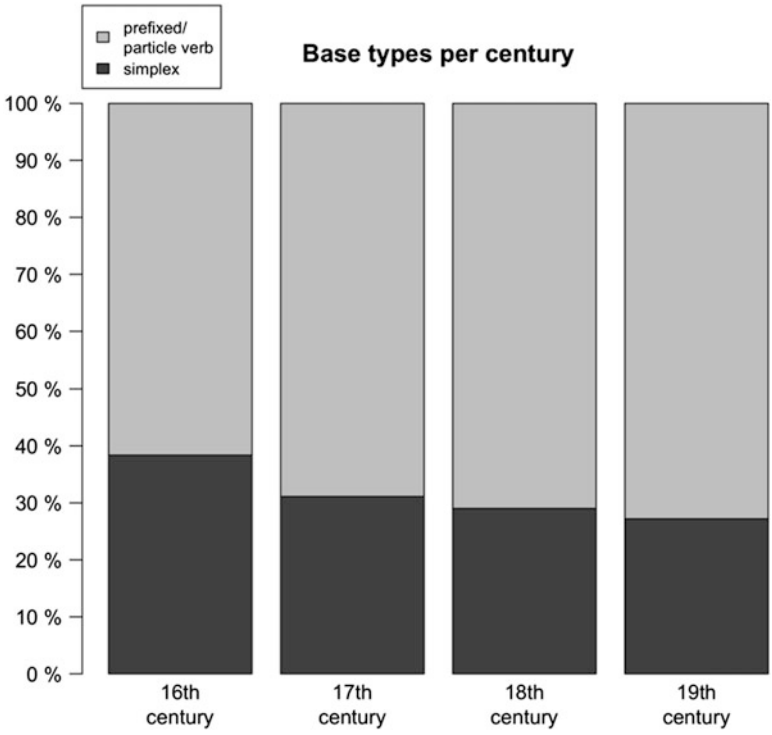

Fig. 2 Proportion of simplex vs. complex bases relative to the total number of lemma types in each of the four centuries covered by the aggregated corpus data

To test this latter hypothesis, we used a more qualitatively-oriented method that has already been applied in Kempf (2016). The idea is to determine as exactly as possible the time of coinage for a sample of derivatives. As this is only feasible for a small portion of the data, we used a random sample of 65 *ung*-nominals from the morphologically annotated "TAGGED-M" subcorpus of the German Reference Corpus (DeReKo/Cosmas II; Kupietz et al. 2010). For each nominal, we determined the time of its first attestation by comparing five different sources: two historical corpora (the German Text Archive = DTA and the Google Books corpus *German 2012*) and three dictionaries (the Early New High German dictionary = FWB, Pfeifer's (1993) etymological dictionary, and the Dictionary of Legal German = DRW) (all accessed in August 2016). We will refer to this method as the *comparative dating method* (CDM).

The individual derivatives of our sample and their times of first attestation are listed in Table 3 in the Appendix. Figure 3 shows the aggregated results: All seven derivatives that date back to the Old High German and Middle High German periods have simplex bases. In the Early New High German and New High German periods, complex verbs become more prominent as bases for *ung*-nominalization. Compared

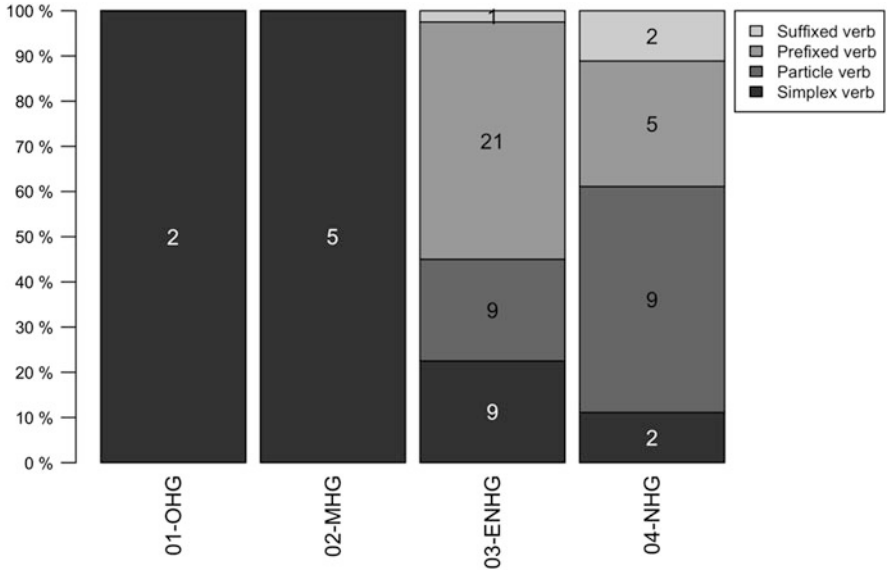

Fig. 3 Results of a "comparative-dating" approach applied to 65 randomly selected *ung*-nominals. For each nominal, its first attestation was looked up in five different sources

to the picture gained from the diachronic corpus data, the increase in the proportion of complex bases sets in somewhat earlier: In Fig. 2, complex bases account for about 70% of the types in the three rightmost, i.e. NHG, columns. With the more exact dating of the coinages, complex bases reach 77% already in ENHG and 89% in NHG (cf. the two right-hand columns in Fig. 3). These data are, of course, somewhat low in absolute numbers. Yet, they have the advantage of having been researched profoundly, taking into account many different sources. To be sure, the procedure partly suffers from the same disadvantages as methods relying on one single corpus. For instance, less frequent words are more likely to be attested in later stages due to the general availability of a greater amount of data. But as the CDM takes multiple data sources into account, it may be able to remedy this problem at least to a certain extent.

Even if the percentages calculated from such little data cannot be expected to be exact, the overall tendency they indicate confirms our expectations: It can be expected that the tendency towards complex bases becomes visible earlier in the CDM than in the corpus data, since they depend on the accidental occurrence of the derivatives in the corpus texts and thus are likely to show some artificial delay.

Taken together, the different methods suggest that *ung*-nominalization has indeed developed an increased preference towards complex bases, which may have given rise to a complex schema of the type [Prf/Prt-X-*ung*]$_{N}$. This could also account for the present-day formations cited earlier. A potential objection against such an approach is, however, that in the case of the present-day formations mentioned

above, the corresponding verb seems at least possible, even if it may in some cases be unattested. In this case, it would seem more plausible to analyze the schema as [[Prf/Prt-X]$_V$-*ung*]$_N$. For instance, *verschnecken* (roughly: 'become populated with slugs') might seem marked to many native speakers of German, but it is hardly less marked than *Verschneckung* 'the state of becoming populated with slugs', which is itself so rare that it does not even occur in the DECOW14AX webcorpus (but it can be found using Google).

Unlike most *ung*-nominals with simplex bases, which tend to be strongly lexicalized (see Demske 2000, Hartmann 2016), productively coined *ung*-nominals with prefixed or particle verbs as bases tend to be semantically very close to their base verbs. In CxM terms, then, we can assume a *paradigmatic relationship* between [Prf/Prt-X]$_V$ and [Prf/Prt-X-*ung*]$_N$ (see also Booij (2015: 304), who offers an alternative analysis of nominalizations of particle verbs). Note that the relationship between present-day *ung*-nominals and their *simplex* bases is much less straightforward. In our view, this is a major argument in favor of assuming a complex schema: While the association between [X$_i$]$_V$ and [X$_i$-*ung*]$_N$ is fairly unpredictable, it is very systematic for [Prf/Prt-X]$_V$ and [Prf/Prt-X-*ung*]$_N$. The idiosyncrasy vs. systematicity of the relation between base and derivative can consequently be seen as part of language users' knowledge about the schemas in question.

2.2 Case Study 2: un-V-lich Adjectives

Our second case study investigates complex derivation of the type *un*-V-*lich*, as in *un-bestech-lich* 'unbribable' or *un-glaub-lich* 'unbelievable'. The adjective-forming suffix *-lich*, cognate to English *-ly*,[2] has been highly productive throughout the history of German. In fact, in Old High German (OHG, ca. 500/750–1050) and Middle High German (MHG, 1050–1350), it was one of the two most productive adjectival suffixes (together with *-ig*, cognate to English *-y*; cf. Winkler 1995, Klein et al. 2009: 313, Ganslmayer 2012). While originally combining mostly with nouns and adjectives (OHG *kuning-lîh* 'royal', *frî-lîh* 'free'), the suffix attached increasingly to verbs during the Early New High German period (ENHG, 1350–1650). The share of deverbal *lich*-types increased from about 10% in MHG (Klein et al. 2009: 311, Ganslmayer 2012: 535) to over 20% in ENHG (cf. Thomas 2002: 327, confirmed by data of the present study). Deverbal *lich*-derivatives display an active or a passive meaning and sometimes allow for both readings (ENHG *begier-lich* lit. "desire-ly", 'desirous' or 'desirable').

Especially with the passive sub-schema, the negation prefix *un-* occurs rather frequently at various points in history, e.g. (*un*)*-ersinn-lich* '(in)conceivable' (sev-

[2]On the divergent development of *-lich* and *-ly* in German and English, see Pounder (2001). The early adverbial uses of German *-lich* are also discussed in detail in Kempf (2016).

enteenth century, Winkler 1995: 368; cf. also 127–131). In the historical data, there is often no affirmative variant that would precede the variant with negation prefix. In her in-depth study on the history of *lich*-derivation, Winkler (1995: 127–128, 368–372) provides an abundance of *un*-V-*lich*-derivatives that lack an unprefixed equivalent, e.g. *un-ermeß-lich* 'unfathomable', *un-verberg-lich* 'unconcealable' (both coined in the seventeenth century). Similarly, there are cases where a corresponding positive form occurs only secondary to the complex derivative, remains less frequent and often falls out of use again (e.g. *un-widersteh-lich* vs. *widersteh-lich* '(ir)resistable', see also below).

Data like these pose a challenge to the assumption that these complex derivatives (*un*-V-*lich*) are derived from simple derivatives of the type V-*lich*. The dates and frequencies for the pairs of simple and complex derivatives render it implausible to assume that there is always an underlying *lich*-derivative and that the prefixation followed in a second step. One would have to resort to argue the simple derivative only existed "virtually" and then was prefixed. Based on the data at hand, it seems far more plausible to assume that prefixation and suffixation happen simultaneously. This simultaneousness can be captured with combined schemas as envisaged in CxM. Booij's (2010: 42) schema for English *un*-V-*able*, repeated below in (2), can be adopted for *un*-V-*lich* (cf. (3)). Alternatively, it can be modified as in (4), where the internal bracketing in the combined schema is omitted. This notation reflects the idea that prefixation and suffixation occur simultaneously and that we do not necessarily have to assume an intermediate formation.

(2) $[\text{un-A}]_A + [\text{V-able}]_A = [\text{un-}[\text{V-able}]_A]_A$
(3) $[\text{un-A}]_A + [\text{V-lich}]_A = [\text{un-}[\text{V-lich}]_A]_A$
(4) $[\text{un-A}]_A + [\text{V-lich}]_A = [\text{un-V-lich}]_A$

Note that option (4) assumes the *simultaneous* attachment of prefix and suffix. As such, the schema is largely independent of its "parent" schemas and their formal constraints. While *un-* does not attach to verbs in German (which is why it would be inadequate to assume a schema like *$[[\textit{un}\text{-V}]_V\textit{-lich}]_A$), the combined schema in (4) interprets *un*-V-*lich* as a complex pattern which takes verbal bases, without taking the detour via the simplex $[\text{V-}\textit{lich}]_A$ formation.

While a combined schema as in (3) or (4) appears adequate on a descriptive level, it is difficult to assess whether the combined schema was cognitively real in the speakers' minds at any point in time. From a pragmatic point of view, however, the complex schema seems to fulfill a very specific and widespread communicative need: Often, the property that needs to be expressed is precisely an entity's resistance towards being *V*-ed (*unverwüstlich* 'indestructible', *unvergesslich* 'unforgettable'). Winkler (1995: 129–131) documents an increase in *un*-V-*lich*-derivatives around the year 1300. One explanation she offers for this phenomenon is the mystics' desire to express the unimaginable. She also shows an even stronger prosperity of *un*-V-*lich*-derivatives between 1650 and 1700. For this second surge in productivity, she holds linguistic economy responsible: a derivative *un*-V-*lich* 'un-V-able' is much shorter and syntactically more versatile than e.g. a corresponding relative clause 'that cannot be V-ed'.

With these functional factors at work, the combined use of both schemas, [*un*-A]$_A$ and [V-*lich*]$_A$, may have flourished at various times, and it certainly did around 1700. This can be conceived of as a strengthening of the horizontal connection between the two schemas (i.e. a connection between different morphological schemas at the same level of abstraction in a CxM hierarchy, cf. Van de Velde 2014). One possible consequence may have been the entrenchment of a combined schema as suggested in (3) or (4), bolstered by an increasing number of established *un*-V-*lich*-derivatives. As is generally the case for historical idioms, it is an open question what may count as evidence for the actual entrenchment of this schema. The wealth of complex derivatives (*un-verberg-lich* 'unconcealable') without unprefixed counterparts (**verberg-lich* 'concealable') supports the assumption of a complex schema. Another piece of evidence would be gained if the complex schema was shown to somehow have diverged functionally or formally from what the parent schemas amounted to when combined.

The historical data discussed in Kempf (2016), which will also be introduced in more detail below, do not support the claim that there has been any strong divergence. However, it can be argued that the complex schema *un*-V-*lich* was more transparent than the simple V-*lich* schema: The simple V-*lich* schema corresponded to active derivatives (*förderlich* 'supportive, adjuvant') as well as passive ones (*merklich* 'noticeable'); the complex schema, on the other hand, corresponded more clearly (if not exclusively) to the passive function (*unverwüstlich* 'indestructable'). A third type of evidence could be provided by differing productivity developments. Therefore, we will analyze the productivity developments of the simple schema [V-*lich*]$_A$ and the assumed combined schema [*un*-V-*lich*]$_A$ to assess whether the combined schema developed a productivity of its own at any point in time. As in the previous Sect. (2.1), we will compare the results of two different methods.

The first method uses a dataset gathered from the Bonn Early New High German corpus (henceforth: BonnC, 1350–1700) and the German Manchester Corpus (GerManC, 1650–1800). Together, both corpora provide seven periods of 50 years each, two of them overlapping (1650–1700 is covered by both corpora). In order to obtain roughly equal corpus sizes for each 50-year period, we used only four of the eight genres of the GerManC. For the best possible consistency with the BonnC, we selected the genres Sermons, Scientific texts, Newspapers, and Narrative prose (see the GerManC documentation and Kempf 2016: 105 for further detail). From the selected corpus texts, all tokens of suffixed adjectives were extracted along with their lemma annotations, and, in the case of the BonnC, also suffix annotations. All annotations were then corrected manually, or added in the case of GerManC suffix annotations. For the present study, we additionally added a very rough part-of-speech annotation for the individual bases, e.g. "noun" for *König-lich* 'royal', lit. "king-ly" or "verb" for *dien-lich* 'serving, useful' (based on *dienen* 'to serve'). Unclear cases or cases in which several base types are possible (e.g. *tröstlich,* which can be traced back to the noun *Trost* 'consolation' or the verb *trösten* 'to console') were assigned an "X". Importantly, the relevant *un*-V-*lich* cases were assigned a category of their own ("*un*-V") so that their development could be tracked over time.

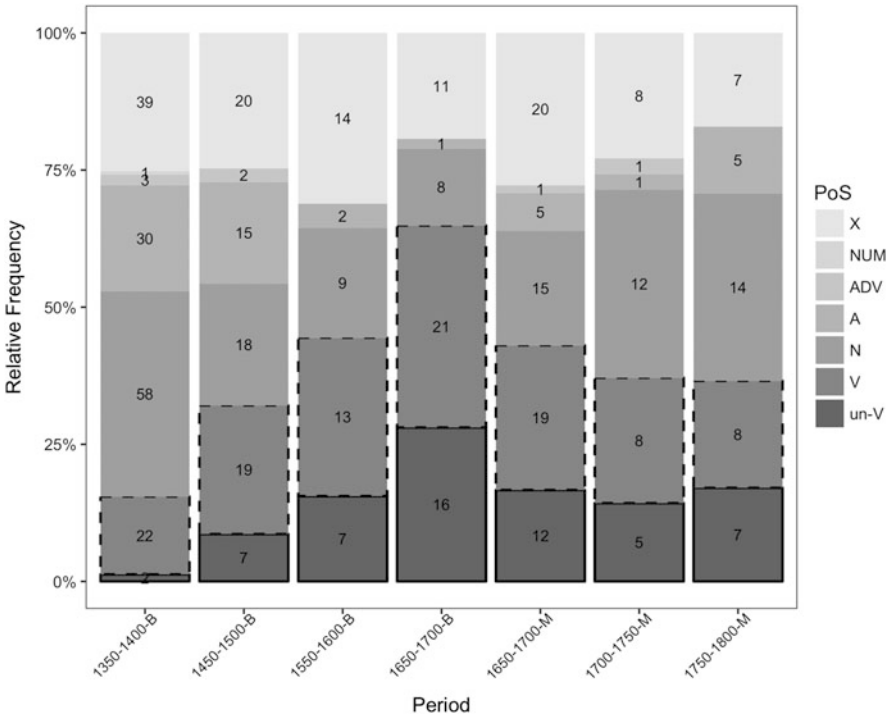

Fig. 4 Parts of speech of the bases of *lich*-derivatives arranged according to the corpus period they are first attested in. (Note that the fourth and the fifth columns do not show subsequent periods, but rather the two overlapping periods of the two corpora. We chose to plot the BonnC data on the left and the GerManC data on the right for reasons of corpus composition: While the BonnC contains a high percentage of religious texts that behave more conservatively, the GerManC contains scientific and newspaper texts that behave progressively in terms of word formation (cf. Kempf 2016: 104–109, 116)) *un-V un*-verb, *V* verb, *N* noun, *A* adjective, *ADV* adverb, *NUM* numeral, *X* unclear

In order to approach the question of whether the complex *un*-V-*lich*-derivation shows a development independent of the simple V-*lich*-derivation, we assigned all *lich*-derivatives in the corpus to the period in which they were attested for the first time (within the corpus). Figure 4 shows the shares of the various base categories for each period. The share of deverbal derivation increases at first (V and *un*-V together attain 15%, 32%, 44%, and 65% in the first four periods). After this, its percentage drops again to 43%, 37%, and 37% in the last three periods).[3]

[3]Note that the last period of the B[onn] corpus and the first period of the M[anchester] corpus coincide. Thus, they were both calculated against the backdrop of the first three periods. Still, the period "1650-1700 M" displays more progressive results, since the corpus contains a higher share of modern genres, i.e. newspapers and scientific texts (see Kempf forthc.).

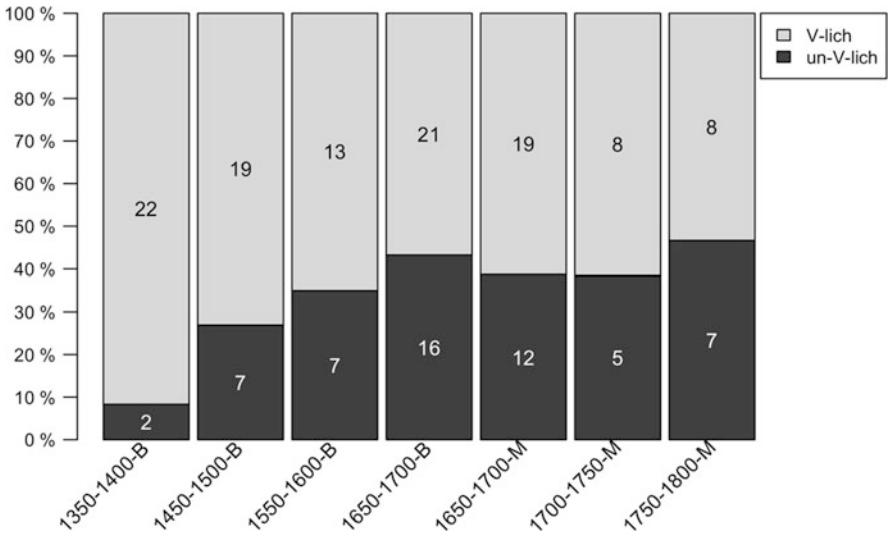

Fig. 5 Relation of simple vs. complex deverbal *lich*-derivatives (based on first attestation in the corpus)

Figure 5 focuses on the deverbal derivatives exclusively. Here, we can see a change in the relation of the two subschemas: Over time, the complex subschema (*un*-V-*lich*) gains more ground compared to the simple deverbal pattern.

The approach via the first attestations looks quite promising. Yet, it is limited by the corpus size and the coincidental occurrence or non-occurrence of a newly coined word in the limited corpus (which may yield a delayed picture of the actual word formation activity). Therefore, we additionally applied the comparative dating method (CDM). As in our first case study (Sect. 2.1), we selected a sample of relevant derivatives and identified their age as accurately as possible by checking and comparing the sources already mentioned in Sect. 2.1. The goal of this study was to determine the productivity developments of the simple and the complex deverbal subschema more accurately. Particularly, we wanted to check whether the complex subschema has indeed gained ground over the simple one, and/or if it might even have remained productive for a longer period of time. As a sample, we used the list of deverbal passive *lich*-derivatives (simple or complex) provided by Kühnhold et al. (1978: 393–394; cf. footnote 12). Figure 6 below shows how the first attestations of these types are distributed over the different time periods.[4] The full list of derivatives and their first attestation dates is given in Table 4 in the appendix.

The CDM refines the picture of the diachronic scenario: It reveals that the deverbal *lich*-derivation reached its peak not in the seventeenth century, but probably

[4]The periods span 50 years each, except for the first two periods, where only coarse-grained dates of attestation were available, e.g. “Middle High German”.

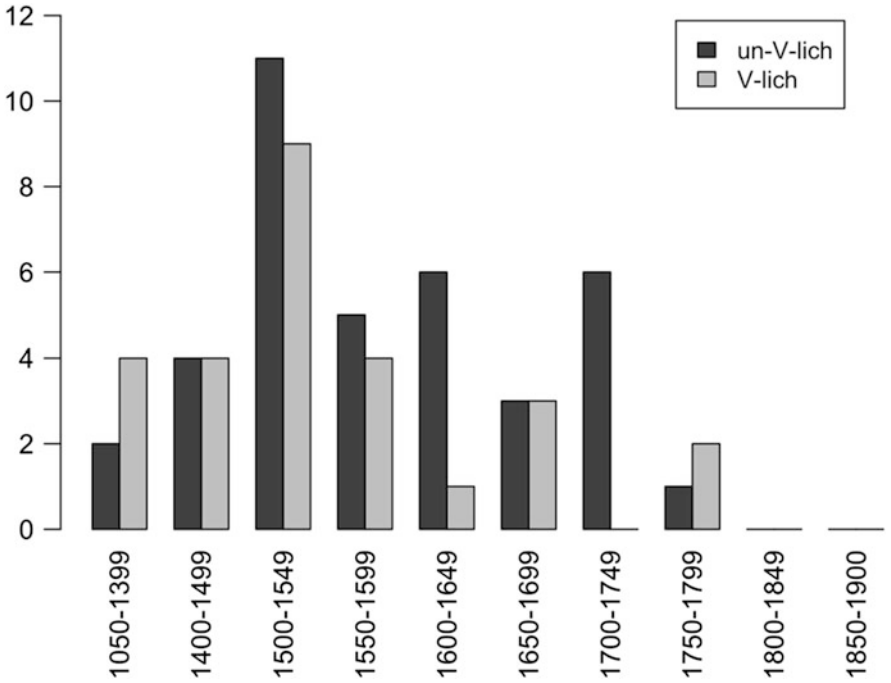

Fig. 6 First attestations of deverbal *lich*-derivatives (sample of 65 types)

already in the first half of the sixteenth century. Furthermore, it shows that deverbal *lich*-derivation has become unproductive – there are no new formations after 1800.[5] Crucially, this analysis suggests that the combining subschema, *un*-V-*lich*, has been dominant ever since the general peak in the early sixteenth century. Of course the absolute numbers are very low, so this aspect may not seem reliable at first glance. However, a closer look at the actual derivatives proves very conclusive. Table 1 shows the youngest derivatives of the sample.

It turns out that the last genuine V-*lich*-derivative is *erhältlich* 'available'. It dates back to (at least) 1626. All subsequent V-*lich*-derivatives can be identified as back-formations of corresponding *un*-V-*lich*-derivatives that are attested earlier (e.g. *ersetzlich* 'replaceable', 1662 < *unersetzlich* 'irreplaceable', 1620, etc.). Based on these scarce, but carefully researched data, we can tentatively conclude that the combining schema, *un*-V-*lich*, indeed remained productive for a longer period of time: The last complex derivative was formed one and a half centuries later than the last simple derivative. If these observations are correct, they provide evidence that the combined schema existed independently from its parent simplex schemas.

[5]The decline of deverbal *lich*-derivation can be linked, among other things, to the rise of deverbal *bar*-derivation, cf. Kempf (2016: 189–190) and Flury (1964).

Table 1 Deverbal passive *lich*-derivatives after 1600, arranged by first attestation

Lexeme	Translation	Morphol. structure	1st attestation (year)	1st attestation (period)
unfasslich	incomprehensible	un-V-lich	1559	1550–1599
[. . .]				
unersetzlich	irreplaceable	un-V-lich	1620	1600–1649
erhältlich	available	V-lich	1626	1600–1649
unentbehrlich	indispensable	un-V-lich	1628	1600–1649
unbeschreiblich	indescribable	un-V-lich	1650	1650–1699
entbehrlich	dispensable	V-lich	1654	1650–1699
unverzeihlich	unforgivable	un-V-lich	1655	1650–1699
ersetzlich	replaceable	V-lich	1662	1650–1699
unbestechlich	incorruptible	un-V-lich	1672	1650–1699
fasslich	comprehensible	V-lich	1682	1650–1699
unwiderstehlich	irresistable	un-V-lich	1704	1700–1749
unausstehlich	insufferable	un-V-lich	1718	1700–1749
unabweislich	irrefutable	un-V-lich	1740	1700–1749
unerschütterlich	imperturbable	un-V-lich	1741	1700–1749
unverwüstlich	indestructable	un-V-lich	1747	1700–1749
unabänderlich	unchangeable	un-V-lich	1748	1700–1749
widerstehlich	resistible	V-lich	1753	1750–1799
bestechlich	corruptible	V-lich	1773	1750–1799
unauffindlich	untraceable	un-V-lich	1784	1750–1799

Some related observations lend additional support to the emancipation of the combined *un*-V-*lich* schema. At the beginning of the period covered by our sample, i.e. at earlier stages of deverbal *lich*-derivation, the simple V-*lich*-derivative usually precedes the complex *un*-V-*lich*-counterpart. This is the case, e.g., with *beweislich* ‘provable’ 1294 > *unbeweislich* ‘unprovable’ 1490; *erklärlich* ‘explicable’ 1451 > *unerklärlich* ‘inexplicable’ 1562, and many more, cf. Table 4 in the appendix. This suggests that there is indeed a development from an initial phase where complex *un*-V-*lich*-derivatives came about by consecutive derivation processes to a later stage where the complex derivation occurred independently. This later stage can be grasped by the notion of *embedded productivity* (Booij 2010: 47–50), where a word formation process that is otherwise unproductive can still be active when embedded in a combined schema.

One final piece of evidence is added by those derivatives that lack a counterpart. The “partnerless” instances of the simple schema occur relatively early; a prime example is *bedauerlich* ‘deplorable’ 1508, where a counterpart **unbedauerlich* is attested neither in Google NGram Viewer, nor in the DTA.[6] Other examples are *erforderlich* ‘necessary’ (1451), *vernehmlich* ‘audible’ (15th ct.), and *annehmlich*

[6]Checked in January 2017.

'acceptable' (1520), where the prefixed counterparts are scarcely attested. With the complex *un*-V-*lich*-schema, the cases with (virtually) no counterpart occur relatively late, e.g.

- *unausstehlich* 'insufferable' 1718 (counterpart *ausstehlich*: only 2 tokens in the DTA)
- *unerschütterlich* 'imperturbable' 1741 (no counterpart attested in the DTA)
- *unverwüstlich* 'indestructable' 1747 (no counterpart attested in the DTA)
- *unauffindlich* 'untraceable' 1784 (no counterpart attested in the DTA)

All observations taken together, there seems to be enough evidence to assume that the combined schema *un*-V-*lich* underwent a different productivity development than its simple counterpart. The data suggest that the productive phase of the former lasted longer than the productive phase of the latter. Ultimately, these diachronic findings support the assumption of a combined schema.

2.3 Case Study 3: Pseudo-Participles

Our third case study addresses the phenomenon of so-called pseudo-participles, i.e. forms that look like past participles but actually do not have a verbal counterpart, but are instead derived directly from a noun, e.g. *bebrillt* 'wearing glasses' from *Brille* 'glasses' (cf. Riecke 1999: 156). Booij (2007: 39f.) discusses similar cases in Dutch under the label of *participia praeverbalia*, while Plag (1999: 103, fn. 10) mentions English derivatives of the type *bedaughtered* as examples of parasynthetic formations, i.e. "complex words with more than one affix [that] seem to have come into being through the **simultaneous attachment** of two affixes" (Plag 2005: 40, emphasis original). As such, they are of major interest for the present study. Booij (2010: 45), discussing Dutch pseudo-participles like *getand* 'toothed' or *kortgerokt* 'short-skirted', points out that they have "specific constructional properties of their own." More precisely, he argues that they always have a possessive-ornative meaning of the type 'provided with N, having N'. Van Haeringen (1949: 187) points out that this word-formation pattern provides a practical means for avoiding a more cumbersome prepositional phrase, as in *gebaard* '*with* a beard', *getijgerd* 'spotted *like a* tiger'.

While they have often been mentioned in passing in the literature on German word-formation (e.g. Motsch 2004: 226f.; Eisenberg 2013: 397), to our knowledge, no systematic corpus-based study has been conducted on this pattern so far. Bernstein (1992) provides an extensive dictionary-based collection of pseudo-participles, but he only mentions some selected examples of pseudo-participles directly derived from nouns. According to him, "the possibilities for coining such

[pseudo-participles] are almost unlimited; even an approximately complete listing of such words would be impossible" (Bernstein 1992: 12f., our translation).[7]

The lack of truly empirical studies may partly be due to the lack of appropriate corpora. However, thanks to huge web corpora like DECOW14AX (Schäfer & Bildhauer 2012), we can now take an empirical look even at such rather low-frequency phenomena that are arguably tied to a more informal register. In the present study, we will focus exclusively on pseudo-participles of the form [*be*-X-*t*]$_{\text{ADJ}}$, neglecting (i) pseudo-participles with other prefixes such as [*ver*-X-*t*]$_{\text{ADJ}}$ (e.g. *verwerbebannert* 'covered with ad banners'; example from DECOW) or without a prefix like *talentiert* 'talented', and (ii) pseudo-participles with non-nominal bases, e.g. *behübscht* 'be-prettied'. We will first give a general overview of the instances of the word-formation pattern and then discuss potential explanations for their what pseudo-participles can tell us about the much-discussed relationship between creativity and productivity.

In order to extract the data from DECOW14AX, we first searched the word form frequency lists (with POS information) for inflected forms tagged either as participle or as adjective and matching the pattern *be-x-t-*.[8] Some 40,000 hits were then manually searched for potential pseudo-participles. The word form types selected as candidates for pseudo-participles were then exhaustively extracted from the DECOW14AX files using a custom Python script. In addition to strings that exactly matched the candidates, we also extracted hits in which the respective search term is preceded by other material, which allows for taking compounds like *sonnenbebrillt* 'wearing sunglasses', lit. "sun-be-glassed", into account. Again, the individual word-form types were manually checked. For the pilot study reported on here, we only took clear cases into account, while 1128 types (14,069 tokens) were disregarded as it could not be clearly determined whether they can be considered actual pseudo-participles. In a more detailed follow-up study, it would be necessary to check these items individually in their respective context. For example, *behautet* could be a pseudo-participle based on *Haut* 'skin'. In actual fact, however, most of the 371 instances turn out to be misspelled variants of the verb *behaupten* 'to claim'. Similar considerations apply, for example, to *bemäntelt* (767 tokens), which can occur as a past participle of the verb *bemänteln* 'to veil', but also as pseudo-participle derived from *Mantel* 'coat'. In sum, 273,242 tokens (2831 types) remained in our data. Table 2 shows the 20 most frequent pseudo-participles.

While many pseudo-participles discussed in the literature can be considered "playful formations" which usually occur in humorous and/or mocking contexts, as in (5) and (6), many of the most frequent pseudo-participles are strongly lexicalized

[7] "Die Bildungsmöglichkeiten solcher PsPs [=Pseudopartizipien] sind fast unbegrenzt, eine auch nur annähernde Aufstellung solcher Wörter wäre unmöglich". Van Haeringen (1949: 187) makes the same observation for Dutch pseudo-participles.

[8] Using the lemma information available in both the corpus and the n-gram frequency list was not an option as many pseudo-participles are not recognized by taggers and therefore lemmatized as <*unknown*>. We used the following search pattern: "^be.*(en|t)((er)?e(s|n|m|r)?)"

Table 2 Top 20 most frequent pseudo-participles in the DECOW14AX data

Lemma	Freq
benachbart 'be-neighbor-ed' ('adjacent')	124,662
beheimatet 'be-home-d' ('native/resident')	45,422
bewaldet 'be-wood-ed' ('wooded')	16,678
beherzt 'be-heart-ed' ('brave')	14,692
betagt 'be-day-ed' ('old')	14,459
behaart 'be-hair-ed' ('haired')	7466
betucht 'be-cloth-ed' ('rich')	5430
bewölkt 'be-cloud-ed' ('clouded')	4579
hochbetagt 'high-be-day-ed' ('very old')	3205
begütert 'be-good-ed' ('wealthy')	3091
beleibt 'be-bodied' ('stout')	2071
belaubt 'be-leaved' ('leafy')	1123
bemoost 'be-moss-ed' ('mossed', colloq. also: 'rich')	1073
gutbetucht 'good-be-cloth-ed' ('rich')	1011
bebrillt 'be-glass-ed' ('wearing glasses')	858
behelmt 'be-helmet-ed' ('wearing a helmet / helmets')	822
bemuskelt 'be-muscle-d' ('muscled')	768
unbehaart 'un-be-hair-ed' ('hairless')	768
behandschuht 'be-gloved' ('gloved')	730
beblättert 'be-leaf-ed' ('leafed')	575

and perfectly natural, whereas many new formations appear marked to native speakers (cf. Motsch 2004: 227).

(5) Spätestens, als der **rundbebrillte** Sozialwissenschaftler mit seinem an Johann König erinnernden Sprachduktus die politische Arbeitsrechtssprechung zu erklären beginnt, hat er die ersten Lacher bereits eingeheimst. 'At the latest when the **round-glassed** social scientist begins to explain political employment jurisdiction with his characteristic style of speaking, which reminds of Johann König, he has generated the first laughs.' (http://www.16vor.de/index.php/2010/12/04/wissenschaft-als-buhnenshow/)

(6) Was mir an ihr auffällt, sind ihre schönen, gepflegten rotblonden, glatten, dicken Haare und ihr Stringtanga, der [...] nur ihrem **bierbebauchten** Ehemann gefällt und total unpassend ist. 'What I notice about her is her beautiful, neat, strawberry blond, smooth, thick hair, and her G-string, which only appeals to her **potbellied** husband and is totally unsuitable.' (http://www.stadt-wien.at/lifestyle/tagebuch/kempinski.html)

Note that the formations in (5) and (6) both instantiate an interesting subpattern of pseudo-participle formation, in which a compound is split up such that its first constituent precedes the prefix. Hüning & Schlücker (2010: 809) briefly discuss such formations, stating that they usually express a possessive relation, e.g.

nickelbebrillt (< *Nickelbrille* 'metal-rimmed glasses'): 'with metal-rimmed glasses'. Therefore, they see certain similarities between such compounds and so-called bahuvrihis like *redneck*, which refer to something outside of the compound (e.g. a person). Note, however, that compounds of the type [first constituent + *be* + second constituent + *t*] do not differ semantically from pseudo-participles with a simplex base or from pseudo-participles which incorporate the first compound constituent, like *bebierbaucht* 'potbellied', *besonnenbrillt* 'sun-glassed'. While Motsch (2004: 227) points out that simple stems are much preferred and pseudo-participles with a complex base are usually strongly marked (he cites **besonnenbrillter Macho* 'macho wearing sunglasses' as ungrammatical), such cases do occur quite frequently in the data, as (7) and (8) exemplify.

(7) Wahrscheinlich sind in der Musik von Lexx, Obst und Wallace zu viele Gitarren für das **bepornosonnenbrillte** Housevolk. 'In the music of Lexx, Obst, and Wallace, there are probably too many guitars for the House folk **wearing porn sunglasses**.' (http://www.vanbauseneick.de/html/body_kn_rez_k_007.html)

(8) Während ihr den Horden schwer schwankender Junggesellinnentrupps, die vor allem im Sommer wie eine der sieben Plagen über die Städte herfallen, peinlich berührt ausweicht, stößt eure Freundin bei der Sichtung eines **bebauchladeten** Junggesellinnenabschieds seit Jahren Verzückungsrufe wie "Oh wie cool!" aus. 'While you, being embarrassed, avoid the hordes of heavily staggering bachelorettes, who infest the cities, especially in summer, like one of the Seven Bowls, your girlfriend has been exclaiming ecstatic noises like "Oh how cool!" for years whenever she sees a hen party **with a hawker's tray**' (http://www.jolie.de/bildergalerien/hochzeit/uebersicht.html)

In terms of type frequency, the split-compound pattern is more frequent than the incorporated-compound pattern – the former accounts for 514 types, the latter for 138. Taken together, they constitute almost a quarter of all types, which shows that, counter to Motsch's claim, compounds are in fact quite eligible as bases for pseudo-participles. Interestingly, the split-compound pattern seems to be salient enough that even proper names are split, e.g. *neckerbemannt* (< *Neckermann*, a travel company) or *birkenbestockt* (< *Birkenstock*, a shoe factory specialized in sandals):

(9) Segeltoern im tuerkischen Lykien, im Land der 100.000 **neckerbemannten** Motorsegler 'sailing trip in Turkish Lycia, land of the 100,000 neckermanned motor sailers.' (http://www.tomboettger.de/fethiye.html)

(10) Die Grünen sorgen sich um ihre **birkenbestockten** Empörungsprofis 'The green party is worried about their birkenstocked indignation professionals.' (http://www.gamersplus.de/forums/archive/index.php/t-6823.html)

The preference towards the split-compound scheme might of course be due to the increased comic effect – the pattern that characterizes established, "prototypical"

pseudo-participles like those in Table 2 is deliberately violated. This can be explained invoking Keller's (1994) maxim "talk in such a way that you are noticed", concisely termed "maxim of extravagance" by Haspelmath (1999). Haspelmath sees the maxim of extravagance as a key causal factor in grammaticalization. If we conceive of the emergence of word-formation patterns (and subpatterns) as constructionalization (Traugott & Trousdale 2013), it seems reasonable to assume that the same logic applies here:

> a grammatical construction is initially used for special communicative effect that gives a short-term advantage to the innovator [. . .], but as more and more people are trying to get their share of this advantage [. . .], the advantage disappears, and the system has undergone a change. (Haspelmath 1999:1061)

In the development of the pseudo-participle construction, then, we can assume the following steps: First, innovative neologisms are coined in analogy to past participles derived from ornative verbs (cf. Bernstein 1992: 12). The "special communicative effect" achieved by coining these formations can in some cases be humorous, as in *bebrillt* (which, in the DTA, is first attested in 1830[9]), but it can also derive from the fact that the construction allows for a very condensed expression of rich semantic content, as observed by Van Haeringen (1949: 187) for its Dutch counterpart. This gives rise to a new constructional schema $[be\text{-x-}t]_{\text{ADJ}}$, i.e. a new node is added to the constructional system. However, this construction is not (yet) fully established in the population of speakers – as we have seen, newly coined pseudo-participles are still deemed marked or even ungrammatical. Thus, the "special communicative effect" has not yet disappeared.

In a similar vein, Koch (2004: 606) points out that language change not only encompasses change in linguistic facts (*regulata*, i.e. what is regulated by linguistic conventions) but also a change in their (extra-linguistic) variational marking (*regulans*, i.e. factors that influence linguistic norms/conventions). According to him, language change starts with *innovation*, which entails the creation of a new *regulatum* while violating an existing *regulans*. As the innovation spreads, its variational marking can change. Many pseudo-participle neologisms can potentially be ascribed to what Koch & Oesterreicher (1996) call "expressive orality". The phenomena they subsume under this label tend to be thematically centered around emotion and evaluation (note the pejorative connotation of the examples cited above), and they make use of fundamental associational relations like contiguity and similarity. Regarding the latter point, recall that Hüning & Schlücker (2010) compare compounded pseudo-participles with bahuvrihis, which are fundamentally metonymic. While innovative pseudo-participles like *bierbebaucht* 'potbellied' in (6) or *bepornosonnenbrillt* 'wearing porn sunglasses' in (7) are not metonymic, what they share with bahuvrihis is that they characterize an entity – usually a person, or a group of persons – by referring to one particular salient feature.

[9]There is one single attestation of the verb *bebrillen* in the DTA, which dates to 1802. However, it seems unlikely that *bebrillt* can be regarded as an actual participle, especially given that this one instance is massively outnumbered by the occurrences of the pseudo-participle *bebrillt*.

Future studies should address the potential connection between the innovative use of pseudo-participles and register in more detail – the upcoming DECOW16AX corpus promises to be a fruitful resource for such a study. The meta-annotation of DECOW16AX can potentially be used to test the hypothesis that innovative pseudo-participles occur predominantly in forums and blogs, but also in essay writing and in literary texts that deliberately make use of expressive and "extravagant" patterns.

At the same time, the fact that many pseudo-participles seem deviant touches upon a problem widely discussed in linguistic morphology, namely the distinction between creativity and productivity: Can the pseudo-participle construction be regarded as a truly productive pattern, even though its domain of use is limited and even though most innovative formations may seem marked? Bauer (2001: 66–71) has already argued that this distinction is highly problematic and that productivity and creativity should not be regarded as mutually exclusive categories, but rather as a cline. A construction morphology approach can arguably incorporate these considerations in more detail. On the one hand, construction grammar holds that pragmatic and discourse-functional properties are important aspects of a construction's function (Croft 2001: 19). Thus, the "variational marking" of pseudo-participles can be seen as part of language users' knowledge about the form-meaning pair at hand – in other words: it can be modeled as an integral part of the constructional schema. On the other hand, Barðdal's (2008) "productivity cline" (which she posits for syntactic constructions, but it can be generalized to morphological constructions) can prove insightful in accounting for the pattern's productivity, which is seemingly unlimited (Bernstein 1992 and Van Haeringen 1949 both point out that their domain of application seems to be unrestricted) but, in light of the actual attestations, still fairly constrained. Barðdal (2008: 39) argues that in her model a construction's productivity varies along the axes of semantic coherence and type frequency, for which she assumes an inverse correlation. On the upper end of her productivity cline, we find constructions with a high type frequency, which correspond to fully extendable open schemas. A construction with a high type frequency will almost necessarily exhibit a low degree of semantic coherence, which she sees as "an immediate consequence of the fact that there are limits to how much internal consistency there can be between items of a large category" (Barðdal 2008: 34). On the lower end of the cline, we find constructions with a low type frequency which can only be extended if the degree of semantic coherence is high. Analogy, i.e. extension based on only one model form, is located on the extreme pole of this lower end of the cline (cf. Barðdal 2008: 43f.).

Pseudo-participles can be allocated toward the lower end of this cline: Even though their domain of application seems to be unlimited, as pointed out by Bernstein (1992) for German and by Van Haeringen (1949) for Dutch pseudo-participles, this is only due to their semantic coherence: the possessive-ornative semantics of these formations is, in principle, compatible with every noun – but given the huge number of potential bases, the actual type frequency is almost vanishingly low. They approach the extreme pole of analogical extension in that it seems reasonable to assume that a very limited number of more frequent instances like *bebrillt* 'wearing glasses' and *behandschuht* 'wearing gloves' serve

as important templates for new formations. In semantic terms, the low-frequency pseudo-participles in our data are very homogeneous, which is also in line with Barðdal's predictions.

Thus, both aspects – the productivity cline and the very concept of a construction, which incorporates pragmatic and discourse-functional properties – contribute to explaining the contextual and semantic constraints on the pattern's productivity. These ideas also fit in well with Hilpert's (2015) "upward-strengthening hypothesis", which predicts that under certain circumstances, experiencing a linguistic unit will trigger the strengthening of a more abstract construction, i.e. a construction higher in the constructional network. This "upward strengthening" in turn is hypothesized to be necessary for grammaticalization or constructionalization to occur. For instance, experiencing a marginal member of a category (e.g. a new coinage) triggers upward strengthening as it forces the recipient to re-consider the boundaries of the category (Hilpert 2015: 139f.). However, the construction that is strengthened does not have to be the most abstract "parent" construction; instead, it can also be a subpattern, i.e. a mid-level constructional schema (Hilpert 2015: 137f.). In the case of pseudo-participles, it seems straightforward to assume that experiencing innovative pseudo-participles does not strengthen the superordinate Participle construction but rather the unified schema, i.e. the pseudo-participle construction.

This account, however, again presupposes the assumption of a unified schema. Let us conclude by briefly discussing the alternative account proposed by, e.g., Donalies (2011), who sees the assumption of a complex schema as superfluous and instead suggests to interpret pseudo-participles as adjectivizations of (partly nonexistent, but possible) ornative verbs. Rephrasing the alternatives in constructionist terms, one could ask: Can we posit a pseudo-participle construction in its own right, or can pseudo-participles be explained in terms of other constructions, viz. the prefix construction [*be*-N-*en*] and the regular participle construction?

Among the most important criteria for identifying a construction are that it has some added semantic value, i.e. that it carries non-compositional meaning, and that it shows collocational preferences (Hilpert 2014: 16–22). Extending the notion of "collocational" preferences to the base-selection preferences of word-formation patterns, the latter criterion seems to be fulfilled. There are clear preferences towards certain semantic domains like clothing and body parts among the innovative formations. More importantly, however, the hypothesized pseudo-participle construction arguably adds semantic value that goes beyond regular participles of ornative verbs. Even though the meaning of most pseudo-participles can be described as possessive-ornative, the possessive reading seems to trump the ornative one, to the point that it can also encode inalienable possession, in which case a 'provide with X' reading is excluded, cf. *beschnabelt* 'having a beak' in (11).

(11) Die Daroth sind ein **beschnabeltes**, großwüchsiges und grausames Kriegervolk. 'The Daroth are a **beaked**, huge-grown and gruesome tribe of warriors.' (http://astan-magazin.de/AstanM-2/Buch.htm)

It could of course be argued that the ornative meaning is still present and that the comic effect of many innovative pseudo-participles emerges from the mismatch between ornative semantics and the possessive reading implied by the word-formation product. However, this effect is exploited frequently and systematically enough that it seems reasonable to see it as part of language users' rich linguistic knowledge about the construction in question. Future research could add more credibility to the complex-construction account with a more systematic corpus-based analysis of the pattern's base-selection preferences.

3 Discussion

In our three case studies, we found increasingly good evidence to vindicate the assumption of combined schemas. In the case of *ung*-nominals, a combined schema may have formed in speakers' minds, based on the abundance of complex *ung*-nominals – yet, we lack evidence for actual simultaneous derivation processes (or, in other words, we cannot rule out that all complex derivatives were formed in a cyclic manner). In the case of *un*-V-*lich* adjectives, our diachronic enquiries suggest that early derivatives may often have resulted from cyclic derivation, but later on, a complex schema may indeed have developed and generated complex *un*-V-*lich* adjectives independently of its parent schemas. Finally, in the case of pseudo participles, we find an abundance of derivatives that can not have been formed in a cyclic manner, so that the assumption of a combined schema seems well-justified.

3.1 Accounting for the Productivity of Combined Schemas

The three patterns of complex derivation analyzed above can be assessed as "semi-successful" in terms of productivity. The first two cases, Pref-X-*ung* and *un*-V-*lich*, turned out more productive or productive for a longer period of time than the corresponding simple schemas. Yet in the first case, it is not clear if a schema has really been formed and in the second case, the schema we do believe to have existed is not productive any longer. Pseudo-participles are fairly productive today, as documented by the wealth of ad hoc formations. Yet they seem somewhat restricted to playful usage in essay and expressive writing style (such as in web commentaries).

This moderate productivity status can be linked systematically to more general historical, morphological, and cognitive factors. First, and as the most general account, the diachronic rise of complex derivation can be understood in connection with the rise of written German. During the ENHG and early NHG periods, German gradually replaced Latin as the language of written discourse. Also, the literacy rate went up – from up to 4% around the year 1500 (Gauger 1994; Knoop 1994) to virtually the entire speech community in the late nineteenth century (Grosse et al.

1989: 12). Writing allows for more density and complexity than speech, due to more planning time as opposed to real-time performance. An increase of complexity in the ENHG and early NHG periods has been observed in various domains of morphology (e.g. Schröder 1988, Scherer 2005, Kempf 2016) and syntax (e.g. Weber 1971, Szczepaniak 2015).

One particular feature that characterizes written registers in contrast to speech is that information is coded in a nominal(ized) rather than in a verbal manner (cf. Wells 1960, Biber & Finegan 1997, Plag et al. 1999, Halliday 2004, Hartmann 2016: 261). All three complex constructions studied in this paper contribute to shifting information from verbal to nominal expression. This is also the case for most of the Dutch, English, Polish, and Italian examples of schema unification discussed in Booij (2010: 41–50). Notwithstanding this presumable tendency towards nominalization, there are also verbal cases of schema unification, like the English *de-caffein-ate* type.

Generally, combined schemas provide a very condensed expression of rich semantic content (e.g. *un*-V-*lich* derivatives or pseudo-participles are shorter than corresponding relative clauses and contribute to the respective nominal phrase being heavily packed with information). The effects of such dense expression may be various. In particular, complex derivatives may appear sophisticated, prestigious, and, in the case of pseudo-participles, evoke a humorous or expressive effect.

Related to their high complexity, combined schemas exhibit a high degree of salience. This feature, too, is likely to contribute to their entrenchment (possibly making up for a relative shortage of high-frequency types in the case of pseudo-participles) and thus to strengthening their productivity. More specifically, there are two rather different notions of salience that can both be applied to the combined schemas analyzed above.

The first one is a morphological notion of salience as summed up, e.g., in Giraudo & Dal Maso (2016). In all three cases, the combined schemas are formally salient in that they are relatively rich in material (two syllables as opposed to shorter morphemes such as **-th* in English *length*), in that they occupy both the initial and the final position of the complex words, and in that they are formally relatively consistent and thus recognizable.[10] Also, the complex schema may be morphologically salient in terms of Hay's (2001, 2003) observation that affixes stand out more in formations that are less frequent than their bases. For instance, *–ly* stands out more in *eternally*, which is much rarer than its base (*eternal*), while it stands out less in *exactly*, which is much more frequent than *exact*. This applies, most of all, to the pseudo-participles, as they are in many cases nonce words. Also from a functional perspective, combined schemas can be viewed as relatively salient since they tend to be more transparent or semantically uniform than the related

[10]This is less so with Prf/Prt-X-*ung*, more so with *un*-V-*lich*, and still an open question in the case of pseudo-participles, since the variants with prefixes other than *be-* still remain to be investigated. Still, the forms are relatively consistent compared, e.g., to suffixes with multiple grapho-phonological variants like ENHG *-et/-echt/-ocht/-icht/-igt* (cf. Kempf 2016: 74).

simple schemas. Semantic transparency is a rather ambivalent factor with respect to productivity (Kempf 2016: 74–76): Besides – or by way of – strengthening its salience, it may help a schema win out over its competitors in the function it realizes. On the other hand, the productivity of a monofunctional schema is limited to the degree to which its function is needed in discourse.

The other notion of salience is much more general. In their programmatic 2016 paper, Schmid & Günther advance the idea of "a unified socio-cognitive framework for salience in language". They assume that salience in language arises from matching the linguistic input with expectations based on previous knowledge and situational context. In this matching process, salience may arise from either the confirmation *or* the violation of the expectations. The morphological salience described above seems to point towards salience by entrenchment, i.e. salience by confirmation of expectations. However, this might be a premature and in fact false conclusion. The morphological salience of a combined schema might be strong enough to keep it entrenched on an abstract, schematic level. Yet, its instantiations tend to be low frequent if not unknown – so that encountering them may trigger "salience by novelty" (Schmid & Günther's type 4 salience, based on mismatch with long term memory). This is most clearly the case with highly occasional pseudo-participles. Also, instantiations of combined schemas may trigger "salience by surprisal" (Schmid & Günther's type 3 salience, based on mismatch with expectation in current context). Some of the derivatives are exceedingly complex, so that they can neither be expected, nor parsed easily. They pose a challenge to the recipients and are thus particularly striking. This is quite noticeable in the contemporary example in (12), but can also be discerned with the *un*-V-*lich* derivative in the historical example in (13): It is used in a passage of a sermon that seeks to encourage people to pronounce and preach their protestant belief, thus honoring the denomination of the first protestants. Clearly, the complex derivative serves as a climax within the rhetorical question. This climax would not work if it did not come with a surprise. The surprising effect is likely created by the complex morphology rather than the content: An equivalent syntactic paraphrase would not have created the same effect (cf. "a memento that can not be extinguished").

(12) Und dann sehe ich für den Bruchteil einer Sekunde [. . .] eine bepelzhandschuhte Hand aus dem Stein ragen[11] 'And then, for a split second, I saw a hand in a fur glove (lit. "a be-fur-gloved hand") reaching out of the stone'

(13) Wird es nicht ein Werck der hoͤchsten Billigkeit seyn, daß ihr ihrem unerschrockenen Bekaͤnntniß ein unauslo̊schliches Denckmahl stifftet?[12] 'Will it not be a deed of highest justice, that you should award their dauntless denomination with "unextinguishable" memento?'

[11] Record from DECOW; the original website http://forum.scharesoft.de/archive/index.php/t-1085.html is no longer available (2017–01-15).

[12] Record from the GerManC corpus, text SERM_P2_NoD_1730_JubelFeste.

Having argued for the existence of combined schemas and having discussed how to account for their moderate success in terms of productivity, we now turn to the more theoretical question of how their emergence can be modeled in CxM.

3.2 Modeling the Emergence of Combined Schemas

All three case studies discussed in this paper have in common that the hypothesized complex constructions combine at least two existing constructions. In the first case study, these are prefix constructions and *ung*-nominalization, in the second case study, *un*-prefixation and *lich*-derivation, and in the third one, *be*-prefixation and participle formation. In all three cases, the assumption of a complex schema is certainly contentious. We have provided arguments in favor of positing complex constructions in these cases, but it has also become apparent that the complex patterns are still strongly connected to their respective parent constructions. Thus, the question of whether, in these cases, complex schemas exist in speakers' minds maybe cannot be answered with a simple "yes" or "no". As Hilpert (forthcoming) points out with regard to Traugott & Trousdale's (2013) notion of constructionalization,

> the term constructionalization ultimately invites the notion of a discrete threshold between an existing construction that has changed and a new construction that has come into being. This threshold may turn out to be a line in the sand that is impossible to draw with certainty.

Therefore, Hartmann (e.g. 2016) argues for a more gradualistic view of constructions – rather than being an "all-or-nothing" affair, constructionalization can be a matter of degree, and a linguistic unit can have a status as an independent construction to a greater or lesser extent. This is partly in line with Schmid's (2014, 2017) entrenchment-and-conventionalization model, which puts *associations* center stage. In the domain of word-formation, the emphasis on associations seems particularly relevant: Word-formation patterns can, in Schmid's terms, be seen as "symbolic associations" between a form and an abstract meaning or function whose instances are understood via associations to their respective base (this would fall under Schmid's notion of "syntagmatic associations"). At the same time, morphological constructions tend to compete with each other as well as with functionally similar syntactic constructions, yielding what Schmid calls "paradigmatic associations".[13] Thus, the combinatorial schemas discussed here can perhaps best be seen as weakly constructionalized patterns with strong connections to their parent schemas. In the case of *un*-V-*lich*, the pattern has ceased to be productive. In the case of Pref-X-*ung* and pseudo-participles, there is a hypothetical possibility that their constructionalization might proceed further. For the sake of the argument, imagine a situation in which the pseudo-participle construction extends

[13] On paradigmatic relations between constructions, see also Norde & Trousdale (2016).

its possessive semantics to more abstract domains, e.g. *behoffnungte Europäer* 'Europeans having hope', *beunmuteter Mensch* 'displeasured human' – this would suggest that the pattern is gaining ground not only against less condensed syntactic alternatives but also against more established competitors (*hoffnungsvoll* 'hopeful', *unmütig* 'discontent'). This, then, would be an argument for increased construction status from the perspective of Schmid's paradigmatic associations.

These considerations show that constructionalization is a multi-dimensional phenomenon. While this is a truism, we argue that the perspectives offered in this paper can help disentangling the complexities involved in the development of complex morphological schemas. Importantly, the theoretical toolkit of CxM with its notions of the hierarchical lexicon and schema unification offers an ideal starting point for investigating these patterns both synchronically and diachronically. Taking diachrony into account, however, requires a more nuanced view of constructions. Constructions, on this view, are emergent and continually evolving. They are emergent in that they arise from routinization of local communicative patterns (e.g. Hopper 2015, Pleyer 2017), and they are evolving in that "[e]very usage event has some impact (even if very minor) on the structure of the categories it evokes" (Langacker 1987: 376).

The case studies discussed in this paper can be considered prime examples for the emergence, spread, and/or decline of emergent constructional patterns that arise through the key mechanisms of reanalysis and analogization (cf. Traugott & Trousdale 2013) and that are tied to other constructional schemas to varying degrees. Future research could investigate the dynamics involved in these processes in more detail. For instance, psycholinguistic research could assess the connection strength between the complex schemas and their parent constructions in the linguistic knowledge of present-day speakers. Both corpus-linguistic and behavorial methods could be used to determine the semantic constraints of the respective patterns in more detail, thus working towards a more precise characterization of the schemas.

To conclude, the case studies discussed in this paper touch upon some of the most hotly-debated topics both in linguistic morphology and in construction grammar – the problem of multiply complex word-formation schemas; the validity of "playful formations" in assessing morphological productivity; the question of when a construction can be legitimately posited, to name just a few. A diachronic perspective that conceives of constructions as emergent and dynamic patterns alleviates many of these problems and can thus add important insights to a thoroughly usage-based CxM and to a better understanding of the construction of words.

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A.1 Appendix

Table 3 Sample of *ung*-derivatives arranged by first attestation[a]

Derivative	Translation	Base morphology	First attestation (exact)	First attestation (period)
Lösung	solution	simplex	OHG	01-OHG
Ordnung	order	simplex	OHG	01-OHG
Förderung	facilitation	simplex	MHG	02-MHG
Gattung	kind	simplex	MHG	02-MHG
Innung	guild	simplex	MHG	02-MHG
Prüfung	examination	simplex	MHG	02-MHG
Kürzung	reduction	simplex	late MHG	02-MHG
Begabung	gift	simplex	1321	03-ENHG
Leitung	management	simplex	1349	03-ENHG
Zeitung	information	simplex	late 14th ct.	03-ENHG
Belastung	burden	prefixed	1446	03-ENHG
Aufteilung	distribution	particle v	1449	03-ENHG
Ausstellung	exhibition	particle v	1450	03-ENHG
Erteilung	grant	prefixed	1493	03-ENHG
Versuchung	temptation	prefixed	1494	03-ENHG
Entfremdung	estrangement	prefixed	15th ct.	03-ENHG
Siedlung	settlement	simplex	15th ct.	03-ENHG
Sitzung	session	simplex	15th ct.	03-ENHG
Verbindung	connection	prefixed	15th ct.	03-ENHG
Vereinigung	coalition	prefixed	15th ct.	03-ENHG
Verwaltung	administration	prefixed	15th ct.	03-ENHG
Verbesserung	improvement	prefixed	15th ct.	03-ENHG
Verhaftung	arrest	prefixed	15th ct.	03-ENHG
Regierung	government	suffixed	mid 15th ct.	03-ENHG
Ausbildung	training	particle v	1507	03-ENHG
Beratung	counseling	prefixed	1508	03-ENHG
Erhöhung	increase	prefixed	1511	03-ENHG
Spaltung	division	simplex	1522	03-ENHG
Verknüpfung	assignment	prefixed	1524	03-ENHG
Vereinbarung	agreement	prefixed	1528	03-ENHG
Vorstellung	introduction	particle v	1528	03-ENHG
Darbietung	performance	particle v	1531	03-ENHG
Betreuung	assistance	prefixed	1532	03-ENHG
Verkürzung	reduction	prefixed	1535	03-ENHG

(continued)

Table 3 (continued)

Derivative	Translation	Base morphology	First attestation (exact)	First attestation (period)
Gründung	foundation	simplex	1536	03-ENHG
Aufforderung	prompt	particle v	1547	03-ENHG
Freistellung	release	particle v	1555	03-ENHG
Verweigerung	refusal	prefixed	1563	03-ENHG
Versammlung	gathering	prefixed	1564	03-ENHG
Abschreibung	deduction	particle v	1565	03-ENHG
Begrüßung	greeting	prefixed	1574	03-ENHG
Wirkung	effect	simplex	1578	03-ENHG
Schwankungen	fluctuation	simplex	1595	03-ENHG
Aufwendung	expenditure	particle v	1596	03-ENHG
Gestaltung	arrangement	prefixed	16th ct.	03-ENHG
Verarbeitung	processing	prefixed	1600	03-ENHG
Bewachung	surveillance	prefixed	1623	03-ENHG
Einreichung	submission	particle v	1650	04-NHG
Herausforderung	challenge	particle v	1653	04-NHG
Täuschung	deception	simplex	1676	04-NHG
Verständigung	communication	prefixed	1677	04-NHG
Entwicklung	development	prefixed	1682	04-NHG
Veranstaltung	event	prefixed	1685	04-NHG
Zuladung	payload	particle v	1734	04-NHG
Aussperrung	lock-out	particle v	1740	04-NHG
Aufarbeitung	rehabilitation	particle v	1762	04-NHG
Hervorhebung	accentuation	particle v	1791	04-NHG
Identifizierung	identification	suffixed	1793	04-NHG
Beschwichtigung	conciliation	prefixed	1803	04-NHG
Aufbesserung	amelioration	particle v	1804	04-NHG
Regelung	regulation	simplex	1808	04-NHG
Überschuldung	overindebtedness	particle v	1814	04-NHG
Sanierung	restoration	suffixed	1869	04-NHG
Bewertung	assessment	prefixed	1871	04-NHG
Stilllegung	closedown	particle v	1905	04-NHG

[a]The sample is taken from annotated "TAGGED-M" subcorpus of the DeReKe/COSMAS II. For all 65 derivatives, we checked the following resources to determine the time of their formation: DRW, DTA, FWB, Google Books, Pfeifer (1993) (all accessed August 2016)

Table 4 Deverbal passive *lich*-derivatives arranged by first attestation[a]

Derivative	Translation	Morphol. structure	1st attestation (year)	1st attestation (period)
unverständlich	incomprehensible	un-V-lich	700-1050	0700–1050
unsäglich	unspeakable	un-V-lich	1050-1350	1050–1399
unträglich	unbearable	un-V-lich	1050-1350	1050–1399
verständlich	comprehensible	V-lich	1050-1350	1050–1399
träglich	bearable	V-lich	1216	1050–1399
beweislich	provable	V-lich	1294	1050–1399
begreiflich	comprehensible	V-lich	14. ct.	1050–1399
erforderlich	necessary	V-lich	1451	1400–1499
erklärlich	explicable	V-lich	1451	1400–1499
breuchlich	suitable	V-lich	1489	1400–1499
unbeweislich	unprovable	un-V-lich	1490	1400–1499
undurchdringlich	impenetrable	un-V-lich	1496	1400–1499
unerschöpflich	inexhaustible	un-V-lich	15. ct.	1400–1499
vernehmlich	audible	V-lich	15. ct.	1400–1499
unbegreiflich	incomprehensible	un-V-lich	ca. 1400	1400–1499
unwiderruflich	irrevocable	un-V-lich	1503	1500–1549
unergründlich	fathomless	un-V-lich	1505	1500–1549
bedauerlich	deplorable	V-lich	1508	1500–1549
unüberwindlich	insurmountable	un-V-lich	1508	1500–1549
unvermeidlich	unavoidable	un-V-lich	1508	1500–1549
unaussprechlich	inexpressible	un-V-lich	1509	1500–1549
unerforschlich	inexplorable	un-V-lich	1509	1500–1549
vergleichlich	comparable	V-lich	1514	1500–1549
annehmlich	acceptable	V-lich	1520	1500–1549
unauflöslich	irresolvable	un-V-lich	1521	1500–1549
unerträglich	unbearable	un-V-lich	1521	1500–1549
unversöhnlich	unconciliatory	un-V-lich	1521	1500–1549
unwiderleglich	irrefutable	un-V-lich	1521	1500–1549
verletzlich	vulnerable	V-lich	1523	1500–1549
unübersteiglich	insurmountable	un-V-lich	1524	1500–1549
anschaulich	demonstrative	V-lich	1525	1500–1549
verzeihlich	forgivable	V-lich	1528	1500–1549

(continued)

Table 4 (continued)

Derivative	Translation	Morphol. structure	1st attestation (year)	1st attestation (period)
erträglich	bearable	V-lich	1531	1500–1549
ausdrücklich	expressible	V-lich	1534	1500–1549
überwindlich	conquerable	V-lich	1541	1500–1549
widerleglich	refutable	V-lich	1557	1550–1599
unfasslich	incomprehensible	un-V-lich	1559	1550–1599
unerklärlich	inexplicable	un-V-lich	1562	1550–1599
unermesslich	unfathomable	un-V-lich	1564	1550–1599
erschwinglich	affordable	V-lich	1566	1550–1599
unvergleichlich	incomparable	un-V-lich	1575	1550-1599
vermeidlich	evitable	V-lich	1580	1550-1599
unerschwinglich	unaffordable	un-V-lich	1587	1550–1599
erdenklich	imagineable	V-lich	1591	1550–1599
unumgänglich	inevitable	un-V-lich	1602	1600–1649
unumstößlich	irrevocable	un-V-lich	1610	1600–1649
unnachahmlich	inimitable	un-V-lich	1611	1600–1649
unzerbrechlich	indestructible	un-V-lich	1617	1600–1649
unersetzlich	irreplaceable	un-V-lich	1620	1600–1649
erhältlich	available	V-lich	1626	1600–1649
unentbehrlich	indispensable	un-V-lich	1628	1600–1649
unbeschreiblich	indescribable	un-V-lich	1650	1650–1699
entbehrlich	dispensable	V-lich	1654	1650–1699
unverzeihlich	unforgivable	un-V-lich	1655	1650–1699
ersetzlich	replaceable	V-lich	1662	1650–1699
unbestechlich	incorruptible	un-V-lich	1672	1650–1699
fasslich	comprehensible	V-lich	1682	1650–1699
unwiderstehlich	irresistable	un-V-lich	1704	1700–1749
unausstehlich	insufferable	un-V-lich	1718	1700–1749
unabweislich	irrefutable	un-V-lich	1740	1700–1749
unerschütterlich	imperturbable	un-V-lich	1741	1700–1749
unverwüstlich	indestructable	un-V-lich	1747	1700–1749
unabänderlich	unchangeable	un-V-lich	1748	1700–1749
widerstehlich	resistible	V-lich	1753	1750–1799
bestechlich	corruptible	V-lich	1773	1750–1799
unauffindlich	untraceable	un-V-lich	1784	1750–1799

[a]The sample is taken from Kühnhold et al. (1978: 393–394; for further details on the sample, see Kempf 2016: 324–327). For all 65 derivatives, we checked the following resources to determine the time of their formation: DRW, DTA, FWB, Google Books, Pfeifer (1993) (all accessed Oct 2014 + Jan 2017)

References

Corpora and web resources.
GOOGLE BOOKS http://books.google.de/.
DRW http://drw-www.adw.uni-heidelberg.de/drw-cgi/zeige.
MHDBDB http://mhdbdb.sbg.ac.at/.
DTA http://www.deutschestextarchiv.de/.
DWDS http://www.dwds.de/.
DEREKO/COSMAS II http://www.ids-mannheim.de/cosmas2/.
BonnC http://www.korpora.org/Fnhd/.
GerManC http://www.ota.ox.ac.uk/desc/2544.
WORTWARTE http://www.wortwarte.de/.
GOOGLE NGRAM VIEWER https://books.google.com/ngrams.

Literature

Anderson, J.R., D. Bothell, M.D. Byne, S. Douglass, C. Lebiere, and Y. Quin. 2004. An integrated theory of the mind. *Psychological Review* 111: 1036–1060.

Baayen, R.H. 1993. On frequency, transparency, and productivity. In *Yearbook of morphology 1992*, ed. G. Booij and J. van Marle, 181–208. Dordrecht: Kluwer.

———. 2009. Corpus linguistics in morphology: Morphological productivity. In *Corpus linguistics* (HSK 29.2), ed. A. Lüdeling and M. Kytö, 899–919. Berlin/New York: De Gruyter.

Barðdal, J. 2008. *Productivity: Evidence from case and argument structure in Icelandic*, Constructional Approaches to Language 8. Amsterdam/Philadelphia: John Benjamins.

Bauer, L. 2001. *Morphological productivity*. Cambridge: Cambridge University Press.

Bernstein, W.Z. 1992. *Pseudopartizipien im deutschen Sprachgebrauch. Ein Nachschlage- und Übungsbuch*. Heidelberg: Groos.

Biber, D., and E. Finegan. 1997. Diachronic relations among speech-based and written registers in English. In *To explain the present. Studies in the changing English language in honour of Matti Rissanen*, ed. T. Nevalainen and L. Kahlas-Tarkka, 253–275. Helsinki: Société Néophilologique.

Booij, G. 2007. Construction morphology and the lexicon. In *Selected Proceedings of the 5th Décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 34–44. Somerville: Cascadilla Proceedings Project.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2015. The nominalization of Dutch particle verbs: Schema unification and second order schemas. *Nederlandse Taalkunde* 20: 285–314.

Croft, W. 2001. *Radical construction grammar: Syntactic theory in typological perspective*. Oxford: Oxford University Press.

Demske, U. 2000. Zur Geschichte der ung-Nominalisierung im Deutschen: Ein Wandel morphologischer Produktivität. *Beiträge zur Geschichte der deutschen Sprache und Literatur* 122: 365–411.

Donalies, E. 2011. Explizite Adjektivderivate. In *Grammis 2.0. Das grammatische Informationssystem des Instituts für deutsche Sprache*. http://hypermedia.ids-mannheim.de/call/public/sysgram.ansicht?v_id=1231. Last checked 10/02/2017.

Durrell, M., A. Ensslin, and P. Bennett. 2007. The GerManC project. *Sprache und Datenverarbeitung* 31: 71–80.

Eisenberg, P. 2013. *Grundriss der deutschen Grammatik. Bd. 1: Das Wort*. 4th ed. Stuttgart: Metzler.

Flury, R. 1964. *Struktur- und Bedeutungsgeschichte des Adjektiv-Suffixes -bar*. Winterthur: Keller. [Dissertation University Zürich].

FWB = *Frühneuhochdeutsches Wörterbuch*. Robert R. Anderson, Ulrich Goebel, Oskar Reichmann, Anja Lobenstein-Reichmann (Eds.). 12 volumes, 1986–. Berlin/Boston: de Gruyter.

Ganslmayer, Ch. 2012. *Adjektivderivation in der Urkundensprache des 13. Jahrhunderts: Eine historisch-synchrone Untersuchung anhand der ältesten deutschsprachigen Originalurkunden*. Berlin/New York: De Gruyter.

Gauger, H.-M. 1994. Geschichte des Lesens. In *Schrift und Schriftlichkeit. Ein interdisziplinäres Handbuch internationaler Forschung. 1. Halbband*, ed. H. Günther and O. Ludwig, 65–84. Berlin/New York: De Gruyter.

Giraudo, H., and S. Dal Maso. 2016. The salience of complex words and their parts: Which comes first? *Frontiers in Psychology* 7: 1–8. https://doi.org/10.3389/fpsyg.2016.01778.

Goldberg, A.E. 2006. *Constructions at work: The nature of generalization in language*. Oxford: Oxford University Press.

Grosse, S., Grimberg, M, Hölscher, T., and Karweick, J. (eds.). 1989. *"Denn das Schreiben gehört nicht zu meiner täglichen Beschäftigung". Der Alltag kleiner Leute in Bittschriften, Briefen und Berichten aus dem 19. Jahrhundert. Ein Lesebuch*. Bonn: Dietz.

Halliday, M.A.K. 2004. *The language of science. Collected works of M.A.K. Halliday*, vol. 5, ed. J.J. Webster. London: Continuum.

Hartmann, S. 2016. *Wortbildungswandel. Eine diachrone Studie zu deutschen Nominalisierungsmustern*. Berlin/Boston: De Gruyter.

Hartmann, S. 2018. Derivational morphology in flux. A case study on word-formation change in German. *Cognitive Linguistics.* Ahead of print, https://doi.org/10.1515/cog-2016-0146.

Haspelmath, M. 1999. Why is grammaticalization irreversible? *Linguistics* 37: 1043–1068.

Hay, J.B. 2001. Lexical frequency in morphology: Is everything relative? *Linguistics* 39: 1041–1070.

———. 2003. *Causes and consequences of word structure*. London: Routledge.

Hilpert, M. 2014. *Construction grammar and its application to English*. Edinburgh: Edinburgh University Press.

———. 2015. From hand-carved to computer-based: Noun-participle compounding and the upward-strengthening hypothesis. *Cognitive Linguistics* 26: 113–147.

———. forthcoming. Three open questions in diachronic construction grammar. In *Grammaticalization meets construction grammar*, ed. E. Coussé, P. Andersson, and J. Olofsson. Amsterdam/Philadelphia: John Benjamins.

Hopper, P. 2015. Emergent grammar. In *Handbook of language emergence*, ed. B. MacWhinney and W. O'Grady, 314–327. Oxford: Blackwell.

Horlitz, B. 1986. Zur lexikographischen Darstellung der Verbalsubstantive auf *-ung*. In *Studien zur neuhochdeutschen Lexikographie VI, Teilbd. 1* (GL 87), ed. H.E. Wiegand, 479–490. Hildesheim/Zürich/New York: Olms.

Hüning, M., and B. Schlücker. 2010. Konvergenz und Divergenz in der Wortbildung. Komposition im Niederländischen und Deutschen. In *Kontrastive germanistische Linguistik*, ed. A. Dammel, S. Kürschner, and D. Nübling, 783–825. Hildesheim: Olms.

Keller, R. 1994. *Sprachwandel: Von der unsichtbaren Hand in der Sprache*. Tübingen/Basel: Francke.

Kempf, L. 2016. *Adjektivsuffixe in Konkurrenz. Wortbildungswandel vom Frühneuhochdeutschen zum Neuhochdeutschen*. Berlin/Boston: de Gruyter.

Klein, Th., H.-J. Solms, and K.-P. Wegera, eds. 2009. *Mittelhochdeutsche Grammatik: Wortbildung*. Tübingen: Niemeyer.

Knoop, U. 1994. Entwicklung von Literalität und Alphabetisierung in Deutschland. In *Schrift und Schriftlichkeit. Ein interdisziplinäres Handbuch internationaler Forschung. 1. Halbband*, ed. H. Günther and O. Ludwig, 859–872. Berlin/New York: de Gruyter.

Koch, P. 2004. Sprachwandel, Mündlichkeit und Schriftlichkeit. *Zeitschrift für romanische Philologie* 120: 605–630.

Koch, P., and W. Oesterreicher. 1996. Sprachwandel und expressive Mündlichkeit. *Zeitschrift für Literaturwissenschaft und Linguistik* 102: 64–96.

Kopf, K. 2016. *Mainzer (Früh-)Neuhochdeutschkorpus (1500–1710)*. Mainz: University of Mainz.

Kühnhold, I., O. Putzer, and H. Wellmann. 1978. *Deutsche Wortbildung. Typen und Tendenzen in der Gegenwartssprache. Eine Bestandsaufnahme des Instituts für Deutsche Sprache, Forschungsstelle Innsbruck. Dritter Hauptteil: Das Adjektiv*. Düsseldorf: Schwann.

Kupietz, M., C. Belica, H. Keibel, and A. Witt. 2010. The German Reference Corpus DeReKo: A primordial sample for linguistic research. In *Proceedings of the 7th Conference on International Language Resources and Evaluation (LREC 2010)*., ed. N. Calzolari et al., 1848–1854. Valletta: European Language Resources Association (ELRA). http://www.lrec-conf.org/proceedings/lrec2010/pdf/414_Paper.pdf.

Langacker, R.W. 1987. *Foundations of cognitive grammar. Vol. 1: Theoretical prerequisites*. Stanford: Stanford University Press.

Motsch, W. 2004. *Deutsche Wortbildung in Grundzügen*. 2nd ed. Berlin/New York: de Gruyter.

Norde, M., and G. Trousdale. 2016. Exaptation from the perspective of construction morphology. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 163–195. Amsterdam/Philadelphia: John Benjamins.

Paul, H. 1897. Ueber die Aufgaben der Wortbildungslehre. *Sitzungsberichte der philosophisch-philologischen und der historischen Classe der königlich bayerischen Akademie der Wissenschaften 1896, Heft IV*, 692–713. München: Staub.

Pfeifer, W. 1993. *Etymologisches Wörterbuch des Deutschen*. Online version via https://www.dwds.de/.

Pimenova, N.B. 2002. Semantische Restriktionen für die *unga*-Ableitung im Althochdeutschen. *Germanistisches Jahrbuch der GUS "Das Wort"*, 93–106.

Plag, I. 1999. *Morphological productivity: Structural constraints in English derivation*, Topics in English Linguistics 28. Berlin/New York: Mouton de Gruyter.

———. 2005. *Word-formation in English*. Cambridge: Cambridge University Press.

Plag, I., Ch. Dalton-Puffer, and R.H. Baayen. 1999. Morphological productivity across speech and writing. *English Language and Linguistics* 3: 209–228.

Pleyer, M. 2017. Protolanguage and mechanisms of meaning construal in interaction. *Language Sciences* 63: 69–90.

Pounder, A.V. 2001. Adverb-marking in German and English: System and standardization. *Diachronica* 18: 301–358.

Riecke, J. 1999. Pseudopartizipien im Althochdeutschen. Ein Beitrag zur Geschichte eines Wortbildungstyps. *Sprachwissenschaft* 24: 157–193.

Rumelhart, D.E. 1980. Schemata: The building blocks of cognition. In *Theoretical issues in reading comprehension: Perspectives from cognitive psychology, linguistics, artificial intelligence, and education*, ed. R.J. Spiro, B.C. Bruce, and W.F. Brewer, 33–58. Hillsdale: Erlbaum.

Schäfer, R., and F. Bildhauer. 2012. Building large corpora from the web using a new efficient tool chain. In *Proceedings of LREC* 2012, ed. C. Calzolari, K. Choukri, T. Declerck, M. Uğur Doğan, B. Maegaard, J. Mariani, A. Moreno, J. Odijk, and S. Piperidis, 486–493.

Scherer, C. 2005. *Wortbildungswandel und Produktivität. Eine empirische Studie zur nominalen -er-Derivation im Deutschen*. Tübingen: Niemeyer.

Schmid, H.-J. 2007. Entrenchment, salience, and basic levels. In *The Oxford handbook of cognitive linguistics*, ed. D. Geeraerts and H. Cuyckens, 118–138. Oxford: Oxford University Press.

———. 2014. A blueprint of the entrenchment-and-conventionalization model. In *Yearbook of the German Cognitive Linguistics Association*, ed. M. Hilpert and S. Flach, vol. 2, 3–25. Berlin/Boston: de Gruyter.

———. 2017. A framework for understanding entrenchment and its psychological foundations. In *Entrenchment and the psychology of language learning. How we reorganize and adapt linguistic knowledge*, ed. H.-J. Schmid, 9–39. Berlin/Boston: de Gruyter.

Schmid, H.-J., and F. Günther. 2016. Toward a unified socio-cognitive framework for salience in language. *Frontiers in Psychology* 7. http://journal.frontiersin.org/article/10.3389/fpsyg.2016.01110.

Schröder, M. 1988. Entwicklungstendenzen in der Wortbildung. In *Entwicklungstendenzen in der deutschen Gegenwartssprache*, ed. K.-E. Sommerfeldt, 174–192. Leipzig: Bibliographisches Institut.

Szczepaniak, R. 2015. Syntaktische Einheitenbildung – typologisch und diachron betrachtet. In *Handbuch Satz, Äußerung, Schema*, ed. Ch. Dürscheid and J.G. Schneider, 104–124. Berlin/Boston: De Gruyter.

Taylor, J.R. 2002. *Cognitive grammar*. Oxford: Oxford University Press.

Thomas, B. 2002. *Adjektivderivation im Nürnberger Frühneuhochdeutsch um 1500: Eine historisch-synchrone Analyse anhand von Texten Albrecht Dürers, Veit Dietrichs und Heinrich Deichslers*. Berlin: de Gruyter.

Traugott, E.C., and G. Trousdale. 2013. *Constructionalization and constructional changes*, Oxford studies in diachronic and historical linguistics 6. Oxford: Oxford University Press.

Van de Velde, F. 2014. Degeneracy: The maintenance of constructional networks. In *Extending the scope of construction grammar*, ed. R. Boogaart, T. Colleman, and G. Rutten, 141–180. Berlin/Boston: De Gruyter.

Van Haeringen, C.B. 1949. Participia praeverbalia. *De Nieuwe Taalgids* 42: 187–191.

Weber, H. 1971. *Das erweiterte Adjektiv- und Partizipialattribut im Deutschen*. München: Hueber.

Wells, R. 1960. Nominal and verbal style. In *Style in language*, ed. T.A. Sebeok, 213–220. Cambridge, MA/New York: Technology Press & Wiley.

Winkler, G. 1995. *Die Wortbildung mit -lich im Alt-, Mittel- und Frühneuhochdeutschen*. Heidelberg: Winter.

Debonding and Clipping of Prefixoids in Germanic: Constructionalization or Constructional Change?

Muriel Norde and Kristel Van Goethem

Abstract This paper is concerned with the debonding of three Germanic prefixoids: Dutch *kei* 'boulder', German *Hammer* 'hammer', and Swedish *kanon* 'cannon'. Drawing on an extensive corpus-based and statistical analysis, we compare the formal properties (construction types), semantics (degree of bleaching), collocational properties and productivity of bound and free uses of each prefixoid. We show that debonding of prefixoids is a productive process of lexical innovation in Germanic languages, which may lead to the creation of new intensifying adverbs or evaluative adjectives. In addition, we explore whether debonding of prefixoids can be fruitfully analysed from a constructional perspective. More in particular, we address the question of whether the observed changes accompanying debonding are best accounted for by Traugott and Trousdale's concept of 'constructionalization', or by Hilpert's concept of 'constructional change'. To this end, we explore a variety of quantitative methods, including productivity measures and distinctive collexeme analysis. We conclude that the quantitative differences between the bound and the free forms of the three prefixoids studied in this paper allow us to consider them as two separate constructions, but that the distinction is a gradient one.

Keywords Debonding · Clipping · Prefixoids · Intensification · Constructionalization · Constructional change · Germanic languages (Dutch · German · Swedish)

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1 Introduction[1]

In this article, we will examine how the Germanic constructicon is expanded by a process we label 'debonding' – a composite change whereby bound morphemes (clitics, affixes, affixoids) in a specific context develop into free morphemes (Norde 2009: 186). Focus will be on debonding of three Germanic prefixoids that derive from nouns denoting a hard or high impact object: Dutch *kei* 'boulder', German *Hammer* 'hammer', and Swedish *kanon* 'cannon'. Drawing on an extensive corpus-based analysis of bound and free uses of these three prefixoids, we aim to demonstrate that debonding of prefixoids is a productive process of lexical innovation in Germanic languages, which may lead to the creation of new intensifying adverbs or evaluative adjectives. In addition, we aim to explore whether debonding of prefixoids can be fruitfully analysed from a constructional perspective. More in particular, we will address the question of whether the semantic and formal changes accompanying debonding are best accounted for by Traugott and Trousdale's (2013) concept of 'constructionalization', or by Hilpert's (2013) concept of 'constructional change', which includes changes in frequency. In so doing, we will complement the study by Trousdale and Norde (2013) who examine two other types of degrammaticalization (degrammation and deinflectionalization) from a constructionist perspective.

The body of the paper is organized as follows. In the next section, we will outline our constructionist approach to debonding and clipping of prefixoids, as well as discuss the notions of constructionalization and constructional change. In Sect. 3, we will present the sources and method of our empirical studies. Sections 4, 5 and 6 will be dedicated to a detailed analysis of Dutch *kei*, German *Hammer* and Swedish *kanon* respectively. For each prefixoid, we will compare the formal properties (construction types), semantics (degree of bleaching), collocational properties and productivity of its bound and free uses. The results of these three case studies will be compared and analysed statistically in Sect. 7. We conclude the paper with a discussion of the central question: do the results of our data analysis allow us to treat the debonding of a bound prefixoid as an instance of constructionalization?

[1]This paper is part of our joint project on the debonding of prefixoids in the Germanic languages. We gratefully acknowledge the feedback provided by two anonymous reviewers, as well as by a number of colleagues who read an earlier draft of this paper: Malte Battefeld, Chris Ebert, Isa Hendrikx, Nikos Koutsoukos, Therese Lindström Tiedemann, Roland Pooth, Henrik Rosenkvist, Philip Shushurin, Sarah Sippach, and Lars Erik Zeige.

2 Theoretical Preliminaries

2.1 Debonding and Clipping of Prefixoids

Affixoids form a specific class of bound morphemes that have been characterized as morphemes "which look like parts of compounds, and do occur as lexemes, but have a specific and more restricted meaning when used as part of a compound" (Booij 2009: 208, see also Booij 2010: 55ff.).[2] They form a very productive class – Hoeksema (2012), for instance, lists 696 Dutch compounds with prefixoids, and his list is far from exhaustive. When affixoids develop out of left-hand members of head-final compounds, they typically acquire evaluative meaning (in [N-N] compounds) or intensifying meaning (in [N-ADJ] compounds), as in Dutch *wereld-wijf* 'fantastic woman' (< *wereld* 'world'), or *bloedmooi* 'drop dead gorgeous' (< *bloed* 'blood'). The lexical basis of such modifying prefixoids is often a noun, but adjectives (e.g. *dolverliefd* 'madly in love (< *dol* 'mad')), or verbs (e.g. *loeistrak* 'tight as a drum' (< *loei-* 'to blast, roar')) can develop into prefixoids, too.[3] In many cases, there exists a cline from determinative compounds via simile compounds to evaluative/intensifying compounds, as the following examples show (Norde and Van Goethem 2014: 259)[4]:

(1) [N-N] compounds: German *Riesenhand* 'hand of a giant' (determinative) – *Riesenbühne* 'giant stage' (simile) – *Riesenstimmung* 'great atmosphere' (evaluative)

(2) [N-ADJ] compounds: Swedish *jättelik* 'giant-like' (determinative) – *jättestor* 'as big as a giant' (simile) – *jättegullig* 'very cute' (intensifying)

On the formal side, prefixoids often have specific characteristics as well. For instance, some Dutch prefixoids are followed by a linking vowel [ə], e.g. *bere-* (< *beer* 'bear'), *reuze-* (< *reus* 'giant'), or *rete-* (< *reet* 'ass'). Moreover, Dutch prefixoids can be emphasized either by vowel lengthening (*reeeeetegoed* 'ass good > excellent'), or by reduplication (*spek- en spekglad* 'bacon and bacon slippery > very slippery'). German prefixoids, on the other hand, are prosodically different from

[2]There is some controversy regarding the morphological status of prefixoids. Although it is generally acknowledged that they are semantically different from the free morphemes they derive from and may have specific formal properties, several authors have argued that this does not imply that they form a distinct type of morpheme. This issue is outside of the scope of this paper – for discussion, see Norde and Van Goethem (2015); Norde and Morris (2018) or Battefeld et al. (2018), and references therein.

[3]Prefixoids with intensifying function in [N-ADJ] compounds are found in all Germanic languages except English. English did borrow *über-* from German (*übercool, übersexy*; Van der Wouden and Foolen 2017: 85), but this is not a prefixoid in the strict sense because it does not correspond to a free English lexeme.

[4]On the development of affixoids see further, among others, Stevens (2005); Pittner and Berman (2006); Berman (2009); Leuschner (2010); Hoeksema (2012); Klara (2012); Meibauer (2013); Hüning and Booij (2014); Battefeld et al. (2018).

determinative compounds, compare the different stress patterns in *ˈHammerklavier* 'hammer piano > fortepiano' and *ˈHammerklaˈvier* 'outstanding piano' (Schlücker 2013: 457).

In this article, we will focus on another typical formal property of such evaluative/intensifying prefixoids, which is that they can be severed from their head and written as a separate word before its R1. Once separated from its head, the prefixoid may acquire new morpho-syntactic functions, such as taking scope over an entire NP (as in (3)), or modifying a verb (as in (4)). That these free morphemes developed out of the prefixoid, and not out of the corresponding noun, is not only evidenced by their evaluative or intensifying meaning, but, in some cases, also by their form: when the prefixoid had a linking vowel (example (5)), or consonant (example (6)), these are preserved in the free form. Conversely, if a vowel is dropped in the prefixoid, as in German *end-* (< *Ende* 'end'), it is also absent if the prefixoid develops into a free morpheme, as in (7).[5]

(3) *das spiel hat eine* ***riesen*** *deutsche community wo man genug hilfe findet.*
'the game has a huge German community where one can find plenty of support'
(DECOW 2012)

(4) *min fredag startade* ***kanon***
'my Friday started wonderfully'
(SECOW14AX)

(5) *Onze kinderen hebben zich* ***reuze*** (**reus*) *vermaakt* (. . .)
'Our kids enjoyed themselves tremendously (. . .)'
(NLCOW 2012)

(6) *Ik hou* ***ziels*** (**ziel*) *van jou meer dan van wie dan ook.*
'I love you with all my soul, more than (I love) anyone'.
www.quizlet.nl/chapters/1179678/part-155-zayn/

(7) *würd mich über eine antwort* ***end*** (**Ende*) *freuen!!!*
'(I) would be much looking forward to a reply!!!'
(DECOW14AX)

The development of free morphemes out of erstwhile bound ones are examples of debonding (Norde 2009: 186). Debonding may affect clitics, affixes (both inflectional and derivational), and affixoids. Examples include the Northern Saami postposition *haga* 'without', which developed out of an abessive suffix, or the independent uses of English *ish* (Norde 2009: 186–227). Examples of debonding of prefixoids were discussed earlier in, for instance, Norde and Van Goethem (2014, 2015), Van Goethem and Hiligsmann (2014), Van Goethem and De Smet (2014), Van Goethem and Hüning (2015) and Battefeld et al. (2018). The specific linguistic context for debonding of prefixoids is one in which the bound prefixoid can be reanalysed as an attributive adjective (in case of [Prefixoid-N] constructions), as in

[5]Thanks to Sarah Sippach for drawing our attention to German *end*, and finding corpus examples.

(8), or an adverb (in case of [Prefixoid-ADJ] constructions), as in (9) (note that the adverb takes scope over two coordinated adjectives):

(8) *ich habe einen **riesen** fehler gemacht*
'I have made a huge mistake'
(DECOW 2012)

(9) *Het klinkt allemaal **reuze** leuk en aardig: vergeven en vergeten, streep eronder en doorgaan!*
'It all sounds very nice and neat: forgive and forget, let bygones be bygones and move on!'
(NLCOW 2012)

Debonding of prefixoids into adjectives is a gradual process – adjectives that develop in this way are usually not inflected, at least not initially (Van Goethem and De Smet 2014: 253). Furthermore, debonding of prefixoids is often 'sneaky' in the sense of De Smet (2012: 7), who defines this sneakiness as "apparently thriving on structural ambiguities and (possibly superficial) resemblances to existing patterns". This may be illustrated by German *riesen* 'giant': in 19 out of 32 adjectival contexts,[6] the adjectival suffix *–en* is required (Norde and Van Goethem 2014: 270), so that *einen riesen Fehler* in (8) above looks like a perfectly grammatical construction. Similarly, Dutch *reuze* can be interpreted as an adjective in *–e*, which is the suffix used in most attributive contexts (Van Goethem and Hiligsmann 2014: 60). At a later stage, the debonded adjectives may acquire adjectival inflections, such as the indefinite neuter singular in the German example in (10), or the comparative form in the Dutch example in (11):

(10) *Ein **rieses** Dankeschön nochmal*
'A huge thank you, once more'
(DECOW2012)

(11) *Ik krijg ineens een leuk idee: een nog **reuzere** mergpijp op taartformaat!*
'I suddenly have this great idea, an even bigger (lit. more giant) marrow-bone (kind of Dutch pastry) the size of a pie!'
http://forum.deleukstetaarten.nl/viewtopic.php?id=30091

However, free uses of erstwhile prefixoids may also be the result of clipping in a specific (predicative) context (Van Goethem and De Smet 2014, Van Goethem and Hiligsmann 2014, Van Goethem and Hüning 2015, Norde and Van Goethem 2015, Battefeld et al. 2018). For instance, in example (12) *stapel* derives from *stapelgek* (lit. 'pile mad'), whereas *piep* in (13) derives from *piepjong* (lit. 'squeak young'). In these cases, the meaning of the full compound is transferred to the free

[6]German adjectival inflection features three genders, four cases, as well as a contrast between definite and indefinite forms in the singular; and 4 cases and definite/indefinite contrast in the plural. This makes 32 contexts, although many of these forms have the same suffix.

prefixoid. Note that the corresponding attributive constructions in (14) and (15) are ungrammatical (Van Goethem and Hiligsmann 2014: 58).

(12) *Ik ben **stapel** op mooi gemaakte kinderfilms*
'I am mad about beautifully made children's movies'
(NLCOW 2012)

(13) *En met 54 jaar ben je ook niet meer zo **piep***
'And at 54 one is not the youngest anymore'
(NLCOW 2012)

(14) **Een stapele jongen* 'a mad boy'

(15) **Een piep meisje* 'a very young girl'

The use of clipped prefixoids in predicative position may be favoured by the existence of the structurally similar predicative bare noun construction, which is found in all three languages studied. In these constructions, illustrated in (16) and (17), the bare noun expresses a general quality, e.g. a profession or nationality, and has become less noun-like in the sense that it cannot be modified by an adjective, and more adjective-like because it can be modified by an adverb (cf. Berman 2009: 99–101)[7]:

(16) *Er ist (*netter) **Lehrer***
'He is a (nice) teacher'

(17) *Er ist **ganz Lehrer***
'He is the typical cliché of a teacher'

These constructions are structurally very similar to free prefixoids in predicative position, which can likewise be modified by an adverb:

(18) *Ja wir wissen das Spiel sieht **total mist** aus.*
'Yes we know, the game looks totally crap'
(DECOW2014AX)

In some works (e.g. Pittner and Berman 2006, Berman 2009) the predicative bare noun construction is even considered the *only* source of evaluative adjectives that are homophonous with prefixoids. On the other hand, Van Goethem and Hüning (2015) have shown that, e.g., Dutch *top* and German *spitze* (both meaning 'top') have developed out of two source constructions: debonding of the corresponding prefixoids and noun to adjective change in predicative position (on multiple source constructions see further Trousdale 2013, Van de Velde et al. 2013).

[7]Thanks to Roland Pooth for providing us with example (17).

2.2 *Constructionalization and Constructional Change*

In this article we will discuss debonding and clipping of prefixoids from a constructionist perspective. Since prefixoids are neither free morphemes nor prefixes, they are best analysed in a framework which treats symbolic form-meaning pairings (i.e. constructions) as the basic unit of analysis, without putting constraints on the category of a construction or one of its parts. In constructional approaches to language and language change, words and larger units are defined by their formal and semantic properties, and these properties link them both to constructions that are similar in meaning and/or form, and to more schematic constructions that generalize over similar types. In the case of prefixoids, this means that e.g. Dutch *bere-* and *reuze-* are laterally linked because of their similarity in function, whereas both are vertically linked to (or 'sanctioned by' in construction grammar terms) the more general schema for intensifying prefixoids with an adjectival base in (19) (see further Norde and Van Goethem 2015; Norde and Morris 2018):

(19) $[<a> [b]_{Ai}]_{Aj} \quad \Longleftrightarrow \quad [[\text{very } [\text{SEM}]_i]_j$

Recently there has been a growing interest in changes in constructions and the emergence of new constructions (cf. among others Bergs and Diewald 2008; Hilpert 2013; Traugott and Trousdale 2013; Trousdale and Norde 2013; Barðdal et al. 2015; Van Goethem et al. 2018; a recent survey of the field is given in Noël 2016). From this usage-based view of language change, it is taken for granted that changes do not occur in isolation, but that linguistic context is highly relevant (e.g., Bergs and Diewald 2009). From such a diachronic point of view, Hüning and Booij (2014) have convincingly argued that the 'umbrella' notion of 'constructionalization' (Traugott and Trousdale 2013) is more appropriate than the notions of grammaticalization and lexicalization to account for hybrid and context-dependent changes, such as the rise of affixoids. Hüning and Booij (2014: 600) argue that "[T]he general concept of constructionalization (. . .) offer[s] a way out of the problems associated with the "element based view" and with the idea of a "cline", (. . .)" because in Construction Grammar the idea of a cline can be replaced by a taxonomic network of related constructions (Trousdale 2008: 172).

Another basic tenet of the Construction Grammar approach is that the underlying mechanisms of change are analogical thinking and subsequent neoanalysis[8] (cf. Traugott and Trousdale 2013). In 2.1, we have illustrated that language users recognize the formal and semantic connections between evaluative modifiers in compounds or intensifying prefixoids, on the one hand, and evaluative adjectives or intensifying adverbs, on the other, and that this may trigger attraction to these other constructions in the network and ultimately the shift from bound to free morphemes.

[8]Neoanalysis is a term taken from Andersen (2001) and refers to the creation of a "new representation in the mind of a language user" (Traugott and Trousdale 2013: 21), which is argued to be "a micro-step in a constructional change" (p. 36).

For all these reasons, we believe it is interesting to apply the constructional perspective to debonding. To this end, we first need to briefly discuss the two main constructional approaches to language change, as advanced by Traugott and Trousdale (2013) and Hilpert (2013) respectively.

Traugott and Trousdale (2013) define the notion of 'constructionalization' as follows:

> **Constructionalization** is the creation of $form_{new}$-$meaning_{new}$ (combinations of) signs. It forms new type nodes, which have new syntax or morphology and new coded meaning, in the linguistic network of a population of speakers. It is accompanied by changes in degree of schematicity, productivity, and compositionality.[9] (Traugott and Trousdale 2013: 22).

Traugott and Trousdale (2013: 22) specify that

> [M]inimally, constructionalization involves neoanalysis of morphosyntactic form and semantic/pragmatic meaning (...). Formal changes alone, and meaning changes alone cannot constitute constructionalization.

When the change affects only the semantic or the formal pole of the construction, but no new construction is created (which would imply both formal and semantic change), Traugott and Trousdale (2013: 26) call this a 'constructional change' instead of a constructionalization:

> A **constructional change** is a change affecting one internal dimension of a construction. It does not involve the creation of a new node. (Traugott and Trousdale 2013: 26)

Constructional changes that typically 'feed' constructionalization are pragmatic inferences, semanticization of those inferences, form-meaning mismatches and some small distributional changes. Constructionalization may be followed by further constructional changes, such as expansion of collocations and, in some cases, morphological and/or phonological reduction.

Whereas the development of new constructions is mostly *gradual*, or "a succession of micro-steps preceding the creation of a new node" (Traugott and Trousdale 2013: 29), some (lexical) micro-constructions arise "with no prior constructional changes discernible" (ibid). This distinction is important when comparing debonding to clipping: both processes involve the free use of bound morphemes, but whereas debonding is gradual, clipping is instantaneous. As has been shown in Van Goethem and Koutsoukos (forthcoming), the Dutch compound member *luxe* 'lit. luxury; luxurious' (e.g. *luxehotel* 'luxury hotel') was first used as a free form in attributive constructions (e.g. *een erg luxe hotel* 'a very luxurious hotel'), where it still collocates with a noun, before gradually expanding to other contexts such as the predicative one (e.g. *het hotel is erg luxe* 'the hotel is very luxurious'), whereas a clipped prefixoid such as *piep* 'very young' (< *piepjong* lit. 'squeak young') did not develop in such a bridging context.

[9] As the parameters of schematicity and compositionality, as defined by Traugott and Trousdale (2013), are difficult to operationalize in our case studies, we will not use them in the remainder of this article.

In the second major introduction to Diachronic Construction Grammar, Hilpert (2013) does not use the term of 'constructionalization' but refers to the emergence of new constructions as 'constructional change'. In his view, constructional change not only manifests itself through form and meaning change, but through changes in frequency or distribution as well:

> **Constructional change** selectively seizes a conventionalized form-meaning pair of a language, altering it in terms of its form, its function, any aspect of its frequency, its distribution in the linguistic community, or any combination of these. (Hilpert 2013: 16).

An important difference between Traugott & Trousdale's definition of constructional change and Hilpert's is thus that Hilpert includes frequency as a third level of change: "[E]ven if a change does not create new functions or new structures, a rearrangement of relative frequencies still brings about a constructional change" (Hilpert 2013: 17). Changes in frequency may refer to text frequency, but also to the relative frequency of the functional and structural variants of the construction.

The central aim of this paper, then, is to investigate whether debonding can best be accounted for by Traugott and Trousdale's (2013) concept of 'constructionalization', or by Hilpert's (2013) concept of 'constructional change'. According to the definition, this implies changes in formal, semantic and/or distributional properties. We will investigate this question through three different cases of debonding, which will be subject to a detailed qualitative and quantitative analysis of their formal and semantic properties, as well as of their change in collocational properties and productivity. Before examining the case studies, we will present the corpora and discuss some methodological issues in Sect. 3.

3 Sources and Methods

Data for this study are drawn from COW14 (Corpora from the Web),[10] a gigatoken database of tagged and lemmatized texts from the web, compiled at the FU Berlin in 2011 and 2014 and released in 2014–2015 (Schäfer 2015). This corpus is perfectly suited to the study of language change in progress from a comparative perspective: it provides similar data sets from different languages, among them Dutch, German and Swedish, and a substantial portion of these data come from informal sources,[11] which is the typical locus of recent and innovative constructions. The subcorpora used for this study are given in Table 1. If no alternative source is given, all examples mentioned in the remainder of this paper are drawn from one of these three subcorpora.

To collect our data, we proceeded as follows: using the Colibri[2] query interface, we carried out a search for both the bound and free forms of Dutch *kei*, German *H/hammer* and Swedish *kanon.* Since written corpus data do not allow us to check

[10]The corpus is available, after registration, at https://www.webcorpora.org//

[11]We quote literally from the corpora, which means that spelling errors have not been edited.

Table 1 Subcorpora used in this study

COW14 Subcorpora	Number of tokens	Number of sentences
NLCOW14AX	4,732,581,841	259,717,960
Dutch subcorpus (Belgian and Netherlandic Dutch)		
DECOW14AX	11,660,894,000	624,767,747
German subcorpus (Austrian, Swiss and German German)		
SVCOW14AX	4,842,753,707	306,599,971
Swedish subcorpus (Finland Swedish and Sweden Swedish)		

phonological criteria such as stress, the distinction between bound and free forms has been exclusively based on spelling. The results were imported into Excel, and we used the RAND function in Excel to shuffle them. The first results in the concordance were checked manually and all irrelevant hits were discarded until we had a sample of 1000 relevant occurrences for each construction, which made 6000 occurrences in all.

In the case of bound *kei*, we removed irrelevant examples such as *keizer* 'emperor' and determinative compounds such as *keisteentjes* 'cobble-stones' or *keileem* 'boulder clay'. With respect to free *kei*, all occurrences of the noun *kei*, in its literal or figurative meaning (e.g. *een kei in wiskunde* 'a crack mathematician'), were excluded, so that the comparison between the bound and free forms is exclusively based on the use of *kei* as prefixoid or part of a simile compound and its debonded uses. Similarly, for bound *Hammer-/hammer-,* we removed determinative compounds (e.g. *Hammerschlag* 'hammer blow'), classifying compounds (e.g, *Hammerhai* 'hammerhead shark') and other irrelevant results such as *hammermäßig* 'hammer-wise'.[12] For the free *hammer* construction, we took a random sample of 1000 tokens of lower case *hammer*. We did not include *Hammer* (with upper case *H*) in this analysis, because a pilot study revealed that only very few upper case *Hammer* constructions were relevant tokens.[13] From the raw *hammer* data, we discarded irrelevant hits such as the noun *hammer* (erroneously written in lower case), or *hammer* as short for *haben wir* 'have we' (colloquial). As far as our third prefixoid, Swedish *kanon*, is concerned, we discarded irrelevant examples (e.g. *kanonen* 'the cannon; cool', *kanonkula* 'cannonball', *kanonisk* 'canonical', *kanonjär* 'cannonneer'). For free *kanon* we had to remove all examples where *kanon* was the original noun 'cannon', or a homographic noun meaning 'canon'.

[12]Each single token had to be analysed separately, because some tokens had to be discarded, whereas other were relevant to this study. For example, *Hammerfilm* could mean 'a movie from the *Hammer House of Horror* studios' or 'a great movie'. Tokens with the former meaning were removed from the data set.

[13]Of the first 200 tokens in the sample, only 51 were relevant to our study. This would imply that we would have needed to sift through 4000 tokens (manually) to obtain a 1000 token sample including upper case *Hammer*.

The remaining examples were tagged for R1 (i.e. the second compounding element in bound constructions, or the first word to the right in free constructions), part of speech of the R1, semantic type (e.g. simile) and particular properties such as reduplication. For *H/hammer* we furthermore noted whether the prefixoid was spelled with upper case or lower case, and whether the free form of the prefixoid was preceded by an article (definite or indefinite).

This database forms the basis for the quantitative analyses in the sections below. For each bound and free form, we will analyse four properties: (i) construction type (the part of speech the bound or free prefixoid collocates with), (ii) (in case of [Prefixoid-ADJ] constructions) semantic bleaching (the proportion of simile and intensifying constructions), (iii) collocational properties (R1 types and tokens) and (iv) productivity. We use two measures for productivity: type/token ratio (TTR) and Potential Productivity (PP). The latter is discussed in Baayen (2009), and is calculated by dividing the number of hapax legomena of a particular word formation pattern in the corpus by the total number of tokens of that pattern (Baayen 2009: 902). This ratio will allow us to compare the potential growth rate of the bound and free morphemes in both languages.

In Sect. 7, we will offer statistical analyses of all three case studies in order to assess whether formal, semantic, and collocational differences as well as differences in productivity between bound and free *kei, hammer* and *kanon* are significant. If the probability that an attested difference between the bound and the free form is due to chance is smaller than 0.05, we will argue that we are dealing with a constructional change. Since all four properties that we examine in this paper are quantifiable, constructional change, or the absence thereof, can be calculated with the help of associative statistics. A more tricky issue however, is how we can identify constructionalization. As Hilpert (2015: 134) aptly puts it: "Just after how many constructional changes exactly do we have a construction that counts as a new node?" We will return to this question in Sect. 8.

4 Dutch *kei*

The Dutch noun *kei* means 'boulder, cobble-stone' and is attested as left-hand member of simile compounds at least since the nineteenth century. According to Van der Sijs (2010), the compound *keihard* 'rock-hard, as hard as (a) stone' goes back to 1872; its first attestation in the Dictionary of Dutch language (WNT, s.v. *keihard*) is from 1921 (20). The same dictionary lists an occurrence of the simile compound *keidood* 'stone-dead' from 1803 (s.v. *kei*[I]) (21).

(20) *De kluiten droogden glashard op, (. . .), waardoor een bovenlaag van* ***keiharde*** *knikkers . . . verkregen werd* (1921)
'The clods got as hard as glass when they dried up, (. . .), as a result of which an upper layer of rock-hard marbles . . . was obtained'

(21) *Hij viel van de stelling en hij was* ***keidood*** (1803)
'He fell from the stand and he was stone-dead'

In the same period, *keihard* is already attested with a metaphorical meaning, too ('very hard, with a lot of power'). In these cases, *kei* can be analyzed as an intensifying prefixoid meaning 'very':

(22) *Een* ***keihard*** *schot (met den voetbal)* (1872)
'A powerful shot (with the football)'

(23) *Wanneer een voorwaarts op een achterspeler toeloopt en deze laatste trapt den bal* ***keihard*** *in het gelaat van den toeloopenden voorhoedespeler* (. . .) (1909)
'When a forward runs into a back player and the latter kicks the ball at full speed in the face of the vanguard player who is running in his direction (. . .)'.

The WNT dictionary does not mention the use of *kei* in combination with other adjectives than *hard* or *dood* nor the use of *kei* as a free intensifying morpheme. In the sections below, we will examine in more depth the formal (4.1) and semantic (4.2) properties of bound and free *kei*, and its collocational properties and productivity as both a bound and free form (4.3).

4.1 Construction Types

We analysed a corpus sample of 1000 relevant tokens of both bound and free *kei*. For bound *kei*, this sample includes occurrences in which *kei* forms part of a simile or an intensified compound, either written as one word (983 occurrences) or hyphenated (only 17 compounds). The sample of free *kei* includes 1000 instances in which *kei* is written as a separate word and still preserves its simile or intensifying meaning. As indicated in Sect. 3, occurrences of the noun *kei* have been excluded since these are not debonded uses of the compound member.

Table 2 presents the construction types of bound and free *kei* as observed in both corpus samples.

Table 2 indicates that bound kei mostly combines with adjectives (24–25) or adverbs (26); some examples do not contain sufficient context to determine whether the compound head was an adjective or an adverb (27). In one example only, bound *kei* combines with a nominal head (28).

Table 2 Bound and free *kei* – construction types

POS R1	Bound *kei*	Free *kei*
Adj/Adj P (or interjection)	514 (51.40%)	631 (63.10%)
Adv	460 (46.00%)	302 (30.20%)
Adj/Adv	25 (2.50%)	0
N/NP	1 (0.10%)	3 (0.30%)
Quant	0	48 (4.80%)
V	0	10 (1.00%)
No R1 (predicative use)	0	6 (0.60%)
	1000 (100%)	**1000 (100%)**

(24) *Vissen leven in een **keiharde,** stressvolle wereld onder water waar het constant "eten of gegeten worden" is.*
'Fish live in a tough, stressful underwater world with a constant threat of "to eat or to be eaten".'

(25) *Laminaat ligt, maar ik ben ook **keikapot** . . .*
'Laminate is ready, but I'm exhausted also . . . '

(26) *Ik was **keihard** aan het meezingen met het liedje I will always love you van Dolly Parton.*
'I was singing loudly along with Dolly Parton's song "I will always love you".'

(27) *En gelukkig overal **keihard**, volume op standje 10*
'And luckily everywhere very loud(ly), at volume 10'

(28) *Hij is echt een **keisukkel** (. . .)!*
'He is really a complete idiot (. . .)!'

Free *kei* is used in a broader range of construction types than bound *kei*. Besides having scope over adjectives (29) and adverbs (30), which are still the most frequent heads, free *kei* can also intensify quantifiers (31) and verbs (32). Scope over a noun, as in (33), is still marginal. In 6 examples, *kei* is used as a predicative adjective without modifying a head (34): this signals that debonded *kei* has undergone "flexibilization", i.e. an increase in syntactic freedom (Norde 2009: 131). Moreover, as shown by the examples (35–36), *kei* may also have scope over (adjectival or noun) phrases, which signals "scope expansion" (Norde 2009: 131) compared to bound *kei*.

(29) *Heb het wel al miljoen keer gezegd maar ik ben echt* ***kei en kei trots*** *op je!!!*
'Have said it a million times already but I'm really super proud of you!!!'

(30) *Om 13 u verwachten ze me in het Jan Palfijn om een biopsie te nemen van mijn pancreas via mijn maag (. . .) En ik moet daarom dus* ***kei lang*** *nuchter zijn!*
'At 1 p.m. they expect me in the Jan Palfijn hospital for a biopsy of my pancreas through my stomach (. . .) And therefore my belly needs to be empty for such a long time!'

(31) *Ik heb dagen dat ik echt helemaal niets eet en dagen dat ik* ***kei veel*** *eet!*
'There are days that I am really eating nothing and days that I eat very much!'

(32) *Nogmaals* ***kei bedankt*** *dat ik hier mag wonen ik voel me echt thuis.*
'Thanks again very much that I can live here, I feel really at home.'

(33) *'s middags voelde ik me goed, 's avonds* ***kei keelpijn*** *en ziek . . . dag erna dood ziek*
'In the afternoon I felt good, in the evening terrible sore throat and sick . . . next day sick as a dog'

(34) *(. . .) uitdagingen, die hij tof,* ***kei****, en hip moest vinden.*
'(. . .) challenges, which he had to find nice, cool, and hip.'

(35) *Ze komen dus* ***kei te laat****, maar dat moeten ze maar op de koop toenemen.*
'So they are arriving way too late, but they have to put up with that.'

(36) *En zeg nou zelf, 50 cent is echt* ***kei geen geld****.*
'And let's face it, 50 cents is really no money at all.'

Free *kei* mostly acts as an adverb modifying an adjectival, adverbial (including quantifier) or verbal head. On the other hand, *kei* has an adjectival function when it has scope over a noun or noun phrase, or when it is used predicatively. Its adjectival status manifests itself when *kei* is coordinated with other adjectives, as illustrated in example (34). This shows that the debonding of *kei* also involves "recategorialization" (Norde 2009: 131). To sum up, it is shown that free *kei* has some "innovative" uses in relation to bound *kei* that result from debonding, although they are not (yet) very frequent.

4.2 Semantic Properties

Table 3 provides an overview of the semantics of bound and free *kei*. We only include examples where the simile reading is potentially available, i.e. where *kei* has scope over adjectives, adverbs and quantifiers; when *kei* modifies verbs, nouns or is used predicatively, it always has an intensifying or evaluative value.

Bound *kei* acts as an intensifying prefixoid in the great majority of occurrences (91.29%). The remaining instances are all examples of *keihard* used as a simile compound ('as hard as stone'). Examples (37) and (38) illustrate the two semantic types: *keihard* is used as a simile in (37) and as an intensifying compound in (38):

Table 3 Bound and free *kei* (R1 = Adj(P)/Adv/Quant) – semantics

	Bound *kei*	Free *kei*
Simile	87 (8.71%)	16 (1.63%)
Intensifying meaning	912 (91.29%)	965 (98.37%)
	999 (100%)	**981 (100%)**

(37) *Chocola uit Ghana heeft – om smelten in tropische temperaturen te voorkomen – een lager vetgehalte en is dus* ***keihard****.*
'Chocolate from Ghana – in order to prevent melting in tropical temperatures – has a lower fat content and that's why it is so hard.'

(38) *Dat laatste lieg ik* ***keihard****, want ik ga daar als eerste van genieten !!!*
'About that last thing I'm just really kidding, cause I will be the first to have fun!!!'

As Table 3 and example (39) show, the simile interpretation of *kei hard* is still available for the free form, albeit more exceptionally. We suggest to regard these 16 occurrences as deviant spellings of simile compounds. In all other occurrences, free *kei* has an intensifying meaning, as in example (40).

(39) *De klei wordt* ***kei hard*** *en neemt gewoon geen vervuiling op*
'The clay gets rock hard and just does not take any pollution'

(40) *United brands … een muts, sjaal en wanten (****kei Ally McBeal-achtig*** *dus) van hetzelfde*
'United brands … a hat, scarf and mittens (very Ally McBeal-ish) of the same type'

Surprisingly, in a number of occurrences *kei* even intensifies intrinsically non-gradable adjectives, such as *vrijwillig* 'voluntary' (41) and *vatbaar (voor)* 'susceptible, prone (to)' (42).

(41) *Bij het binnenkomen hadden we ons '****kei vrijwillig'*** *opgegeven voor het kauwgom-bellen-blazen (…)!*
'When we entered we signed up 'very voluntarily' for chewing gum-blowing!'

(42) *Ben* ***kei vatbaar*** *voor dit soort klote dingen.*
'[I] am very prone to this kind of fucked up things.'

Both bound and free *kei* can form part of an emphatic reduplicative construction (see 2.1); three different types of reduplication occur in the corpus sample:

(43) *Daten is **kei-en keihard,** en je kunt meedogenloos tegen de keien worden gesmeten*
'Dating is extremely tough, and you can end up thrown ruthlessly against the rocks'

(44) *Jayh – Doe de thing is echt **keikeikeihard**.*
'Jayh – Do the thing is really amazing.'

(45) *Het is een nieuw soort horrorfilm, (. . .), met 2 dames als hoofdrolspeelster, die allebei **keihard (maar dan ook KEIhard**) moeten vechten voor iets dat ze graag willen (. . .).*
'It's a new kind of horror movie, (. . .), with two women as protagonists, who both have to fight really hard (and I mean REALLY hard) for something that they want badly (. . .)'

The emphatic reduplicative construction is not restricted to purely intensifying morphemes; it is also available for simile compounds,[14] and remarkably, we even observed reduplication of free similative *kei* (46). We regard these cases as instances of simile compounds written as separate words (instead of the standard spelling *kei-en keihard*).

(46) *Niet lekker, het koekje was **kei en kei hard**, ze zijn zo de vuilnisbak ingegaan, jammer.*
'Not tasty, the cookie was rock-hard, they ended up in the bin, too bad.

In a number of instances, the compound *keihard* seems to have undergone semantic extension. In examples such as (47) and (48), *kei* still functions as an intensifying prefixoid, but the adjective or adverb *keihard* is used in contexts where the use of *hard* alone would not fit. The meaning of this 'lexicalized' *keihard* can be described as 'obvious(ly), loud and clear'.

(47) *Het staat er **keihard (*hard)**, zwart-op-wit.*
'It is loud and clear, black-on-white.'

(48) *Dat ze het doen weet je nu ook **keihard (*hard)**!!*
'That they are doing it, now at least you know it loud and clear'

This lexicalized use is also attested for separated *kei hard* (49). Example (50) is a particular use of lexicalized *kei* on its own. This case probably illustrates a clipped form of *keihard* which retains the meaning of the entire compound form (cf. Norde and Van Goethem 2015).

[14]This finding supports Hoeksema's (2012) account, according to which similes ("compounds expressing stereotyped comparisons") and compounds beginning with an intensifying prefixoid ("analogical extensions of comparison-based compounds") belong to the same class of "elative compounds", and may undergo emphatic reduplicative conjunction in a similar way as regular adverbs of degree (e.g. *ijs- en ijskoud* 'ice and ice cold; extremely cold', *erg maar dan ook erg koud* 'very but indeed very cold; really very cold', *zeer en zeer koud* 'very and very cold') (Hoeksema 2012: 98–99). Since this emphatic construction is available for both intensifying compounds and adverbs, it is not a conclusive criterion to range these uses of *kei* as instances of either an intensifying adverb or an orthographically separated prefixoid.

(49) *En misschien is daar ooit iemand in getrouwd, die nu* ***kei hard (*hard) gescheiden*** *is.*
'And perhaps someone ever got married there, who is now irrevocably divorced'

(50) *Maar het tegendeel werd mij op dat moment* ***kei bewezen***.
'But the opposite was clearly proved to me at that time.'

We can conclude that, at the semantic level, bound and free *kei* are used with a simile or an intensifying meaning. Free *kei* has not undergone any extension to new meanings or resemanticization. Language users tend to associate the simile interpretation with the compound *keihard* (written as one word).

4.3 Collocational Properties and Productivity

Table 4 shows the different types of adjectival and adverbial heads of bound *kei*; the occurrence *keisukkel* 'great idiot' (nominal head) has been excluded in order to make the data set uniform for the calculation of the productivity measures. As already suggested by the preceding examples, bound *kei* combines in the vast majority of cases with the adjective/adverb *hard* 'hard': *keihard* even covers 89.39% of the total corpus sample. *Keigoed* 'very good', *keigaaf* 'absolutely great', *keileuk* 'very nice' and *keigezellig* 'very cosy' complete the top 5, but their total token ratio only amounts to 6.40%. All the other types occur less than 5 times in the corpus, including 21 hapax legomena. Because of the small number of different adjectival/adverbial types (only 35) and the fact that *kei* almost exclusively combines with a single type, bound *kei* has a very low type-token ratio (0.04). Its potential productivity (0.02) is extremely low as well: it indicates that compounding with *kei* is running a "high risk of saturation", in Baayen's (2009) words. Potential expansion to new heads is therefore implausible.

Tables 5, 6 and 7 contain information about the collocational properties and productivity of free *kei* used as a modifier with scope over adjectives/adjectival phrases, adverbs and quantifiers (Table 5), verbs (Table 6) and nouns/noun phrases (Table 7).

Table 4 Bound *kei* (R1 = Adj/Adv) – collocates and productivity

Types	Number of tokens	%
hard 'hard'	893	89.39%
goed 'good'	26	2.60%
gaaf 'great, cool'	19	1.90%
leuk 'nice'	12	1.20%
gezellig 'cosy'	7	0.70%
n < 5 (incl. 21 hapax legomena)	42	4.20%
Types: 35 **TTR = 35/999 = 0.04** **PP = 21/999 = 0.02**	**Tokens: 999**	**100%**

Table 5 Free *kei* (R1 = Adj(P)/Adv/Quant) – collocates and productivity

Types	Number of tokens	%
hard 'hard'	274	27.93%
leuk 'nice'	108	11.01%
goed 'good'	95	9.68%
veel 'many'	47	4.79%
tof 'great'	33	3.36%
mooi 'beautiful'	28	2.85%
gezellig 'cosy'	24	2.45%
lang 'long'	16	1.63%
gaaf 'great'	15	1.53%
(n = 13) (2 types)	26	2.65%
(n = 12) (2 types)	24	2.45%
(n = 11) (2 types)	22	2.24%
(n = 10) (2 types)	20	2.04%
(n = 8) (1 type)	8	0.82%
(n = 6) (5 types)	30	3.06%
(n = 5) (3 types)	15	1.53%
n < 5 (incl. 87 hapax legomena)	196	19.98%
Types: 155	**Tokens: 981**	**100%**
TTR = 155/981 = 0.16		
PP = 87/981 = 0.09		

Table 6 Free *kei* (R1 = V) – collocates and productivity

Types	Number of tokens	%
bedanken 'to thank'	5	50.00%
(n = 1) *amuseren* 'to have fun', *bewijzen* 'to prove', *genieten* 'to enjoy', *gunnen* 'to grant, to allow', *lachen* 'to laugh'	5	50.00%
Types: 6	**Tokens: 10**	**100%**

Table 7 Free *kei* (R1 = N(P)) – collocates and productivity

Types	Number of tokens	%
(n = 1) *film* 'movie', *keelpijn* 'sore throat', *geen geld* 'no money'	3	100%
Types: 3	**Tokens: 3**	**100%**

It is worth noting that, among the 155 different adjectival/adverbial types, 10 types are loanwords from English (*cool, cute, happy, awesome*, etc.), covering a total of 23 occurrences, while only one compound with bound *kei* contains an English loanword (*keichill*). Language users possibly tend to write combinations with English loanwords as two separate words because this is the standard spelling for English compounds.

Given the low number of tokens of *kei* with scope over verbs and nouns, we will not calculate its productivity for these construction types. With respect to the

adjectival/adverbial/quantifier types, the adjective/adverb *hard* is clearly still the most frequent type (27.93%), but its frequency is much lower than that observed in combination with bound *kei* (89.39%). Instead, the distribution of free *kei* is spread over a far greater number of types (TTR = 0.16). Thanks to a higher number of hapax legomena, unbound *kei* also shows a greater potential productivity than bound *kei* (PP = 0.09). Both the type/token ratio and the potential productivity measures indicate that free *kei* is much more productive than bound *kei*. This does however not imply that bound *kei* is not a productive form with respect to its absolute frequency for instance, but the ratios indicate that it is almost saturated by one single type. The combination *kei* with *hard* reflects the oldest stage of the simile compound and is so high in token frequency that there may be a tendency to lexicalization (see 4.2) and univerbation, whereas more recent types with lower token frequency are more often orthographically separated from *kei*.

5 German *Hammer*

German *Hammer* 'hammer' is used as a noun referring to the tool, as well as in exclamations and predicative constructions to express a series of emotions, ranging from frustration and indignation to surprise and appreciation. In Grimms' German dictionary (s.v. *Hammer*), these emotive uses are associated with the mythological hammer of the god Thor, a source of both fear and admiration. The following historical examples[15] illustrate metaphorical and exclamative uses of *Hammer*:

(51) *Mein Wort ist ein* ***Hammer****/der die Felsen zerschmettert*. (DTA 1603)
'My word is a hammer that crushes the rocks' (DTA 1760)

(52) *Daß dich der* ***Hammer****!*
'OMG!'

An early example of the simile compound *hammerhart* 'hard as a hammer' is given in (53). The quotation marks may imply that the expression had not yet been conventionalized at the time.

(53) *Der Stein [. . .] war so groß wie eine Tischplatte, feinkörnig* ***"hammerhart"*** *[. . .].* (Die Zeit 1949)
'The stone [. . .] was as large as a tabletop, finegrained, and iron-hard [. . .]'

These figurative uses of *Hammer*, which have been around for centuries, have most likely played a part in the rise of *Hammer-/hammer-* as an evaluative and intensifying prefixoid. In the sections below, we will discuss formal, semantic and collocational properties of *Hammer-/hammer-*, in the same way as we have done for *kei*. To ease reading, we will henceforth write *hammer* to refer to both upper case and lower case spellings.

[15]The examples are from *Deutsches Textarchiv* (http://www.deutschestextarchiv.de)

5.1 Construction Types

German compounds are head-final, which implies that the second compound member determines the part of speech. Accordingly, formations with *hammer* should be written in upper case when R1 is a noun, and with lower case when R1 belongs to a part of speech other than nouns, according to German spelling rules. When R1 is an adjective initial capitals may be used as well, but only in combination with a hyphen, as in example (54). Hyphens may furthermore be used in compounds to emphasize the first compound member,[16] which may account for the hyphen in (55). However, hyphens are not consistently used, as the contrastive examples in (55) and (56) show. This suggest that users are uncertain about the morphological status of *hammer*, although spelling inconsistencies may also be due to the informal register represented by the COW corpus. With nouns, there is a lot of variation – most examples of lower case nouns are spelling errors (other nouns in the context of these examples lack upper case initials as well). The frequencies of all spelling variants are listed in Table 8.

(54) *Das Game is so* ***Hammer-geil***
'The game is so totally cool'

(55) *Vor uns liegt ein echtes* ***Hammer-Wochenende***
'We've got a really great weekend ahead of us'

(56) *Dann steht einem* ***Hammerwochenende*** *nichts mehr im wege.*
'Then nothing can prevent us from a great weekend.'

As Table 9 shows, bound *hammer* is most frequently used with adjectives (57), followed by nouns (58), adverbs (59), and quantifiers (60). Interestingly, the prefixoid may also collocate with other prefixoids, as in (61).

(57) *Naja, jetzt bin ich ja zufrieden mit der Vichy Nutrilogie 2, die für* ***hammertrockene*** *Haut gedacht ist*;).
'Well, at the moment I am happy with Vichy Nutrologie 2, meant for extremely dry skin;)'.

Table 8 Spelling variants of bound *Hammer-/hammer-* according to part of speech of R1

	Noun	Adjective	Adverb	Quantifier	Other
upper case	294	10	0	1	0
lower case	72	558	56	7	2
hyphen	232	28	1	0	0
no hyphen	134	540	55	8	2

[16] http://www.duden.de/sprachwissen/rechtschreibregeln/bindestrich#K26

Table 9 Bound and free *hammer* – construction types

POS R1	Bound *hammer*	Free *hammer*
Adj (or interjection)	567 (56.80%)	119 (11.80%)
Adv	56 (5.60%)	4 (0.40%)
N	366 (36.60%)	172 (17.20%)
Prefixoid	3 (0.30%)	0
Quantifier	8 (0.80%)	3 (0.30%)
Verb	0	18 (1.80%)
No R1 (predicative use)	0	685 (68.50%)
	1000 (100%)	**1000 (100%)**

(58) *Außerdem gefällt mir der Kandidat, der bei TV Total gecastet wurde, der hat echt eine* ***Hammer-Stimme****.*
'Moreover I like the candidate that had been casted by TV Total, he really does have an awesome voice.'

(59) *Goku wurde von dem cyborg* ***hammerhart*** *geknebeld.*
'Goku was tied up by the cyborg very rigidly'.

(60) *Ich finde 300 g Futter + Snack* ***hammerwenig****.*
'I find 300 grams of (dog) food plus a snack very little.'

(61) *für so einen preis muß bei mir das mu [makeup]* ***hammersuper*** *sein.*
'for such a price I think makeup has to be absolutely amazing'

From Table 9 it is evident that there is more variation in free *hammer* constructions than there is in bound *hammer-* constructions. Like its bound equivalent, free *hammer* may collocate with adjectives (62), adverbs (63), quantifiers (64), and nouns (65).

(62) *Nächste Folge wird* ***hammer spannend*** (. . .)
'The next episode is going to be absolutely thrilling'.

(63) *matt du kannst* ***hammer gut*** *küssen* *:) *
'Matt, you kiss extremely well'

(64) *aber das is bestimmt* ***hammer viel*** *arbeit . . .*
'but that is clearly going to be a whole lot of work'

(65) *Ganz ehrlich, ich glaube Dragon Age ist ein* ***hammer Spiel*** *mit* ***hammer Story*** (. . .)
'Quite frankly, I find Dragon Age an awesome game with an awesome story (. . .)'

In examples (62–64) *hammer* can be substituted by canonical intensifying adverbs such as *sehr* 'very' or *furchtbar* 'terribly', suggesting it is functionally similar to adverbs (but adverbs are not formally distinguished from the corresponding adjectives, so it is not possible to establish whether full conversion has occurred). On the other hand, when *hammer* precedes a noun, as in (65), it is clear that it has not (yet) become a fully-fledged adjective, as *hammer* does not formally agree with the noun (in which case we would expect *hammeres* and *hammere* respectively). Nevertheless, there is evidence that some speakers interpret *hammer* as an adjective like any other, with the correct inflections such as the indefinite neuter nominative

singular (66), which is furthermore modified by the adverb *total* 'totally', the definite masculine dative singular in (67), or the comparative and superlative in (68), followed by the interesting meta-comment that this is not a grammatical construction, which suggests that the speakers are well aware that they are using innovative forms.

(66) *oh man ein total* ***hammeres*** *ende*
'Oh man, a totally awesome ending'
www.fanfiktion.de/r/s/4a22e2fb0000e22606705dc0/date/0/1

(67) *Alles in allem ein super Gesamtpaket zu einem* ***Hammeren*** *Preis.*
'All in all, a super package deal for a terrific price.'
http://www.fat-burners.org/in-den-wissenschaftlichen-ueberpruefungen-zeigte-sich-eine/

(68) *das cover,* ***hammer****! die story,* ***hammerer****! der mann, am* ***hammersten****!!! (ich weiß das das grammatikalisch falsch ist, mir egal!)*
'The cover, awesome! The story, even more awesome! The man, most awesome! (I know this is grammatically incorrect, don't care!)'
https://www.amazon.de/Mad-Love-Tower-Don-Both/product-reviews/3945164346?pageNumber=6

As Table 9 also shows, however, that free *hammer* occurs in more construction types than bound *hammer*. It may modify a verb (69), or occur in predicative position. The latter construction is very frequent, and out of these 685 tokens, 335 have a definite article (example (70)), 20 have an indefinite article (example (71)), whereas 330 have no article at all (example (72)). Battefeld et al. (2018) note that the presence or absence of the indefinite article does not make a semantic difference. Morphosyntactically, however, *hammer* preceded by an article behaves more like a noun than bare *hammer*, as shown in (73), where *hammer* is modified by an adjective.

(69) *"you are not alone" von michael, er hat es* ***hammer gesungen***
'Michael's "You are not alone", he sung it magnificently'

(70) *düsseldorf war* ***der hammer****!!!*
'Düsseldorf was fantastic!!!'

(71) *(. . .) bin ich seit einem jahr in pension – mit nur 62% der bezüge. Ist schon* ***ein finanzieller hammer****!*
'(. . .) since a year I am retired – with only 62% retirement benefits. A financial blow for sure!'

(72) *Wir leben inner leistungsgesellschaft, und der Druck ist* ***hammer****.*
'We live in a meritocracy, and the pressure is enormous.'

(73) *aber* ***der absolute hammer*** *is der dirrty look mit den blond/schwarzen haaren.*
'but the real smasher is the dirty look with blond/black hair.'

According to Pittner and Berman (2006: 241), predicative *hammer* is the result of noun to adjective "conversion" in predicative position (cf. examples (16–17) in

Sect. 2.1), and they explicitly rule out the role of prefixoid constructions[17] such as *hammerhart* 'very hard' in the emergence of adjectival *hammer*. Example (72) however, casts doubt on this claim, since *hammer* may be a clipped form (compare *hammerharter Druck* 'very strong pressure'). A more likely scenario is one in which debonding, clipping and noun to adjective conversion in predicative contexts all contributed to the rise of free *hammer* constructions and possibly reinforced one another (see Van Goethem and Hüning 2015 for a similar analysis of Dutch *top* and German *spitze*).

5.2 Semantic Properties

When *hammer* collocates with an adjective, adverb or quantifier it can, like Dutch *kei*, have either simile or intensifying meaning. Table 10 shows a substantial difference between bound and free *hammer* in this regard: whereas 39 occurrences of bound *hammer* represent the simile construction *hammerhart*, free *hammer* is exclusively intensifying.

Hammerhart 'hard as a hammer' makes up more than a third of bound *hammer* constructions, but we only count them as similes when they refer literally to the substance of objects or body-parts (74), sound (75), or impact (76). In most cases however, *hard* is used in a metaphorical sense, e.g. 'cool' (77), 'serious' (78), or 'difficult' (79). Since these examples do not express a comparison to the physical properties of a hammer, we count them as intensifying.[18]

(74) *Ich nahm mir einen großen Hammer, prüfte ihn auf Härte und stellte fest, daß er* ***hammerhart*** *war.*
'I took a large hammer, checked its hardness and concludes it was hard as a hammer.'

(75) *Ich höre gerne laut Musik und lege Wert auf ordentlichen Klang – also glasklare Höhen und* ***hammerharte*** *Bässe* ...
'I love listening to loud music and I appreciate a good sound, meaning crystal-clear highs and very loud basses...'

Table 10 Bound and free *hammer* (R1 = Adj(P)/Adv/Quant) – semantics

	Bound *hammer*	Free *hammer*
Simile	39 (6.18%)	0 (0%)
Intensifying meaning	592 (93.82%)	125 (100%)
	631 (100%)	**125 (100%)**

[17]They do not use the term prefixoid, however, but speak of an "Adjektivkompositum mit intensivierender Bedeutung".

[18]Note also that, even in simile constructions such as (75), an intensifying reading is not precluded – *hammerharte Bässe* can also mean 'very cool basses' (Lars Erik Zeige, p.c.).

(76) *Er bekommt einen* ***hammerharten*** *Faustschlag ins Gesicht.*
'He gets an iron hard punch in the face.'

(77) *Die Coverart ist auf jeden Fall* ***hammerhart!***
'In any event, the cover art is totally cool!'

(78) *Natürlich kann es sich in Einzelnen Fällen um* ***hammerharte*** *Allergien gegen Fischeiweiß usw handeln.*
'Naturally, in some cases, this may be due to serious fish protein allergies etc.'

(79) *Eigentlich müsste ich richtig viel lernen, da ich demnächst ne* ***hammerharte*** *Klausur schreibe* (. . .)
'Actually I need to study a lot, because I will have a very tough exam soon (. . .)'

When *hammer* has an intensifying function, it may collocate with a variety of adjectives (cf. Tables 13 and 14). The meta-comment in example (80) shows moreover that *hammer* is a strong booster, as *hammergeil* is considered the final point on a rating scale:

(80) *Von spitze über geil, echt geil, einfach geil, voll geil bis zu* ***hammergeil*** *reichen die Bewertungen*
'The scores range from top via cool, really cool, simply cool, fully cool to *hammer* cool'

To further increase its intensifying function, *hammer* may co-occur with one or more other prefixoids for emphatic effect, both when the R1 is an adjective (81) or a noun (82)[19]:

(81) *Er sieht einfach* ***hammer-mega-geil*** *aus.*
'He just looks absolutely totally cool'.

(82) *Ich investiere meine Zeit in eine Sache, die mir vorab von RTL als der* ***Hammer-Super-Knaller-Mega-Event*** *verkauft wird, und erlebe so was . . .*
'I invest my time in something RTL claimed was going to be a fantastic event, and now this . . . '

When R1 is a noun, *hammer* may enhance the positive meaning of the noun, as in (83), or conversely its negative meaning, as in (84). In most cases, however, it has ameliorative function, as in (85).

(83) *wenn ihr mal ein eigenes, richtig gutes* ***Hammer****-Schnäppchen [. . .] habt*
'in case you would happen to have a really good real bargain yourself'

(84) *Ein* ***Hammer****-Gewitter: Regen, wie aus Eimern geschüttet [. . .]*
'An intense thunderstorm: rain by the buckets [. . .]'

[19]The sample does not contain examples of emphatic reduplication (compare the *kei* examples (43–46) above).

(85) *ich hab fast ein jahr in kapstadt gewohnt und es ist eine* ***hammerstadt***
'I have lived in Cape Town for almost a year and it's a great city'

5.3 Collocational Properties and Productivity

In this section, we list the most frequent R1s of both bound and free *hammer* as well as their type/token ratio and potential productivity. With nouns (Tables 11 and 12) *hammer* is quite productive – with both free and bound forms, more than half of the tokens are hapax legomena, and the most frequent tokens in absolute numbers form a relatively modest set in terms of relative frequency. Moreover, although ranked differently, many of the most frequent nouns with bound *hammer* are among the most frequent collocates of free *hammer* as well.

As far as adjective constructions are concerned, we already noted in the previous section that *hammerhart* occurs with far higher token frequency in the bound *hammer* sample. Furthermore, Tables 13 and 14 show that bound and free *hammer* have the same #1 adjective R1, *geil*, and some similarities in lower ranking adjectives as well. Productivity is low with both constructions.

Table 11 Bound *hammer* (R1 = Noun) – collocates and productivity

Types	Number of tokens	%
Bild 'picture'	10	2.73%
Deal 'deal'	10	2.73%
Preis 'price'	10	2.73%
Ding 'thing'	9	2.46%
Zeit 'time'	9	2.46%
Song 'song'	8	2.19%
Spiel 'playing'	8	2.19%
Gruppe 'group, band'	8	2.19%
Album 'album'	7	1.91%
Stimme 'voice'	6	1.64%
Wetter 'weather'	6	1.64%
Transfer 'transfer'	6	1.64%
Teil 'part'	5	1.37%
Nummer 'track, song'	5	1.37%
n = 4 (4 types)	16	4.37%
n = 3 (11 types)	33	9.02%
n = 2 (26 types)	52	14.21%
n = 1	158	43.17%
Types: 213	**Tokens: 366**	**100%**
TTR = 213/366 = 0.58		
PP = 158/366 = 0.43		

Table 12 Free *hammer* (R1 = Noun) – collocates and productivity

Types	Number of tokens	%
Stimme 'voice'	8	4.65%
Game 'game'	7	4.07%
Spiel 'playing'	6	3.49%
Bild 'picture'	5	2.91%
Grafik 'graphics'	4	2.33%
Teil 'part'	3	1.74%
Stimmung 'atmosphere'	3	1.74%
Angebot 'supply'	3	1.74%
Track 'track'	3	1.74%
Konzert 'concert'	3	1.74%
n = 2 (16 types)	32	18.60%
n = 1	95	55.23%
Types: 121	**Tokens: 172**	**100%**
TTR = 121/172 = 0.70		
PP = 95/172 = 0.55		

Table 13 Bound *hammer* (R1 = Adjective, Adverb, Quantifier) – collocates and productivity

Types	Number of tokens	%
geil 'cool'	276	43.67%
hart 'hard'	234	37.03%
schwer 'heavy, difficult'	15	2.37%
genial 'brilliant'	9	1.42%
stark 'strong'	8	1.27%
gut 'good'	6	0.95%
viel 'many'	6	0.95%
schnell 'fast'	5	0.79%
n = 4 (4 types)	16	2.52%
n = 3 (3 types)	9	1.42%
n = 2 (7 types)	14	2.22%
n = 1	34	5.38%
Types: 56	**Tokens: 632**	**100%**
TTR = 56/632 = 0.09		
PP = 34/632 = 0.05		

Finally, Table 15 lists the verbs that may occur as R1 with free *hammer*. It is clear that these do not represent a very productive construction type, and therefore we did not calculate its type/token ratio or potential productivity.

Table 14 Free *hammer* (R1 = Adjective, Adverb, Quantifier) – collocates and productivity

Types	Number of tokens	%
geil 'cool'	69	55.20%
gut 'good'	7	5.60%
cool 'cool'	5	4.00%
billig 'cheap'	3	2.40%
genial 'brilliant'	3	2.40%
hart 'hard'	3	2.40%
viel 'many'	3	2.40%
n = 2 (7 types)	12	10.00%
n = 1	20	16.67%
Types: 33	**Tokens: 125**	**100%**
TTR = 33/125 = 0.26		
PP = 20/125 = 0.16		

Table 15 Free *hammer* (R1 = V) – collocates

Types	Number of tokens	%
aussehen 'to look, appear'	6	33.33%
machen 'to make'	3	16.67%
rejoinen 'to rejoin'	1	5.56%
zeichnen 'to draw'	1	5.56%
rappen 'to rap'	1	5.56%
spielen 'to play'	1	5.56%
kühlen 'to cool'	1	5.56%
singen 'to sing'	1	5.56%
abgehen 'to fail'	1	5.56%
sich freuen 'to look forward to'	1	5.56%
schreien 'to cry'	1	5.56%
Types: 11	**Tokens: 18**	**100%**

6 Swedish *kanon*

The Swedish noun *kanon* 'cannon, which ultimately derives from Italian *cannone* (< Latin *canna* 'tube, cane' + the augmentative suffix *–one*), was borrowed into Swedish in the seventeenth century. One of the earliest examples given in the Dictionary of the Swedish Academy (SAOB, s.v. *kanon*) is (86).

(86) *Stenbock . . . låter spela på Slottet medh* ***Canoner***. (1656)
'At the castle, Stenbock had cannons fired.'

The noun soon came to be used metaphorically as a curse, e.g. in *Bomber och Canoner!* 'bombs and cannons!' (1791). In the 1920s, it started to appear in sports journalism (Lundbladh 2002: 30) to refer to high speed or impact (*kanonskott* 'canonball shot') or exceptional strength (*kanonform* 'top condition'). The first attested [*kanon*-ADJ] formation is *kanonfull* (first attested 1909, according to

SAOB),[20] literally meaning 'cannon drunk'.[21] In this sense, *kanon* could also be used independently, as in *dricka sig fullständigt kanon* 'to get wasted (lit. drink oneself cannon)'. Clearly, the typical properties of a cannon (strength, impact and loudness) invited metaphorical extension, which in turn led to the evaluative and intensifying properties discussed in Sect. 6.2. The first occurrence of an evaluative [*kanon*-N] construction, *kanonväder* 'great weather' is mentioned in the 1986 edition of the Swedish Word List (SAOL) and labelled 'colloquial'; the first intensifying [*kanon*-ADJ] construction, *kanonbra* 'very good' appears in the 1998 edition, likewise with the addition 'colloquial'.

6.1 Construction Types

As for the other two prefixoids, we selected 1000 bound and 1000 free forms of *kanon*. Of the bound forms, 11 are hyphenated (e.g. *kanon-blogg* 'great blog', *kanon-kul* 'really cool'), 989 are written as one word. As Table 16 shows, the distributional differences between bound and free *kanon* are substantial.

Bound *kanon* is most frequently used with adjectives as R1 (87), followed by nouns (88), adverbs (89), quantifiers (90). Example (91) illustrates that *kanon* can also be followed by other morphemes, such as the English suffix *–ish* (91):

(87) *Verkar vara en **kanonfin** häst!*
'This seems to be a very fine horse!'

(88) *hoppas du haft en **kanonkväll** på stan!*
'(I) hope you had a great evening in town!'

Table 16 Bound and free *kanon* – construction types

POS R1	Bound *kanon*	Free *kanon*
Adj (or interjection)	495 (6.90%)	151 (15.10%)
Adv	69 (43.10%)	16 (1.60%)
N	431 (43.10%)	162 (16.20%)
Quantifier	2 (0.20%)	3 (0.30%)
Verb	0 (0%)	124 (12.40%)
Predicative use	0 (0%)	544 (54.40%)
other	3 (0.30%)	0 (0%)
	1000 (100%)	**1000 (100%)**

[20] An earlier example (1889) is however found in a historical corpus in *Språkbanken* (https://spraakbanken.gu.se/). Thanks to Henrik Rosenkvist for finding this example.

[21] This is a common association in other languages as well, compare French *bourré comme un canon*, German *voll wie eine Kanone*, Dutch *zo dronken als een kanon*.

(89) *Nu ikväll kom jag på att det var* ***kanonlänge*** *sen jag skrev en sån.*
'Tonight I realized it's been ages (lit. very long) since I wrote one of those'

(90) *Jag jobbade ju hos Lotta o vi hade* ***kanonmycke*** *folk (. . .)*
'I was working at Lotta's and we had a lot of guests (. . .)'

(91) *Kommer bli* ***kanonish****!*
'It's going to be fantastic (ish)!'

Free *kanon* occurs in the same constructions as bound *kanon*, i.e. in collocations with adjectives (92), adverbs (93), quantifiers (94) and nouns (95), but is it also found in other construction types.

(92) *Jag älskar jul och traditioner tycker det är* ***kanon mysigt,*** *gör inte ni?*
'I love Christmas and traditions, I think it's really cosy, don't you?'

(93) *I lördags blev det babysim som vanligt och det gick* ***kanon bra****!*
'On Saturday we went baby-swimming as usual and it went really well!'

(94) *Annars var de* ***kanon mycket*** *gott.*
'Apart from that they were really very tasty.'

(95) *tummen upp även för fotografen, som gjort ett* ***kanon jobb****!*
'Thumbs up for the photographer too, who has done a terrific job!'

Additionally, free *kanon* collocates with verbs (96),[22] and it is part of the fixed expression *att ha kanon* 'to have a great time' (97):

(96) *Själv sov jag* ***kanon****, men jag blev fruktansvärt sur när jag vaknade av min väckarklocka.*
'I myself slept very well, but I was very irritated when the alarm woke me up.'

(97) *Barnen har hur roligt som helst och vi vuxna har det ocksa* ***kanon****.*
'The kids are having a blast and we adults are also having a great time.'

Most frequently of all, however, free *kanon* is found in predicative position, as in examples (98–99), where it translates as 'great, fantastic'. In these constructions, *kanon* may be a clipped adjective (*kanonbra* 'very good'), but it may also have developed out of debonded *kanon*, which spread from attributive to predicative position.

(98) *Och tillsammans med parmesan blir det* ***kanon****.*
'And together with parmesan it is going to be delicious.'

(99) *Två av böckerna är riktigt* ***kanon****!*
'Two of the books are really great!'

[22] Unlike German and Dutch, Swedish (marginally) allows bound prefixoids with verbs (Ascoop and Leuschner 2006: 246), but these do not occur in our sample. A Google search yields few examples (e.g. *vi kanontrivdes* 'we enjoyed ourselves tremendously' (*thailandforum.se › sp)*).

It is difficult to determine the part of speech of predicative *kanon*. Unlike in Dutch and German, predicative adjectives are inflected in Swedish so that, if *kanon* were a fully-fledged adjective, we would expect a neuter form *kanon**t*** in (98) and a plural form *kanon**a*** in (99). The absence of inflection is however in line with Van Goethem and De Smet's (2014) observation that debonding of affixoids is gradual, and that inflectional properties may be acquired at a later stage.[23] We do in fact find inflected forms elsewhere, but they appear to be very rare:

(100) *Det kunde vara **kanont** om ochså personen kunde spela på saxofon.*
'I would be great if this person could also play the saxophone.'
www.danslogen.se › Forum › Dansband

(101) *Poolerna var **kanona** att simma i.*
'The pools were great to swim in.'
eyesoffinland.blogg.se/2008/may/minnen-fran-kreta.html

Other constructions which suggest adjectival status of *kanon* are ones in which *kanon* is modified by an adverb (or two adverbs, as in (102)), or in which *kanon* is coordinated with another adjective, as in (103):

(102) *Nu har jag kommit hem och denna dagen har varit **helt jävla kanon**!*
'Now I have come home and this day has been totally bloody great!'

(103) *Min jul har vart **kanon och mysig***
'My Christmas has been awesome and comfy'

On the other hand, there is evidence that *kanon* is still interpreted as a noun by some speakers, since it may also occur in the definite form (104), and even in the genitive plural (105).[24] In neither case is there a difference in meaning.

(104) *Denna helgen ska bli **kanonen**!*
'This weekend is going to be fantastic!'

(105) *Sen strör man på lite kanel & socker så blir det **kanoners**!*[25]
'Then sprinkle with a bit of cinnamon and sugar and it will be fantastic!'

Summing up, predicative *kanon* has both adjectival and nominal properties. While this may be problematic for a grammatical theory which requires discrete categories, it is not for the constructional approach, in which categories are considered gradient (Traugott and Trousdale 2013: 74).

[23] Other debonded prefixes or prefixoids, e.g. *super* or *skit* 'shit', do not inflect either. Moreover, there are a few indeclinable Swedish adjectives, e.g. *bra* 'good, fine', or *kul* 'cool'. Interestingly, these adjectives can be used as exclamatives as well, just like *kanon*, *super* and *skit*, so it may well be that *kanon* will continue to pattern with these adjectives and not acquire inflection.

[24] Another example of a free prexoid occurring in the genitive plural is *kalasers*, from the intensifying prefixoid *kalas-*, originally a noun meaning 'party' (Ledin 2012).

[25] Generally, *kanoners* and free *kanon* can be used in the same constructions, with the same meaning (*kanoners/kanon bra* 'very good', *kanoners/kanon dag* 'great day' etc.), but *kanoners* is far less frequent in SECOW14AX (1400 raw hits) than *kanon* (more than 10,000 hits, which is the maximum number of results in Colibri^2 queries).

6.2 Semantic Properties

As we saw at the beginning of this section, the first adjective which *kanon* collocates with is *full* 'drunk', in which *kanon* is already used metaphorically. This may explain why *kanon*, unlike *kei* and *hammer*, is not used in simile constructions (adjectives meaning 'drunk' do not occur in the sample either). *Kanonhård* 'very hard' is attested only once, and in a figurative sense (*två kanonhårda kamper* 'two very tough matches'). In other words, in Adjective/Adverb/Quantifier contexts both bound and free *kanon* have a purely intensifying function. For instance, adjectives like *duktig* 'good at, clever', *snygg* 'cute' or *trött* 'tired' clearly have no link to physical properties typically associated with cannons. A further striking example is (106), in which *kanon* is attached to an adverb with a negative prefix (*o-troligt* 'in-credibly').

(106) *Benpasset gick* ***kanonotroligt*** *bra*
'The leg exercises went really incredibly well'

When *kanon* collocates with nouns or verbs, it almost always has ameliorative meaning (cf. examples (88) and (95) above), the only two exceptions being formations in which R1s are inherently negative, viz. *kanonhuvudvärk* 'splitting headache', and (possibly) *kanonfylla* 'state of being stone drunk.' The meta-comment in (107) furthermore shows that *kanon* is considered gradable.

(107) *Hur* ***kanon*** *är det på en skala?*
'How awesome is this on a scale?'

Summing up this section, it is clear that *kanon* as a prefixoid has generally lost the association with the original noun 'cannon', and that semantic differences between bound and free forms are very small.

6.3 Collocational Properties and Productivity

Looking at [*kanon*-N] constructions, we note that many of them are temporal nouns, such as 'day', 'evening', or 'weekend', or nouns referring to events or accomplishments, such as 'race', 'match', or 'job'. The association of loud noise or an explosion with a terrific time is not uncommon, compare English *blast*, which can be used in all three senses, or the Dutch and Swedish intensifying prefixoid *knal(l)* 'bang'. In other collocations, however, the association with typical properties is less obvious, e.g. 'blog', or 'picture'. From Tables 17 and 18 it also emerges that, at first glance, the R1 preferences of bound and free *kanon* are very similar, but free *kanon* is slightly more productive.

Table 17 Bound *kanon* (R1 = N) – collocates and productivity

Types	Number of tokens	%
dag 'day'	51	11.83%
väder 'weather'	46	10.67%
kväll 'evening'	29	6.73%
helg 'weekend'	24	5.57%
jobb 'job'	22	5.10%
pris 'price'	17	3.94%
start 'start'	13	3.02%
bild 'picture'	10	2.32%
ställe 'place'	10	2.32%
idé 'idea'	8	1.86%
match 'match'	6	1.39%
insats 'commitment'	6	1.39%
lopp 'race'	6	1.39%
år 'year'	5	1.16%
sida '(web) page'	5	1.16%
läge 'situation'	5	1.16%
n = 4 (4 types)	16	3.72%
n = 3 (8 types)	24	5.57%
n = 2 (23 types)	46	10.67%
n = 1	82	19.03%
Types: 133	**Tokens: 431**	**100%**
TTR = 133/431 = 0.31		
PP = 82/133 = 0.19		

Table 18 Free *kanon* (R1 = N) – collocates and productivity

Types	Number of tokens	%
dag 'day'	29	17.90%
kväll 'evening'	15	9.26%
helg 'weekend'	12	7.41%
väder 'weather'	11	6.79%
jobb 'job'	7	4.32%
pris 'price'	5	3.09%
lopp 'race'	4	2.47%
bild 'picture'	4	2.47%
lördag 'Saturday'	4	2.47%
start 'start'	3	1.85%
blogg 'blog'	3	1.85%
n = 2 (12 types)	24	14.81%
n = 1	41	25.31%
Types: 64	**Tokens: 162**	**100%**
TTR = 64/162 = 0.40		
PP = 41/162 = 0.25		

Table 19 Bound *kanon* (R1 = Adjective/Adverb/Quantifier) – collocates and productivity

Types	Number of tokens	%
bra 'good'	261	46.11%
fin 'fine'	96	16.96%
god 'good, tasty'	48	8.48%
kul 'cool'	33	5.83%
snygg 'cute'	21	3.71%
mysig 'cosy'	14	2.47%
trevlig 'nice'	14	2.47%
rolig 'nice, funny'	10	1.77%
skön 'beautiful'	7	1.24%
duktig 'good at, clever'	7	1.24%
härlig 'lovely'	6	1.06%
nöjd 'satisfied'	5	0.88%
läcker 'tasty'	4	0.71%
n = 3 (4 types)	12	2.12%
n = 2 (3 types)	6	1.06%
n = 1	22	3.89%
Types: 42	**Tokens: 566**	**100%**
TTR = 42/566 = 0.07		
PP = 22/566 = 0.04		

As we saw in the previous section, *kanon-* has predominantly intensifying function in constructions with adjectives, adverbs and quantifiers. As far as bound *kanon* is concerned, the top four correspond neatly to the token frequencies of the adjectives in the SECOW14AX corpus as a whole,[26] which corroborates our earlier observation that *kanon* in Adjective/Adverb/Quantifier constructions is substantially bleached. Again, the collocational properties of bound and free *kanon* are very similar, and free *kanon* is more productive than its bound counterpart (Tables 19 and 20).

When R1 is a verb, finally, productivity is low. Moreover, most verbs that collocate with (free) *kanon* are semantically close to predicative constructions, e.g. 'to go', 'to feel', or 'to suit'. Only in a few cases, e.g. 'sing', or 'sleep', does *kanon* function as a manner adverb (Table 21).

[26]The frequencies per million tokens for the lower case forms are: *bra* (indeclinable): 2138.973; *fin/fint/fina*: 823.2269; *god/gott/goda*: 681.9374; *kul* (indeclinable): 460.0758. The frequencies can be found at http://hpsg.fu-berlin.de/cow/frequencies/swedish/

Table 20 Free *kanon* (R1 = Adjective/Adverb/Quantifier) – collocates and productivity

Types	Number of tokens	%
bra 'good'	91	53.53%
fin 'fine'	13	7.65%
snygg 'cute'	10	5.88%
kul 'cool'	9	5.29%
god 'good, tasty'	8	4.71%
skön 'beautiful'	3	1.76%
duktig 'good at, clever'	3	1.76%
trevlig 'nice'	3	1.76%
mysig 'cosy'	3	1.76%
skoj 'fun'	3	1.76%
mycket 'much'	3	1.76%
fräsch 'fresh'	2	1.18%
trött 'tired'	2	1.18%
nöjd 'satisfied'	2	1.18%
n = 1	15	8.82%
Types: 29	**Tokens: 170**	**100%**
TTR = 29/170 = 0.17		
PP = 15/170 = 0.09		

Table 21 Free *kanon* (R1 = V) – collocates and productivity

Types	Number of tokens	%
gå 'to go'	60	48.39%
funka 'to function, to work'	30	24.19%
fungera 'to function, to work'	11	8.87%
passa 'to suit'	5	4.03%
sova 'to sleep'	3	2.42%
börja 'to start'	2	1.61%
trivas 'to enjoy, to feel well'	2	1.61%
jobba 'to work'	2	1.61%
sitta 'to sit; to fit'	2	1.61%
n = 1	7	5.65%
Types: 16	**Tokens: 124**	**100%**
TTR = 16/124 = 0.13		
PP = 7/124 = 0.06		

7 Contrastive Statistical Analysis

In this chapter, we summarize the quantitative results from the three preceding sections in order to assess whether there exist statistical differences between the bound and free constructions of *kei*, *hammer* and *kanon* for all four properties mentioned in Sect. 2.2: construction type (7.1.), semantic bleaching (the proportion of simile and intensifying functions in [Prefixoid-ADJ] constructions) (7.2.), collocational properties (7.3.), and productivity (7.4.).

7.1 Construction Types

As far as construction types are concerned, we distinguish four categories that may occur as R1: AAQ (which comprises adjectives, adverbs and quantifiers), N(ouns), V(erbs), and predicative constructions. We merge adjectives, adverbs and quantifiers into a single category because the function of the prefixoid is similar when it modifies one of these. This furthermore enables us to calculate the χ^2 scores in R, because otherwise there would have been too many cells with a frequency < 5, in which case the χ^2 approximation may be incorrect.

Figure 1 shows the distribution of R1 construction types across the bound and free variants of the three prefixoids. It is clear that there is very little variation where *kei* is concerned, whereas variation is more substantial with the other two prefixoids.

In Table 22, we see that all results are significant ($p < 0.05$), but whereas *hammer* and *kanon* get the smallest possible p given by the standard χ^2 function in R, the p for *kei* is much larger. Moreover, the effect size[27] is large for *hammer* and *kanon*, but lower than 0.10 for *kei*.

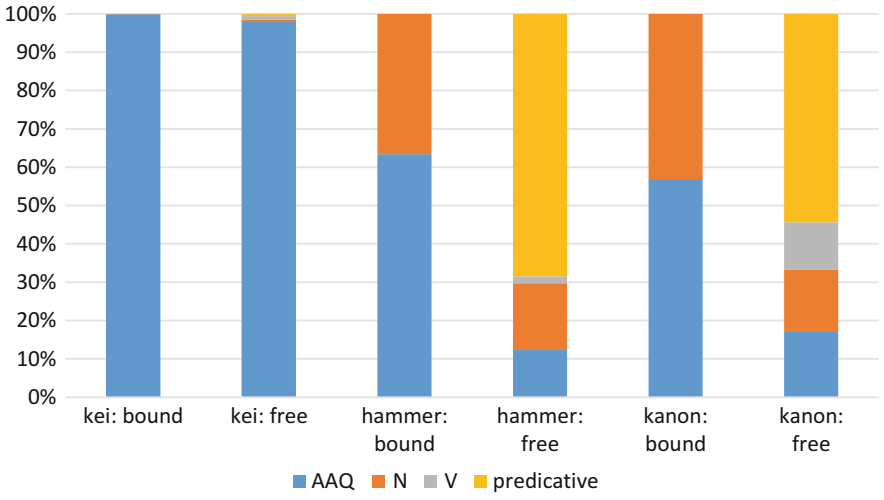

Fig. 1 Construction types – Part of speech of the R1

Table 22 Results of the χ^2 test for construction types

	kei	*hammer*	*kanon*
Pearson's χ^2	17.164	1114.3	1005.5
p-value	0.000654	< 2.2e-16	< 2.2e-16
Cramér's V	0.093	0.746	0.709

[27]The effect size is given as Cramér's V, which indicates correlation strength: 0.10–0.30 indicates a small effect size; 0.30 to 0.50 a moderate one, and >0.50 a large one. We used the vcd package for R (Meyer et al. 2016) to compute it.

7.2 *Bleaching*

For all three prefixoids, we measured the degree of semantic bleaching by comparing the proportion of similes to the proportion of intensifying constructions when R1 is an adjective, adverb or quantifier. Fig. 2 only represents these proportions of simile and intensifier meanings for bound and free *kei* and *hammer*; as mentioned in 6.2., Swedish *kanon* is not used in simile constructions in our sample[28] and is therefore not included in the figure. For both *kei* and *hammer*, we observe loss of the literal meaning in favour of the intensifying meaning, which we interpret as the result of bleaching.

In order to compare degrees of bleaching when the prefixoid collocates with an adjective, adverb or quantifier we also performed χ^2 tests, the results of which are given in Table 23. With both *kei* and *hammer* differences between the bound and the free forms are significant ($p < 0.05$), but the effect size is small.

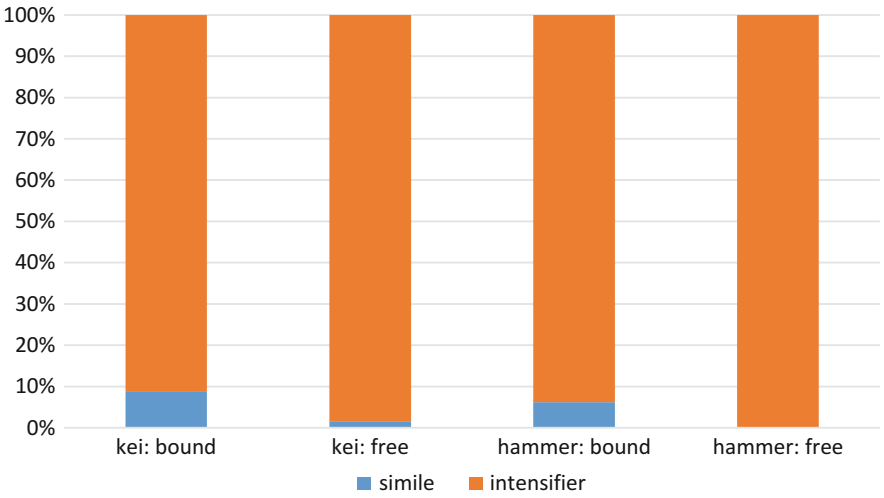

Fig. 2 Bleaching

Table 23 Results of the χ^2 test for bleaching

	kei	*hammer*
Pearson's χ^2	50.156	6.9318
p-value	1.42e-12	0.008468
Cramér's V	0.161	0.104

[28] In the raw corpus data (10,000 hits, the maximum), there is only one single example of the simile construction *kanonhård* 'cannon hard', so this particular collocation does not appear to be very productive.

7.3 Collocations

In order to establish to what degree the free and bound variants are used in different contexts, we performed a distinctive collexeme test, as described in Levshina (2015: 242ff.). This test was originally designed to compare the collocational preferences of two near-synonymous constructions in a corpus (Gries and Stefanowitsch 2004), and compares the observed frequency of a specific slot filler (R1) to the expected frequency of that R1. The purpose of this test is to compute if specific R1s are attracted to one of the two constructions.[29] We used the `pv.Fisher.collostr()` function of the Rling package (Levshina 2014), which computes the Fisher exact p-values for all R1s; these are subsequently log-transformed (using the negative base 10 logarithm). If the observed frequency is smaller than the expected frequency, the log-transformed score will remain negative. Conversely, if the observed frequency is larger than the expected frequency, the log-transformed score will become positive. The cut-off value was set at 1.3, which corresponds to a p-value of 0.05. In our case studies we use the free construction as a base. Hence, if the log-transformed p-value was >1.3, the R1 is distinctive for the free prefixoid, if it is < −1,3, it is distinctive for the bound prefixoid.

Table 24 gives the total number of types for *kei*, *hammer* and *kanon* in combination with an adjective, adverb or quantifier, as well as the distinctive R1s for the free and the bound constructions respectively. The distinctive R1s are given in Tables 25, 26 and 27. The differences in collocational preferences are most pronounced in Dutch *kei*, with 19 distinctive R1s for free *kei* and one (*keihard*) for bound *kei*; note also that the logp for *keihard* is very high, meaning strong attraction (see Table 25). Differences in German are much smaller, with five distinctive R1s for the free form and 1 for the bound form. In German, too, the simile *hammerhart* is distinctive for the bound form, but the attraction is smaller than in Dutch (see Table 26). For Swedish *kanon*, finally, there is only one distinctive R1 for the bound form (*kanonfin* 'very fine') and none at all for the free form (Table 27). If we divide the total number of distinctive collexemes by the number of types, we arrive at very low ratios (see Table 24). We are not aware of a threshold above which differences

Table 24 Distinctive collexemes for R1 = AAQ

	kei	*hammer*	*kanon*
Number of types	163	67	49
Distinctive R1 free form	19	5	0
Distinctive R1 bound form	1	1	1
Ratio	20/163 = 0.12	6/67 = 0.09	1/49 = 0.02

[29] Note that we do not have the data for the entire corpus, but use the frequencies in the samples instead. Therefore, these statistics can only be used for comparison of the bound and free forms in the sample, not of those in the corpus as a whole.

Table 25 Distinctive AAQ collexemes for free *kei* and bound *kei-* (shaded)

R1	free	bound	logp
leuk	108	12	21.308810
veel	47	1	13.159363
goed	95	26	10.555802
tof	33	1	8.909595
mooi	28	4	5.094366
lang	16	0	4.906956
cool	13	0	3.982484
lekker	12	0	3.674783
trots	12	0	3.674783
vet	11	0	3.367309
erg	10	0	3.060062
gezellig	24	7	2.746519
blij	11	1	2.510308
lief	13	2	2.424480
fijn	9	1	1.963911
schoon	6	0	1.833337
vaak	6	0	1.833337
groot	5	0	1.527220
moeilijk	5	0	1.527220
hard	273	893	-184.6871126

Table 26 Distinctive AAQ collexemes for free *hammer* and bound *hammer-* (shaded)

R1	free	bound	logp
gut	7	6	2.6873645
cool	5	3	2.3774070
billig	3	1	1.8094533
geil	69	276	1.7295434
spannend	2	0	1.5672860
hart	3	234	-17.7354171

Table 27 Distinctive AAQ collexemes for bound *kanon-* (shaded)

R1	free	bound	logp
fin	13	96	-2.696587e+00

in collexeme distributions between two constructions can be said to be statistically significant, but since the number of distinctive collexemes relative to the number of types corresponds to a ratio ranging between 0 (no distinctive collexemes) and 1 (all collexemes are distinctive), we may assume the same ranges as Cramér's V for effect size (see footnote 27). We may thus conclude that there is a small effect for *kei*, and none for *hammer* or *kanon*.

We also looked at distinctive collexemes for *hammer* and *kanon* with R1 as a noun (*kei* hardly collocates with nouns at all), but we found only two distinctive nouns for free *hammer* and none at all for *kanon*, so we will not further discuss them here.

7.4 *Productivity*

Figures 3 and 4, finally, show differences in productivity between bound and free *kei*, *hammer* and *kanon*. Both with nouns and adjectives/adverbs/quantifiers, we see an overall increase in productivity, both type/token ratio and potential productivity. The differences are largest with *hammer*, followed by *kei* and *kanon*.

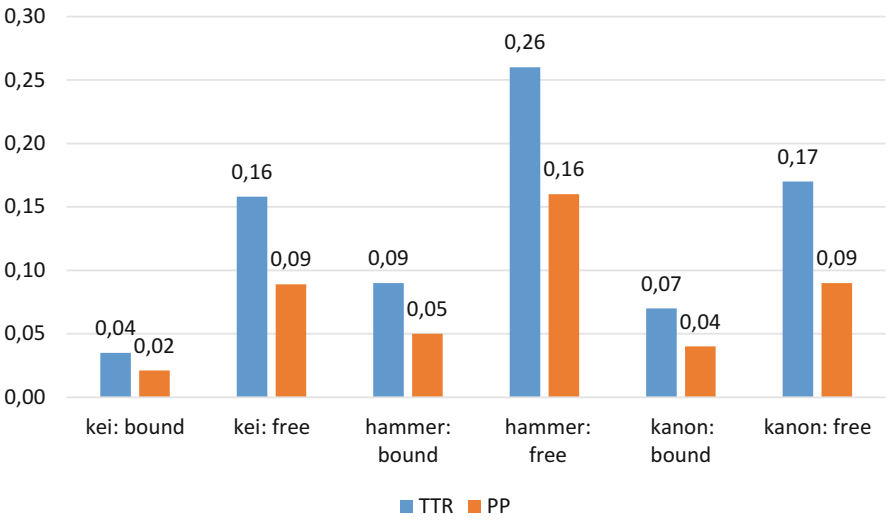

Fig. 3 Type/token ratio and Potential Productivity (R1 = AAQ)

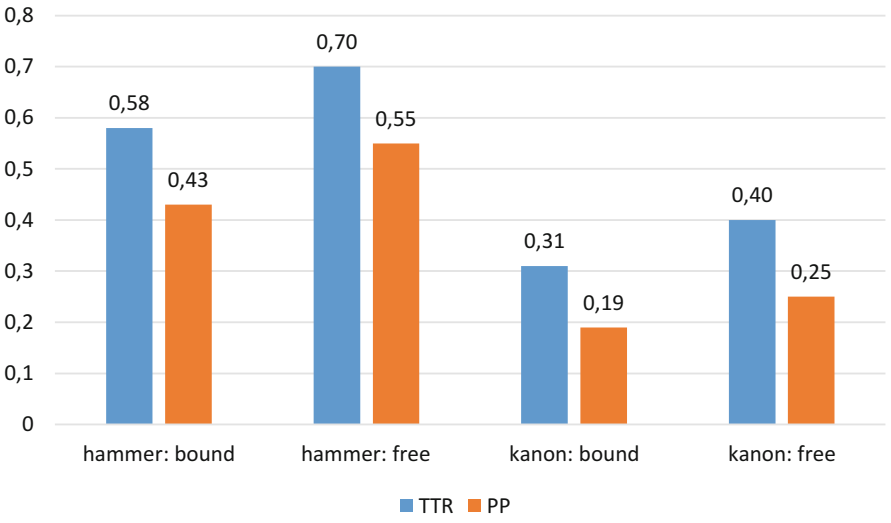

Fig. 4 Type/token ratio and Potential Productivity (R1 = Noun)

8 Summary and Conclusions

A summary of the preceding section is given in Table 28. From this table, it is evident that only Dutch *kei* has undergone all four constructional changes that we examined in this paper. With *hammer* the differences in construction types are larger, but the number of distinctive collexemes is too low to conclude that free *hammer* is sufficiently distinct from bound *hammer* as far as collocational preferences are concerned. In the case of *kanon*, only two constructional changes have occurred: there is a large difference in construction types and an increase in productivity, but no bleaching, and no difference in collocation preferences.

Let us return now to Hilpert's rhetorical question: how many of these constructional changes can be said to suffice in order for the free form to qualify as an instance of constructionalization? As we have seen, Traugott and Trousdale's (2013: 22) definition of constructionalization requires a change in both form *and* meaning, but these authors are not very explicit on which changes they consider formal, and which changes they consider semantic. Moreover, they do not tell us how to quantify changes in form or meaning. Nevertheless, if we consider the first constructional change in Table 28 as a formal change (after all, collocations with different parts of speech suggest changes in morphosyntactic properties), we note that all three prefixoids have undergone formal change (even in the absence of phonological change). Bleaching in [Prefixoid-ADJ] constructions, which can be considered a semantic change, is only attested for *kei* and *hammer*, but the effect size (Cramér's V) is small with both. *Kanon* is exclusively used as an intensifier in our sample. Distinctive collexeme analysis, which we used to test whether there has been a change in collocational preferences, shows only a small effect for *kei*, and none for *hammer* and *kanon*. Finally, all three debonded prefixoids show an increase in productivity as compared to the bound forms. According to Traugott & Trousdale's definition of constructionalization, then, only *kei* and *hammer* have developed a new node in the network, whereas *kanon* has only changed formally. This is somewhat

Table 28 Constructional changes – summary

Constructional change	*kei*	*hammer*	*kanon*
R1: PoS	χ^2: significant difference	χ^2: significant difference	χ^2: significant difference
	Cramér's V: < 0.01	Cramér's V: large effect	Cramér's V: large effect
Bleaching (R1 = AAQ)	χ^2: significant difference	χ^2: significant difference	n.a.
	Cramér's V: small effect	Cramér's V: small effect	
Distinctive collexemes (R1 = AAQ)	small effect	no effect	no effect
Productivity	increase	increase	increase

problematic, however, because it implies that there is a single node for bound and free *kanon*, in spite of clear differences in construction types and productivity. It should also be noted that free *kanon* is not just an orthographic variant of the bound form, as we have shown for Swedish *jätte* 'giant, very' (Norde and Van Goethem 2014).[30] For this prefixoid, distributional differences between bound and free *jätte* were statistically insignificant. The proportion of bleaching was similar, and unlike free *kanon*, free *jätte* does not modify verbs nor does it occur in predicative position. On the other hand, we would have to assume two separate nodes for bound and free *hammer*, even though there are no significant differences in distribution.

Another complicating factor is that the free prefixoids may have developed out of more than one source construction – apart from debonding in [Prefixoid-N] and [Prefixoid-ADJ] constructions, clipping of specific [Prefixoid-ADJ] constructions and predicative use of bare nouns may have played a role in the rise of free forms as well. If *kanon* is 'only' a formal change, then which source node(s) has changed?

Summing up, it seems that Traugott & Trousdale's framework with its focus on distinguishing constructionalization from constructional changes is difficult to apply to this particular case study. Rather than concern ourselves with the question of whether or not the emergence of free uses of prefixoids is constructionalization, we feel it is more insightful to look at observable changes at different levels, considering as many factors as possible that can be operationalized quantitatively, including collocational properties and productivity. Debonding of *kei*, *hammer* and *kanon* can therefore be considered an instance of 'constructional change' according to Hilpert's approach, because he (2013: 7) explicitly states that "frequency changes (. . .) are no less indicative of constructional change than are developments in meaning or the phonological and morphosyntactic substance of a construction."

To conclude, for all three case studies, we feel the quantitative differences discussed in Sect. 7 justify the conclusion that the bound and the free forms are different constructions (and hence distinct nodes in the constructicon). Although there is a tendency to write compound words as two words in Dutch, German and Swedish (probably under the influence of English), the free form is not merely an orthographic variant of the bound form. For in that case, we would not expect any distributional differences at all.

References

Andersen, H. 2001. Actualization and the (uni)directionality of change. In *Actualization. Linguistic change in progress*, ed. H. Andersen, 225–248. Amsterdam/Philadelphia: John Benjamins.

Ascoop, K., and T. Leuschner. 2006. "Affixoidhungrig? Skitbra!" Comparing affixoids in German and Swedish. *Sprachtypologie und Universalienforschung* 59 (3): 241–252.

[30]This spelling variant of *jätte* can be explained as due to the tendency in Modern Swedish to write compounds as two words (Teleman et al. 1999: 57).

Baayen, H. 2009. Corpus linguistics in morphology: Morphological productivity. In *Corpus Linguistics. An international handbook*, ed. A. Lüdeling and M. Kytö, 900–919. Berlin/New York: Mouton De Gruyter.

Barðdal, J., E. Smirnova, L. Sommerer, and S. Gildea. 2015. *Diachronic Construction Grammar*. John Benjamins: Amsterdam/Philadelphia.

Battefeld, M., T. Leuschner, and G. Rawoens. 2018. Evaluative morphology' in German, Dutch and Swedish: Constructional networks and the loci of change. In *Category change from a constructional perspective*, ed. K. Van Goethem, M. Norde, E. Coussé, and G. Vanderbauwhede, 229–262. Amsterdam/Philadelphia: John Benjamins.

Bergs, A., and G. Diewald, eds. 2008. *Constructions and language change (Trends in linguistics. Studies and monographs 194)*. Berlin/New York: Mouton De Gruyter.

———, eds. 2009. *Contexts and constructions (Constructional Approaches to Language 9)*. John Benjamins: Amsterdam/Philadelphia.

Berman, J. 2009. The predicative as a source of grammatical variation. In *Describing and modeling variation in grammar*, ed. A. Dufter, J. Fleischer, and G. Seiler, 99–116. Berlin/New York: Mouton De Gruyter.

Booij, G. 2009. Compounding and Construction Morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

De Smet, H. 2012. The course of actualization. *Language* 88: 601–633.

Gries, S.T., and A. Stefanowitsch. 2004. Extending collostructional analysis: A corpus-based perspective on 'alternations'. *International Journal of Corpus Linguistics* 9 (1): 97–129.

Hilpert, M. 2013. *Constructional change in English. Developments in allomorphy, word formation and syntax*. Cambridge: Cambridge University Press.

———. 2015. From *hand-carved* to *computer-based*: Noun-participle compounding and the upward strengthening hypothesis. *Cognitive Linguistics* 26 (1): 113–147.

Hoeksema, J. 2012. Elative compounds in Dutch: Properties and developments. In *Intensivierungskonzepte bei Adjektiven und Adverben im Sprachenvergleich/Crosslinguistic comparison of intensified adjectives and adverbs*, ed. G. Oebel, 97–142. Hamburg: Kovač Verlag.

Hüning, M., and G. Booij. 2014. From compounding to derivation. The emergence of derivational affixes through "constructionalization". *Folia Linguistica* 48 (2): 579–604.

Klara, L. 2012. *Steinreich* ist *saucool*: Adjektivische Steigerungsbildungen des Gegenwartsdeutschen. In *Intensivierungskonzepte bei Adjektiven und Adverben im Sprachvergleich*, ed. G. Oebel, 143–170. Hamburg: Dr. Kovač.

Ledin, P. 2012. Positivens interjektioner: grymmerst! finerst! kanoners och kalasers! braish! *På svenska* 24.5.2012. https://pasvenska.se/positivismens-interjektioner-grymmerst-finerst-kanoners-och-kalasers-braish/.

Leuschner, T. 2010. *Ausnahmepianist fettgeschreckt – inbleich!* Deutsche, niederländische und schwedische Präfixoide im Spannungsfeld von Genealogie, Kreativität und Norm. In *Kontrastive Germanistische Linguistik*, ed. A. Dammel, S. Kürschner, and D. Nübling, 863–892. Hildesheim: Olms.

Levshina, N. 2014. *Rling: A companion package for how to do linguistics with R*. R package version 1.0.

———. 2015. *How to do linguistics with R. Data exploration and statistical analysis*. Amsterdam/Philadelphia: John Benjamins.

Lundbladh, C.-E. 2002. Prefixlika förleder. In *In Det Svenska ordförrådets utveckling 1800–2000*. Göteborg: Institutionen för svenska språket. http://spraakdata.gu.se/ordat/pdf/Ordat17utsida.pdf.

Meibauer, J. 2013. Expressive compounds in German. *Word Structure* 6: 21–42.

Meyer, D., A. Zeileis, and K. Hornik. 2016. *vcd: Visualizing categorical data*. R package version 1.4–3.

Noël, D. 2016. For a radically usage-based diachronic construction grammar. *Belgian Journal of Linguistics* 30: 39–53.

Norde, M. 2009. *Degrammaticalization*. Oxford: Oxford University Press.
Norde, M., and C. Morris. 2018. Derivation without category change: A network-based analysis of diminutive prefixoids in Dutch. In *Category change from a constructional perspective*, ed. K. Van Goethem, M. Norde, E. Coussé, and G. Vanderbauwhede, 47–90. Amsterdam/Philadelphia: John Benjamins.
Norde, M., and K. Van Goethem. 2014. Bleaching, productivity and debonding of prefixoids. A corpus-based analysis of 'giant' in German and Swedish. *Lingvisticae Investigationes* 37 (2): 256–274.
———. 2015. Emancipatie van affixen en affixoïden: Degrammaticalisatie of lexicalisatie? *Nederlandse Taalkunde* 20 (1): 109–148.
Pittner, K., and J. Berman. 2006. *Video ist echt schrott aber single ist hammer.* Jugendsprachliche Nomen-Adjektiv-Konversion in der Prädikativposition. *Deutsche Sprache* 3: 233–250.
R Core Team. 2016. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.
Schäfer, R. 2015. Processing and querying large web corpora with the COW 14 architecture. In *Proceedings of Challenges in the Management of Large Corpora (CMLC-3, July 20, 2015, Lancaster)*.
Schäfer, R., and F. Bildhauer. 2012. Building large corpora from the web using a new efficient tool chain. In *Proceedings of the eight international conference on language resources and evaluation (LREC'12)*, ed. N. Calzolari et al., 486–493. Istanbul: ELRA.
Schlücker, B. 2013. Non-classifying compounds in German. *Folia Linguistica* 47 (2): 449–480.
Stevens, C.M. 2005. Revisiting the affixoid debate: On the grammaticalization of the word. In *Grammatikalisierung im Deutschen*, ed. T. Leuschner, T. Mortelmans, and S. De Groodt, 71–83. Berlin/New York: Mouton De Gruyter.
Teleman, U., S. Hellberg, and E. Andersson. 1999. *Svenska Akademiens Grammatik.II: Ord*. Stockholm: Svenska Akademien.
Traugott, E.C., and G. Trousdale. 2013. *Constructionalization and constructional changes*. Oxford: Oxford University Press.
Trousdale, G. 2008. A constructional approach to lexicalization processes in the history of English: Evidence from possessive constructions. *Word Structure* 1: 156–177.
———. 2013. Multiple inheritance and constructional change. *Studies in Language* 37 (3): 491–514.
Trousdale, G., and M. Norde. 2013. Degrammaticalization and constructionalization: Two case studies. *Language Sciences* 36: 32–46.
Van de Velde, F., H. De Smet, and L. Ghesquière. 2013. On multiple source constructions in language change. *Studies in Language* 37 (3): 473–489.
Van der Sijs, N. (Ed.) 2010. Etymologiebank, http://etymologiebank.nl/.
Van der Wouden, T., and A. Foolen. 2017. A most serious and extraordinary problem. Intensification of adjectives in Dutch, German, and English. *Leuvense Bijdragen* 101: 82–100.
Van Goethem, K., and H. De Smet. 2014. How nouns turn into adjectives. The emergence of new adjectives in French, English and Dutch through debonding processes. *Languages in Contrast* 14 (2): 251–277.
Van Goethem, K., and Ph. Hiligsmann. 2014. When two paths converge: debonding and clipping of Dutch *reuze* 'lit. giant; great'. *Journal of Germanic Linguistics* 26 (1): 31–64.
Van Goethem, K., and M. Hüning. 2015. From noun to evaluative adjective: Conversion or debonding? Dutch *top* and its equivalents in German. *Journal of Germanic Linguistics* 27 (4): 366–409.
Van Goethem, K., and N. Koutsoukos. forthcoming. 'Morphological transposition' as the onset of recategorization. The case of *luxe* in Dutch. *Linguistics.*
Van Goethem, K., M. Norde, E. Coussé, and G. Vanderbauwhede, eds. 2018. *Category change from a constructional perspective*. Amsterdam/Philadelphia: John Benjamins.

Corpora:

COW12-corpora. (Schäfer and Bildhauer 2012).
COW14-corpora. (Schäfer 2015): https://webcorpora.org/.

Dictionaries:

DWB., *Das deutsche Wörterbuch von Wilhelm & Jakob Grimm* (via *Digitales Wörterbuch der deutschen Sprache*): https://www.dwds.de/wb.
SAOB., *Svenska Akademiens Ordbok*: http://www.saob.se/.
SAOL., *Svenska Akademiens Ordlista*: http://www.svenskaakademien.se/svenska-spraket/svenska-akademiens-ordlista-saol.
WNT., *Woordenboek der Nederlandsche Taal* (via *Geïntegreerde Taalbank*): http://gtb.inl.nl/.

Iterated Exaptation

Freek Van de Velde

Abstract Exaptation is a process of linguistic change where obsolescent morphology is refunctionalized. In this article it is argued that exaptation is not a rare, one-off process, as is often assumed, but may come in successive waves, both in biological evolution, where the term originated, and in cultural evolution, including linguistics. Such iterated exaptations may result in complex 'layering', to use a term familiar from grammaticalization studies. Two case studies on central aspects of Proto-Indo-European morphology are looked at in depth, showing how they underwent iterated exaptation in Germanic, namely the nominal stem-building *-n-* affix and the *ŏ*-grade of the verbal ablaut system. On the theoretical side, it is argued that exaptation is the consequence of word-based morphology that gives central stage to output configurations, a basic tenet of Construction Morphology.

Keywords Ablaut · Exaptation · Grammaticalization · Hypoanalysis · Multiple source constructions · Refunctionalization · *n*-stems · *o*-grade

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1 Introduction[1]

Construction Morphology assumes that the semantic interpretation of morphemes relies on their involvement in constructional schemas, which are form-function pairing with a varying degree of concreteness (see Booij 2010). In the course of time, these constructional schemas can be subject to change. One of the ways in which this can happen is by the rearrangement of the form-function relations of the constructional schema. The association of a certain part of the formal side of the construction with a certain part of the semantic side of the construction can become obscure, and a reassociation with a different semantic part or a totally new semantic function can arise. When this new association between a form and an existing or new meaning is 'unexpected' – in the sense that it does not result from classic extension pathways that are familiar from grammaticalization studies (Himmelmann 2004), we call the process 'exaptation' (Lass 1990; Norde and Van de Velde 2016, see Norde and Trousdale 2016 for the application of exaptation to Construction Morphology).

The ubiquity of exaptation is an argument in favour of a word-based morphology (Booij 2010, 2012), in which morphemes are not building blocks with independent meaning that are concatenated to form words, but rather get their meaning from the concrete instances they appear in. Construction schemas are output-oriented, as extensively argued in Booij & Audring (this volume). The output-oriented nature of constructional schemas is what drives exaptation: as morphemes are sanctioned by concrete words, meanings can easily shift by 'abductive inference' (see also Willis 2016). This does not mean this paper necessarily advocates the abductive language change model of Andersen (1973), which privileges first-language acquisition. Exaptation trough abduction is full well compatible with usage-based accounts where adult (or adolescent) language learning is seen as the locus of change (see Croft 2000: Ch.5).

At this point, this may sound vague and abstract, but the tenacious reader will be rewarded with concrete examples further on in this article.

Let's first examine the notion of 'exaptation' in more detail. Exaptation is a notion borrowed from evolutionary biology. In its broadest sense, it is defined as the opportunistic refunctionalization of an existing form for a new, unrelated function. It

[1]This article has benefitted from remarks by two anonymous reviewers and by Geert Booij. I am also heavily indebted to Muriel Norde for discussing many of the examples of exaptation mentioned in this article, some of which also found their way to Van de Velde and Norde (2016) and for her inspirational article about the intermarriage of exaptation and Construction Morphology (Norde and Trousdale 2016). Further inspiration on the developments in the *-n-* affix (case study 1, below) has been found in Perridon (2011) and in an e-mail exchange with Martine Robbeets. Finally, I want to express my gratitude to Peter Alexander Kerkhof for answering a few questions I had with regard to the distribution of the ŏ-grade and the zero-grade in the Proto-Indo-European verbal system (case study 2, below). If the reader finds some of the claims outrageous, insulting or non-interesting, s/he should rest assured that this has nothing to do with the scholars mentioned in this footnote, but is entirely due to me.

was first introduced in linguistics by Roger Lass in a seminal article in 1990 and was further developed in his 1997 monograph on diachronic linguistics. Biological exaptation is often exemplified by the refunctionalization of feathers. They presumably originated as thermoregulatory device, but later they were 'opportunistically co-opted' for flight. An example of linguistic exaptation is the causative (or inchoative) *-en* suffix in English verbs like *deepen*, *lengthen* and *frighten*. Referring to earlier work by Otto Jespersen, Wischer (2010) points out that the *-en* suffix, a relic from the infinitival ending (*-an* in Old English), occurred vacillatingly in Middle English verbs, without a clear contribution to the meaning. The shift to causative or inchoative meaning came about because the old infinitival ending had become defunct in English and because there may have been analogical pressure from an old *-n* stem formant that did have causative or inchoative meaning in Old English, as in *fæstnian* 'fasten' (Wischer 2010: 33–34, see also Van de Velde et al. (2013: 482), who see this as an instance of a Multiple Source Construction).[2] In Construction Morphology terms, we could represent the Old English stage as in (1), the Middle English stage as in (2), and the Modern English stage as in (3).[3] The analogical pressure comes from the (Old English) construction in (4), licensing *fæstnian*.

(1) $[V_{\text{stem-i}} + \textit{-an}_{\text{Infinitive}}] \leftrightarrow [SEM_i \text{ non-assertational}]$
(2) $[V_{\text{stem-i}} (+ \text{-e}\textit{n})]_{\text{Infinitive}} \leftrightarrow [SEM_i]_{\text{non-assertational}}$
(3) $[[A/N]_i + \text{-e}\textit{n}]_{\text{V-Infinitive}} \leftrightarrow$ [causative/inchoative process of state-SEM_i]$_{\text{non-assertational}}$
(4) $[[V_{\text{root-i}}\textit{-n-}]_{\text{V-stem}} + \textit{-an}_{\text{Infinitive}}] \leftrightarrow$ [causative/inchoative process of state-SEM_i, non-assertational]

Another example of linguistic exaptation is the change in the distribution of the double copula in Middle English (Petré 2013). Old English had two copulae, *is* 'is' and *bið* 'will be', sharing a preterite *wæs*. Originally, these copula had different semantics, with the former being used for present states and specific contexts, and the latter being used for future states and generic statements. In later times, this semantically driven distribution became obscured, by the rise of a specific verb for the future, *sceal*. Both copulae survived, but instead of a semantic difference, they came to express a number difference, with *is* being restricted to the singular and *bið* to the plural. This redistribution was supported by the link between generic and plural contexts (Petré 2013). The shift from Old English to Modern English can be formalized as in (5)–(6) and (7)–(8), respectively. Here, the plurality of the subject, fortuitously concomitant with the genericity of *bið*, has been promoted to the encoded meaning, a mechanism which is referred to as 'hypoanalysis' by Croft (2000).

[2]Wischer (2010: 33–34) summarizes the arguments why the *-en* suffix in Present-day English cannot be the straightforward continuation of this stem formant.

[3]*Non-assertational* is meant to capture the semantics of the infinitive. Cognitive Grammarians may prefer the term *non-grounded*.

(5) [NP$_i$ *is*$_V$ A/N$_j$] ↔ [entity-SEM$_i$ is currently in state-SEM$_j$ / is entity-SEM$_j$]
(6) [NP$_i$ *bið* A/N$_j$] ↔ [class-SEM$_i$ has property-SEM$_j$]
(7) [NP$_i$ *is*$_V$ A/N$_j$] ↔ [singular entity-SEM$_i$ has property-SEM$_j$ / is in state-SEM$_j$ / is entity-SEM$_j$]
(8) [NP$_i$ *be*$_V$ A/N$_j$] ↔ [plural entity-SEM$_i$ has property-SEM$_j$ / is in state-SEM$_j$ / is entity-SEM$_j$]

Exaptation is hotly debated, and not everyone agrees on its usefulness as a concept (see De Cuypere 2005 and several contributions in Norde and Van de Velde 2016). Interestingly, the notion might be more useful in the realm of cultural evolutionary products than in the realm of pure biological evolution (Larson et al. 2013). This is not the place to go into the lengthy arguments that have been put forward in defense of or against exaptation (see Van de Velde and Norde 2016 for an extensive status quaestionis). The main reason for the hesitation to accept exaptation as a process of change is that it is hard to come up with necessary and sufficient criteria that set this type of change off against other types of change. The same argument has been raised against grammaticalization (see an oft-cited special issue of *Language Sciences* in 2001). This does, however, not mean that the concept is unworkable. Exaptation is, in my opinion, a very useful term for a specific sort of linguistic change, namely the sudden unexpected lateral shift in function of an obsolescent morpheme. I think exaptation works more like a Wittgensteinian family resemblance structure, where the characteristics are neither necessary nor sufficient criteria, but occur in overlapping constellations. The following aspects have commonly been associated with linguistic exaptation:

(i) Unexpectedness: the new function of an exapted element should not be an extension or recurrent grammaticalization pathway, but should present a sort of leap-like shift (Gardani 2016; Narrog 2016; Wall et al. 2016).
(ii) Novelty of the new function. Exaptation often leads to the establishment of novel functions in a language, such as the establishment of a new gender distinction that was formerly not known in the language (Lass 1997: 320; Simon 2010), or, in a weaker version of this criterion, a function that did already exist in the language, but was formerly not associated with the exaptatum.
(iii) The 'junk' status. Linguistics exaptation happens especially – though certainly not exclusively – in cases where obsolescent morphology, with an increasingly obscure function, is residually present in a language's structure and is ready to take on a new function (Lass 1990; Willis 2010).
(iv) Exaptation occurs much more rarely than grammaticalization, and as a consequence, a morpheme generally does not undergo successive waves of exaptation (Heine 2003; Traugott 2004)

Characteristics (i) and (ii) are the most defining ones for exaptation. The other two characteristics are more problematic, and will be dealt with below. I will focus especially on Characteristic (iv), which has received less attention in the literature.

Characteristic (iii), the junk status, has been discussed the most and is considered the most problematic to use as a necessary or sufficient condition to diagnose exaptation. It has been pointed out that languages change gradually and morphemes are rarely fully devoid of meaning (Vincent 1995; Smith 2011; Van de Velde and Norde 2016: 21–27; though see Lass 2017: 121 for a dissenting view). This is the reason why Willis (Willis 2010, 2016, see also Narrog 2016) prefer to talk about 'obsolescent', rather than 'obsolete' morphology. The result is that exaptation displays a feature that is familiar from grammaticalization theory, namely 'layering' (Hopper 1991), the phenomenon that old and new forms coexist. When the body part *back* grammaticalizes into an adposition (e.g. *two years back*) or when French *pas* ('step') grammaticalizes into a negation marker, the word does not suddenly ceases to exist in its old use. The old and the new meaning peacefully coexist.[4]

The same is true for exaptation, both in biology and in linguistics. Feathers on bird wings serve a function in flight, but their original insulation function is still there, as can be seen when birds tuck away their heads in their feathered wings. In linguistic exaptation as well, the old and new function can coexist. This is nicely illustrated with the 'mirative' use of what originally was an indefinite singular-count article: in (9) and (10), it occurs before plural nouns, and expresses mirativity, in combination with other (prosodic and morphosyntactic) cues (see also Corver 2016: 245). Crucially, this does not mean that *een* cannot be used anymore in its regular function as an indefinite singular-count article.

(9) *Ik heb daar **een** mensen gezien!*
I have there a people seen
'I have seen so many people seen'

(10) *wat **een** schatten van kinderen!*
wat a treasures of a children
'such cute children!'

Even when the morpheme had no clearly discernible function anymore at the time it was exapted into a new function, it can still be used in its a-functional context after the exaptation. The causative/inchoative *-en* in English verbs discussed above is a case in point: in some verbs, like *listen* it just sits there as an irregular relic.

Now let's turn to Characteristic (iv). Of the list of characteristic features commonly associated with exaptation, the issue of rarity has been much less discussed than the junk issue. The assumption seems to be that if a change is 'unexpected', it should be a one-off process. But this is a non-sequitur. Exaptation can come in chains or bursts. This is most clear in the area of technology, where several techniques have been repurposed over and over again. Take Polytetrafluoroethylene

[4]One reviewer points out that the reason for this peaceful coexistence may be that the old and the new form occupy different niches, and are not paradigmatic competitors anymore. The French negation *pas* follows a verb, whereas the noun follows a determiner. I am, however, not convinced that this applies to all cases. The German numeral *ein* and the indefinite article *ein* can occupy the same slot in the NP, and Dutch auxiliaries can occupy the same slot as lexical verbs, for instance.

(PTFE), commonly known under its brandname *Teflon*. It is used for cable coating, bike chain lubricant, water-repellent clothing, non-sticky coating for cookware, graft material in surgical invention and many more applications (see Wikipedia entry *Polytetrafluoroethylene*). Each unexpected jump in function, for instance from cable coating to cookware, can be seen as an exaptation (see also Larson et al. 2013), albeit often with a non-empty exaptatum. But such 'iterated' exaptation is not restricted to technology. It also occurs in biology. The canonical example of feathers, mentioned above, is a good example. Feathers did not undergo just one single exaptation from a thermoregulatory device to a device for flight. Probably earlier in time, another exaptation occurred, where the feathered wings were used for predation, as a screen to catch insects. And in some birds, e.g. the black egret, feathered wings are used for 'mantling', where the bird uses the feathered wing as a canopy to cast a shadow on the glistening water surface, to see the fish beneath (Van de Velde and Norde 2016: 4). Yet another exaptation is the use of brightly coloured feathers into a marker used in sexual selection, such as the peacock's tail. Or take the vertebrate skeleton. Originally it was used as a calcium and phosphate storage device, and it was later repurposed as a support structure and, in the form of skulls and ribs, the protection of vital organs in a case. Subsequently, in some species parts of the skeleton took on yet another function. Irish elk, for instance, grow a large hump, originally a by-product of vertebrae growth to support the antlers, but later exapted for mating display (Gould 1997: 10754). Mammals have exapted part of their jawbones into ossicles in the middle ear as a hearing device. This was made possible by the development of a new jaw structure in therapsids, ancestral to mammals, freeing the precursors of the ossicles to refunctionalize (Anthwal et al. 2013).

Let's now turn to some linguistic cases of iterated exaptation. I will deal with two case studies, and show how the morphemes are exapted over and over, resulting in functional radiation.

2 Case Study 1: Iterated Exaptation in Nominal *n*-Stems

Proto-Indo-European had a so-called 'stem-building' affix *-n-*. Stem-building affixes turn roots into stems, to which additional (portmanteau) endings are attached for case, gender and number (see Beekes 2011: 179). Sometimes, there is no stem-building affix, and the endings are directly attached to the root. The morphological architecture of a Proto-Indo-European word can be visualized as in (11). An example, with a stem-building vowel *ŏ* is given in (12).[5]

[5]The use of diacritics for reconstructed forms (as well as attested forms, occasionally) in historical linguistics is not consistent across handbooks and articles. I have made no attempt to make all forms consistent, as the phonology plays little role in the present paper. I have taken the forms as they are represented in the sources I quote from. Greek forms are transliterated to Roman.

(11) [root (+ stem-building affix)]$_{\text{stem}}$ + inflectional affix]$_{\text{N}}$

(12) [$d^{h}ǒg^{h}{}_{\text{root}}$-$ǒ_{\text{stem-building affix}}$]$_{\text{stem}}$ -$s_{\text{inflectional ending}}$]$_{\text{N}}$ ($d^{h}ǒg^{h}$-$ǒ$-s ‘day’)

It is commonly assumed that stem-building affixes had derivational meanings, but that these meanings were bleached and lost in the daughter languages, so reconstructing a unifying meaning for each of these affixes is not possible at the present state of our linguistic knowledge, and by the end of the Proto-Indo-European stage, they merely functioned as declension class markers (Nübling 2008). In many cases, attested stem-building affixes seem to be cases of relic morphology, without a clear meaning, making them ideal candidates for exaptation.

The stem-building *-n*-affix (in different ‘grades’: zero-grade *-n-*, full grade *-ĕn-* and *-ŏn-*, lengthened grade *-ēn-* and *-ōn-*), extensively attested in Indo-European daughter languages, must have had a wide array of derivational functions (see Kroonen 2011 for an in-depth study). It is often used in derived property-denoting words, such as **krs-nó-* (‘black’, see Sanskrit *kr̥ṣṇá-*), **h₂iu-h₁en-* (‘young’, Sankrit *yúvan-*, Lat. *iuvenis*), see Beekes (2011: 181). Though maybe not all of these words can be unified under a single function, and scholars have characterized the meaning in different terms (see Brugmann and Delbrück 1889: 131, 424–426, 431, 437; Hirt 1927: 149vv.; Prokosch 1939: 260–161; Ranheimsæter 1945: 13–14; Pronk 2015), the common denominator of many formations is that the property-denoting words have a generalising meaning. This means that they denote so-called ‘individual-level’ qualities, i.e. permanent qualities (Prokosch 1939: 260), as opposed to ‘stage-level qualities’, i.e. temporary qualities (see Carlson 1977 for this terminological distinction). Thus, Greek *mélās* (neuter *mélan*, ‘black’), is an *-n* derivative of Proto-Indo-European **mel-* (‘dirty’), and could be understood as individual-level dirty (i.e. inherently dirty, permanently dirty), changing into ‘black’. This function of the *-n-* affix explains several uses:

(i) the frequent use of n-derivations as nicknames, as in Greek *strab-ó-s* (‘squinting’) vs. *stráb-ō-n-* (‘the squinter’) (Greek), Latin *catus* (‘shrewd’) vs. *catō-n-* (‘the shrewd one’) or *rufus* (‘red’) vs. *rufō-n-* (‘ginger’) or for function names like Gothic *weiha* (‘priest’, literally ‘the holy one’) (Pronk 2015: 327);

(ii) the frequent lexicalization of *n*-derivations as animal nouns, e.g. Ancient Greek *phrúnē* ‘frog’ as well as Old High German *bero* < Proto-Indo-European **b^{h}er-*, ‘brown’, Pokorny 1959: 136), **uk^{w}s-en-* ‘ox’, derived from Proto-Indo-European**h₂ueks-* ‘grow’, cf. Greek *aúksein* (‘increase’), so that the meaning of *ox* is originally ‘the (permanently) grown one’, Greek *áēdōn-* (‘nightingale’) (Kroonen 2011: 29), derived from Proto-Indo-European **auēd-* (‘speak’, ‘sing’), Old Prussian *sasins* ‘hare’, derived from the zero-grade of Proto-Indo-European **ḱeh₁-* ‘grey’, Gothic *ara* (‘eagle’) < Proto-Germanic *ar-an-* (cf. Present-day Dutch *arend* with paragogic *d*) and Greek *orn-īth-* (‘bird’) < Proto-Indo-European **er-n-, *or-n-* (‘big bird’), possibly a derivation of

Proto-Indo-European *er-*, *or-*, *r-* 'move, bring upward', compare Greek *órnumi* ('stir', 'excite') (cf. Van Wijk 1929, s.v. *arend*, *rennen*), Hittite *laḫḫanzan-* ('duck', lit. 'the travelling/swimming one', Pronk 2015: 327).

(iii) the use of *n*-derivation for tools, such as Proto-Germanic **wagna-* 'car' (Old Saxon *wagan*, Old High German *wagan*, Old Frisian *wein*, Old English *wægn*, Old Norse *vagn*), Old-Irish *fēn*, a Proto-Indo-European *n*-derivation **ueǵ^{h}-no-*, **uoǵ^{h}-no-*, derived from root **ueǵ^{h}-* 'move' (Philippa et al. 2003–2009 s.v. *wagen*), i.e. 'the permanently/characteristically moving one', or Proto-Indo-European **g^{w}reh$_{2}$u̯-ōn* 'pressing stone, millstone' (Sanskrit *grā̆vān-*, Old Irish *bráu* (genitive *broon*), English *quern*) (Fortson IV 2010: 124), with the meaning, 'the permanently/characteristically heavy one',

(iv) the possessive formations that go under the name of 'Hoffmann suffix', e.g. Latin *iuvenis* 'young', an *n*-derivation of the zero-grade of **h$_{2}$oiu* 'life force', i.e. 'having life-force' (Fortson IV 2010: 124), or Avestan *mąθrā*, genitive *mąθrānō* 'prophet', an n-derivation from **mn-tro* ('thought') (Kroonen 2011: 29).

The use in (i), (ii) and (iii) works on the salient nature of individual-level, permanent, qualities to single the individual referent out. This may also underlie the use in (iv), where the possessive derivations are used to refer to individuals with characteristic features. The individual-level function may also account for *n*-derivations like Sanskrit *rājan-* ('king'), from Proto-Indo-European **h$_{3}$reǵ-* ('stretch, erect'), i.e. 'the one of inherently erect quality', and maybe even the cardinal *one* in many Indo-European languages, which is an *n*-derivative (Proto-Indo-European **oi-no-s*) of a deictic stem, and could thus mean 'inherently, and hence recognisably 'this'' (Pronk 2015: 342), see also Lithuanian *ýnas*, *ìnas* 'true, real' (Pokorny 1959: 286). The same identifying capacity of the cardinal *one* is still visible in English 'the one'. Furthermore, the individualising meaning of the *-n*-affix may explain its use with singulatives, i.e. the singular use of referents that normally come in pairs or larger quantities (Pronk 2015).[6]

This Indo-European stem-building affix came to play an important role in Germanic morphology, as it became the formant of the weak adjectival inflection, one of the unique hallmarks of Germanic morphology. To understand what has happened, we first have to look at a typological shift that swept through the Germanic branch of Indo-European. (Early) Proto-Indo-European did not distinguish between adjectives and nouns as parts-of-speech, but has a 'nominal' part-of-speech, covering property-denoting and entity-denoting lexemes (Bammesberger 1992: 52; Kurzová 1993; Van de Velde 2009: 170–177; Van de Velde et al. 2014: 1–2 for extensive argumentation for this idea, which goes back to Paul and Meillet). Relics of this system can be seen

[6]This singulative meaning of the *-n*-affix may be considered an exaptation (*pace* Pronk 2015: 344, who objects to it being a reanalysis). In Germanic, it was widely used to derive body parts, and in Tocharian it developed into a marker for rational beings (Pronk 2015: 328, 340–341), which appear to be further exaptations. These developments will not be the focus of the present article though, which instead focusses on the exaptations in Germanic adjectives (see below).

in Hittite, Greek, Latin and Sanskrit. In the course of its development, Germanic started to distinguish adjectives from nouns as a separate part-of-speech:

> The development of the adjective is perhaps one of the most conspicuous innovations in Germanic morphology. In Germanic the adjective is not only semantically deliminated by generally expressing some 'quality' (. . .), but it is also morphologically clearly definable. (Bammesberger 1992: 52–53).

As is well-known, Germanic did not just end up with one type of adjectival inflection, but two: the strong and weak inflection. The strong inflection came about by the infusion of the endings of the demonstrative pronoun in the adjective flexion (see e.g., Prokosch 1939: 261), probably through a class of adjectives that already declined pronominally, such as *other* and *last*, which are sometimes referred to as 'semi-pronouns' (Kluge 1913: 209) or 'pronominal adjectives'. The weak inflection is a continuation of the inherited Indo-European *-n*-formations. The original functional distribution was probably such that strongly inflected adjectives were qualifying in nature, whereas weakly inflected adjectives retained their individual-level property-denoting function of Indo-European, and functioned as classifying adjectives (see Spamer 1979; Van de Velde 2006). The classifying function of the weak adjectival inflection meshes well with its nominal nature (Brugmann and Delbrück 1893: 400, 402; Fischer 2001: 258), and its thematic information structure (Fischer 2000, 2001, 2004). This can be seen in examples (13) and (14), where the weak inflection occurs in indefinite NPs, a context that they later cannot occur in anymore. As Fischer points out: "It must be clear that in these examples it is not a temporary or particular state of (. . .) blindness that is emphasized, but the inherent quality." (Fischer 2001: 268).

(13) *an blinda mann* (Old English, Fischer 2001: 268)
a blind:WEAK man
'a blind man'

(14) *sum eorðlice æ* (Old English, Mitchell 1985: 60)
a worldly:WEAK law
'a secular law'

Conversely, the strong inflection can also occur in definite contexts. This is the case when it is premodified by *so*, like in (15), which proves it is not a classifying adjective, as these can, as a rule, not be submodified by a degree adverb. Indeed, submodified adjectives always have the strong inflection (Fischer 2000: 168–169, 2001: 262).

(15) *(in) dero sō mihileru ursuahida* (Old High German, Grimm 1967: 623)
in this so great:STRONG temptation
'in this temptation so strong'

The shift from a derivational nominalising affix in Proto-Indo-European to an adjectival inflectional affix in Germanic can be seen as an exaptation: the derivational function of the stem-building affixes had become partially opaque, to the extent where they merely indicated inflectional classes, and this opacity

made the *-n*-affix a target for refunctionalization (Braunmüller 2008: 360–361). The 'opportunistic' nature of the refunctionalization is supported by the observation that the shift to adjectival function is an idiosyncratic development in Germanic. It has to be added, though, (i) that the productivity of the *-n*-affix had not been entirely lost in the Germanic languages, as we find some derivations that are peculiar to Germanic (see Van de Velde and Norde 2016: 25–26): Proto-Germanic **haz-an-* (English *hare*, Dutch *haas*), a derivation of **has-ua* 'grey',[7] and (ii) that there is of course a natural association with individual-level semantics and classifying adjectives. The exaptation, then, does not primarily consists of a leap in the semantics, but rather in its differential opposition with the strong inflection in a novel part-of-speech category, so more on the level of the morphosyntactic function than on the level of the semantics.

The use of the *-n*-inflection in a new adjectival system in Germanic was not the end of the functional development of this affix. A new shift occurred: the weak inflection came to express definiteness. This happened in all branches of Germanic, suggesting it is a fairly early development. In later stages, the *-n*-inflection did not express definiteness by itself anymore, but had to be accompanied by an explicit definite determiner, though there are early examples where the weak adjectives are used in determiner-less noun phrases (Prokosch 1939; Traugott 1992: 171). An example is given in (16). The new function of definiteness is illustrated in examples (17)–(20). The semantics make it unlikely that the adjectives are classifying in nature.

(16) *Þá wæs forma síð geongan cempan þæt hé* (. . .) (Beowulf vv. 2625–2626)
Then was first time young:WEAK champion that he
'That was the first time for the young champion that he (. . .)'

(17) *sa liuba brôthar* (Gothic, Grimm 1967: 618)
that kind:WEAK brother
'that kind brother'

(18) *sô managfalthô handugei* (Gothic, Grimm 1967: 618)
that manifold:WEAK wisdom
'that manifold wisdom'

(19) *thizôs andvaírthôns thaúrftáis* (Gothic, Grimm 1967: 618)
this present:WEAK need
'this present need'

[7] It cannot be ruled out that the stem-building *-n*-affix grew in productivity in Proto-Germanic, in its functioning as nominalizer from adjectives, like for instance in **manniskan-* ('human', cf. Dutch *mens*, German *Mensch*), from weak adjective **mann-iska-* 'concerning man' (Van Loey 1964: 131). Still, productivity is not the same as transparency. It seems that Germanic has extended the *-n*-affix to a wide range of contexts, beyond the original semantic constraints. This phenomenon can be seen elsewhere in Germanic morphology. The Germanic languages have a "reputed preference for ablaut" (Mailhammer 2008: 281), and use ablaut in contexts were it was unmotivated from an Indo-European perspective, probably because the transparency of its function was lost (see also below). In short, the productivity of the *-n*-affix in Germanic does not entail it was non-transparent.

(20) *se Ælmihtiga God* (Old English, Mitchell 1985: 65)
the almighty:WEAK God
'the almighty God'

Of course, the danger of circularity is lurking: if the odd inflectional behaviour of examples (13), (14), (15) is the *only* indication that we have an obsolete pattern, it cannot in turn be explained by an appeal to the obsolete nature of those examples. We can avoid such circularity by adducing independent evidence for the archaic nature of these attestations. Independent evidence comes from the observation that these constructions are mainly found in poetry, a genre that is known for its retention of obsolete patterns.[8]

The shift from classifying adjective to definiteness marker is a new exaptation. It is not entirely clear whether the classifying function of the adjectival *-n*-inflection had become obsolescent first, but with the increased reliance on word order, one the of the major drifts in the Germanic noun phrase (see Van de Velde 2009), the difference between classifying and qualifying adjectives could easily be signalled by positional differences as well, instead of by morphological means. When preceding the noun, classifying adjectives follow qualifying adjectives, see (21) and (22) from present-day English. The adjective 'criminal' in (22) cannot have a classifying function ('specializing in criminal law') as in (21), but can only mean 'with an inclination to engage in illegal activity'. In older stages of English and Dutch, strongly inflected adjectives never occur in-between a weakly inflected adjective and the noun. Either they precede them, or – more commonly – they follow the noun, as stacking of adjectives in the prefield of the NP was uncommon (see Fischer 2000; Van de Velde 2006: 52–53, 2009: Ch.6).

(21) *Ask any experienced criminal lawyer and he will tell you so.* (COHA, Davies 2010-)

(22) #*Ask any criminal experienced lawyer and he will tell you so.*

The weak inflection, the direct descendant of the Indo-European *-n*-affix, exapted further in Belgian Dutch, where the weak inflection became a marker of gender. The weak inflection withered down to a mere schwa, so the original *n* is not visible anymore. The distribution in attributive adjectives is such that in singular noun phrases, it is used for masculine and feminine nouns, whereas neuter nouns are attributively modified by strongly inflected (i.e. zero-ending) adjectives.[9]

[8]See Mitchell's (1985: 56–60) discussion of the construction at issue for references to the theory that it may represent an older language stage.

[9]This is the main rule. There are many exceptions, motivated by subrules. In Netherlandic Dutch, the distribution is slightly different: the 'strong' inflection is used on attributive adjectives only when they occur in neuter indefinite singular NPs. So in that variety, definiteness still plays a role.

(23) *een/het bruin paard* (Belgian Dutch)
a/the brown:STRONG horse:NEUTER

(24) *een/de bruine hond* (Belgian Dutch)
a/the brown:WEAK dog:NON-NEUTER
'the brown dog'

In Dutch, further exaptations can be witnessed. Van de Velde and Weerman (2014) argue that currently, the weak inflection is undergoing a reinterpretation, where the weak inflection is turning into a marker of 'attributivity', without interacting with gender, definiteness or number. In the prefield of the noun phrase, it is functioning as a watershed between the determiner zone and the zone for attributive adjectives. On the basis of corpus data, Van de Velde & Weerman show that the weak inflection is increasingly found in adjectives where it was formally absent, and is shed from determiners, where the schwa formerly did occur.[10] Take a nineteenth-century example like (25). Here, the possessive determiner (*zijn*) cannot be inflected anymore in Present-day Dutch, see (26). The attributive adjective (*natuurlijke*) retains its weak inflection, however.

(25) *van **zijne natuurlijke** noodzakelijkheid* (nineteenth-century Dutch, Van de Velde and Weerman 2014: 130)
of $\text{his}_{\text{Determiner}}$:WEAK $\text{natural}_{\text{Adjective}}$:WEAK necessity
'of its natural necessity'

(26) *van **zijn natuurlijke** noodzakelijkheid* (Present-day Dutch)
of $\text{his}_{\text{Determiner}}$:STRONG $\text{natural}_{\text{Adjective}}$:WEAK necessity
'of its natural necessity'

If we extend our attention to finer-grained varieties, other exaptations can be discerned with the Indo-European *-n*-inflection. Berteloot (2005: 35) remarks that the thirteenth-century Flemish/Zeelandish writer Jacob van Maerlant refunctionalized the distinction between the strong and weak inflection such that attributive adjectives are declined strongly, and nominalized adjectives are declined weakly. This was a fairly non-disruptive change, as both functions were already associated with the strong and weak adjectival declination before, but the distinction seems to crystallize in an exapted system. The Van Maerlant-system did not make it, though, as it cannot be found with other writers systematically.

In nouns, the Indo-European *-n*-affix underwent its own exaptive course. In German and Dutch, the *-n*-affix, originally part of the stem, was exapted as a marker of plurality. English went with a different plural suffix (*-s*), though in the word *oxen* the plural-exaptation can be seen at work as well (Van de Velde and Norde 2016: 22), suggesting the *-n-* strategy for the plural was experimented with in older stages of English as well. The exaptation to plurality, constituting a clear functional

[10]Note that the schwa inflection on the determiner is synchronically similar to the weak adjectival inflection, but etymologically, in fact, a residue of the strong inflection. Such a reanalysis happens often in historical morphology, as shown in Van de Velde and Van der Horst (2013).

leap, can be understood if we look more closely at the stepwise fashion in which it proceeded (see Van Bree 1987: 238–240; Marynissen 1996). The starting point is the functionalization of the *n* in distinguishing the singular from the plural in Middle Dutch feminine *n*-stems. These words, like *tonge* ('tongue'), had no *n* in the nominative singular, due to sound laws, but had an *n* in the nominative of the plural. This distinction spread to the feminine *ō*-stems, such that singular *siele* ('soul') vs. plural *siele*, where there was no *n* in either of the numbers, was replaced by singular *siele* vs. plural *sielen*. A following step in the expansion of the *n*-plurals was the removal of the *-n* from the singular dative and accusative of the masculine *n*-stems, such as *hanen* ('cock'), to the effect that the singular of all cases (except the genitive) was *hane*, contrasting with plural *hanen*. The next, logical step was the extension of the system to masculine nouns ending in a schwa in the singular, like *u*-stem *sone* ('son'), so that parallel to what happened with *siele*, original singular *sone* vs. plural *sone* was replaced by singular *sone* vs. plural *sonen*. In all these cases, the use of the *n* in the plural had the effect that ambiguity as a result of singular-plural syncretism was avoided. Subsequently, the plural *n* cropped up in Middle Dutch words which did not have the syncretism, like singular *dag* ('day') vs. plural *dage*, which was eventually replaced by singular *dag* vs. plural *dagen*.

This does not exhaust the exaptations that befell the Indo-European *-n*-affix. In Afrikaans, the adjectival schwa, the descendant of the *-n*-affix, was refunctionalized as a marker of the morphophonology of the adjective (see Lass 1990 for details), and is undergoing a new exaptation today, in its use for emotive expressions (see Conradie 2017, who explicitly qualifies this as 'exaptation'). This use is illustrated in the contrast in (27) and (28).

(27) *die arm man* (Afrikaans, Conradie 2017)
the poor man
'the poor (i.e. impecunious) man'

(28) *die arm-e man* (Afrikaans, Conradie 2017)
the poor-INFL man
'the poor (i.e. to-be-pitied) man'

The manifold changes of the affix in Dutch creoles, some of which also qualify as exaptation, is discussed in Van Marle (1995).

In summary, the so-called stem-building *-n*-affix, which had already become obsolescent or at least partially non-transparent in (late) Proto-Indo-European, was refunctionalized. This did not happen just once, but several times, leading to a chain of exaptation. Such 'iterated exaptation' testifies to the ubiquity of the process, contra Heine (2003) and Traugott (2004).

The changes can be made clear in Construction Morphology formalizations. By way of example, take the exaptation of the *-n*-affix in nouns yielding a plural marker in Continental-West-Germanic. As the *-n*-affix becomes non-transparent, it is up for grabs for refunctionalization. This happens not just inevitably, but because the original plural ending gets lost through sound laws (*es* > *iz* > Ø). This is the state in Proto-Continental-West-Germanic in (31), where the root is followed by a non-

transparent affix and a zero-affix, with a function. This causes a reshuffling of the meaning components, such that the non-transparent affix takes over the function of the zero-affix.[11] The status of zero-affixes is a contended issue in any morphological theory, and Construction Morphology is no exception. Given its reliance on output configurations (see above), a paradigmatic zero may easily go unnoticed, which increases the probability of reanalysis, of course. The idea is that the meaning part of the construction consists of a lexical part (SEM) and a grammatical-procedural part (PLURAL). Given that Indo-European languages, including (Middle) Dutch, mostly expresses number with affixes, the language user abductively reasons that *ossen* consists of stem *os* and affix *-en*, as the *-en* affix had become non-transparent earlier. From there, the *-en* can then analogically spread to new contexts as a plurality marker, i.e. as a constructional schema. In a morphological theory where words are seen as concatenations of morphemes, it is much harder to account for the reanalysis. It is unclear why language users lacking the morpheme *-en* for plurality in their mental lexicon should use it, instead of relying on the much more straightforward solution to just drop the affix.

(29) PROTO-INDO-EUROPEAN *uksénes* 'oxen' (Ringe 2006: 49)
$[\text{Root}_i + \text{-}n_{\text{stem-building-affix-j}}]_{\text{stem-k}} + \text{-}es_{\text{affix-l}} \leftrightarrow [\text{entity/property/predicate-SEM}_i + \text{individual-level}_j]_{\text{entity-nominalization-k}} + \text{nom/voc/acc-plural}_l$
$[uks_{\text{root-i}} + \text{-}én_{\text{stem-building-affix-j}}\text{-}]_{\text{V-stem-k}} + \text{-}es_{\text{affix-l}} \leftrightarrow [\text{GROW}_i + \text{individual-level-property}_j]_{\text{entity-nominalization-k (lexicalized)}} + \text{nom/voc/acc-plural}_l$

(30) PROTO-GERMANIC *uhsaniz*[12] 'oxen'
$[\text{Root}_i + \text{-}n_{\text{stem-building-affix}}]_{\text{stem-j}} + \text{-}iz_{\text{affix-k}} \leftrightarrow [\text{entity/property-SEM}_i + \text{untransparent}]_{\text{entity-j}} + \text{nom/voc/acc-plural}_k$
$[uhs_{\text{root-i}} + \text{-}an_{\text{stem-building-affix}}]_{\text{stem-j}} + \text{-}iz_{\text{affix-k}} \leftrightarrow [\text{OX}_i + \text{untransparent}]_{\text{entity-j}} + \text{nom/voc/acc-plural}_k$

(31) PROTO-CONTINENTAL-WEST-GERMANIC *uhsan* 'oxen'
$[\text{Root}_i + \text{-}n_{\text{stem-building-affix}}]_{\text{stem-j}} + \text{-}\emptyset_k \leftrightarrow [\text{entity/property-SEM}_i + \text{untransparent}]_{\text{entity-j}} + \text{nom/voc/acc-plural}_k$
$[uhs_{\text{root-i}} + \text{-}an_{\text{stem-building-affix}}]_{\text{stem-j}} + \text{-}\emptyset_k \leftrightarrow [\text{OX}]_{\text{entity-j}} + \text{nom/voc/acc-plural}_k$

(32) MIDDLE DUTCH *ossen* 'oxen'
$[\text{Stem}_i] + \text{-}n_{\text{affix-j}} \leftrightarrow [\text{entity-SEM}_i] + \text{plural}_i$
$[os_i] + \text{-}n_{\text{affix-j}} \leftrightarrow [\text{OX}_i] + \text{plural}_j$

[11] One is welcome to disagree with the particulars of the formalization in (27)–(30), both the formal and especially the meaning parts to the left and right of the double arrows respectively, in the Proto-Indo-European, Proto-Germanic and Proto-Continental-West-Germanic state, which all rely on reconstruction, as far as they do not concern the main idea of the refunctionalization. The co-indexing of 'affixes' on the left hand side and the grammatical functions on the right hand side (e.g. $\text{-}n_{\text{affix-j}} \leftrightarrow \text{plural}_j$) is not in conformity with the output-oriented, word-based approach in Construction Morphology, and is here used merely for convenience's sake.

[12] As one reviewer points out, the *-é-* of **uksénes* would not become *-a-* but *-e-*. The *-a-* can be explained as analogically transferred from other cases (probably the accusative singular), or the vowel could be reconstructed as *-o-* in Proto-Indo-European. This does not affect the analysis at hand, however.

3 Case Study 2: Iterated Exaptation in the Indo-European Perfect with *ŏ*-Grade

Proto-Indo-European morphology makes use of affixes of all sorts, but it also sports root-vowel alternation, also known as 'apophony', 'vowel gradation', or 'ablaut'. It is not entirely clear what the origins of the ablaut are. As in the case of the stem-building *-n*-affix, the ablaut had become partially non-transparent by the stage that can be safely reconstructed. The ablaut vowel may have arisen as a by-product of stress shifts, as Proto-Indo-European is assumed to have had a dynamic accent, but this is contested (Fortson IV 2010: 80–81). The root vowel comes in five shapes, called 'grades'. It can either be in the zero-grade, so without a vowel, or it can be in the full grade, which is either *ĕ* or *ŏ*, or it can be in the lengthened grade, which is either *ē* or *ō*. It is hard to exhaustively list under what circumstances each of these grades occur, but for the verbal system, the full grade *ŏ* is characteristic of the singular of what is called the 'perfect'. Thus, Greek root *l_ip* 'leave' has a zero-grade *lip*, occurring in the aorist *é-lip-on* ('I left'), a full *ĕ*-grade, occurring in the present, *leíp-ō* ('I leave'), and an *ŏ*-grade in the (reduplicating) perfect *lé-loip-a* ('I have left'). It is the latter grade that concerns us here, in particular in its contrast to other grades.

The Proto-Indo-European perfect is the subject of an ongoing debate about its function and origin. It shifted in several daughter languages to indicate grammatical aspect and later even tense, but it is likely that it originally expressed a present **state**. In ancient Greek, the present *thnḗiskei* means 'he is dying', and the aorist *éthane* means 'he died'. The perfect, by contrast, does not express an action in the present or the past, but a state: perfect *téthnḗke* means 'he is dead' (Clackson 2007: 121). Of course, the difference between a present state 'he is dead' and the perfective 'he has died' is vanishingly small. A clearer example is Greek *óllumi* 'I destroy', which has a perfect *ólōla*, meaning 'I am lost', so a present state, not 'I have destroyed'. Another interesting example is Greek *tétoka*, a perfect from *tíktō* 'beget'. The perfect is associated with females, as men do not enter into a new state after having given birth (Clackson 2007: 121). The stative meaning of the perfect is also clear in the ancient perfect **u̯oid-h₂e* 'know'. It is a non-reduplicating perfect of the stem **u̯eid-* 'see', and turns up in Sanskrit as *véda*, in Greek as *(w)oĩda* 'I know', and in Gothic as *wait*. This is not, in fact, a preterite 'saw', but rather a state resulting from having-seen.

The stative meaning of the Proto-Indo-European perfect may have been the result of an exaptation of what was originally a middle voice, expressing lack of control on the part of the subject. This reconstruction is especially motivated by linking the evidence from the so-called *-hi* conjugation in Hittite to the perfect (Clackson 2007: 138–151), though this is a notoriously controversial issue in Indo-European linguistics, and one that I will not go into here.

A more securely reconstructed exaptation is the drastic change the *ŏ*-grade perfect underwent in Germanic. In fact, it is a triple exaptation.

	ĕ-grade	*ŏ*-grade	zero-grade
Proto-Indo-European	present *b^héyd^h-e/o- (cf. Greek *péithō*)	perfect *b^heb^{h}óyd^he (cf. Greek *pépoithe*)	aorist *é-b^hid^h- (cf. Greek *épithon*)
Proto-Germanic	present **bīdanǫ* (< *beid-*) (cf. Gothic *beidan*)	preterite-singular **baid* (cf. Gothic *baid*)	preterite-plural **bidum* (cf. Gothic *bidum*)

Fig. 1 Ablaut in Proto-Indo-European *b^héyd^h 'trust, believe' (Greek, active: 'persuade'), Proto-Germanic **bīdanǫ* ('wait'). Gothic forms are not all attested as such

The first major exaptation is the one that Roger Lass already used as an illustration in his seminal paper on exaptation (Lass 1990). It concerns the use of the *ŏ*-grade as a number marker in the Germanic preterite in Class I-V of the so-called strong verbs.

The Germanic preterite is a direct continuation of the Indo-European perfect. According to one theory, this is only true for the singular. The plural reflects the aorist. The main argument is that the singular has the *ŏ*-grade, which turns up as /a/ in Germanic in the singular, and zero-grade or lengthened *ē*-grade in the plural, in class I-III and in class IV-V, respectively. Indeed, in the Greek verb *leíp-* 'leave', mentioned above, we see that the present has full ĕ-grade (*leipō)*, the perfect has the *ŏ*-grade (*léloipa*), and the aorist has zero-grade (*élipon*). The correspondence for the root *b^héyd^h-* (Ringe 2006: 156) is illustrated in Fig. 1 (assuming reduplication to be original in the perfect and the augment *e-* to be original in the aorist).

Not everyone agrees, though. Ringe (2006: 157) insists that there are no traces of the aorist in the Germanic preterite. An argument in support is the occurrence of zero-grade plural perfects like Greek *ísmen* (< *(w)ídmen* < *(w)idmén*), plural of *(w)oĩda* Even if the plural of all Germanic preterites can be traced back to Proto-Indo-European perfects, the restructuring such that the vowel gradation more systematically reflects number is a case of exaptation, working on an untransparent heirloom of Indo-European ablaut vowels.[13] Untransparent, because neither the ablaut, nor the reduplication was a fully reliable marker of the perfect in Indo-European: the *ŏ*-grade could be used in the present tense of causative verbs (e.g. Greek present *dokéō* 'teach', with *ŏ*-grade of Proto-Indo-European root *$de\hat{k}$- (Pokorny 1959: 189–191), or *$h_2$kous-* 'hear' (cf. Greek *akoúō*, Gothic *hausjan*), which only appeared in the *ŏ*-grade (Fortson IV 2010: 80), although Indo-Europeanists tend to consider the *ŏ*-grade presents as secondary developments, to be fair) and in nominal[14] derivations, as in *b^hoso-* 'naked', cf. Old High German

[13]Of course, to the extent that the ablaut systematically distinguished the singular and the plural of the perfect, marking number may have been its original function. Still, the *ŏ*-grade is a more conspicuous marker of the perfect, as it is neither found in the singular of the present nor of the aorist.

[14]As pointed out above, the 'nominal' category in Proto-Indo-European includes the adjectival function.

bar, Old Church Slavonic *bosŭ* 'barefooted', probably related to **b^{h}es-* 'rub off' (Pokorny 1959: 163). Moreover, reduplication was used not only in perfects, but in some derived present stems as well: **d^{h}i-d^{h}eh$_1$-* (cf. Luwian *titaimi-* 'nurtured') derived from the Proto-Indo-European root *d^{h}eh$_1$(y)-* 'suckle' (Clackson 2007: 151). Furthermore, on the basis of **u̯oid-h$_2$e* 'knows', it has been assumed that at least some perfects were non-reduplicating, and given the good attestation of this perfect, non-reduplication in perfect appears to be an old feature.

A second exaptation is the use of the *ŏ*-grade in the present, in verbs of class VII. These verbs originally did not have ablaut, but reduplication. This can be seen in Gothic, where the preterite of *háitan* ('call') is *haíháit*, the preterite of *haldan* is *haíhald* and the preterite of *slēpan* 'sleep' is *saíslēp* (Streitberg 1920: 147–148).[15,16] Several of these verbs have an *ă* instead of an *ĕ* in the present, as in Gothic *haldan* ('hold'), *fraisan* ('try'), *aukan* ('multiply'). As the Germanic *ă* is the result of a merger of Indo-European *ă* and *ŏ*, the *ă* in the present could easily be taken for the reflex of the *ŏ*-grade, and sometimes it actually was the reflex of the *ŏ*-grade, for instance in *háitan*, which is cognate of Proto-Indo-European *koih$_2$-d-*, from the root **keih$_2$-*. In West-Germanic, the reduplication was remodelled to make it look like an ablaut-pattern. So Proto-Germanic **háitan* had a reduplicating preterite **hæ-gait*, in which the initial consonant of the root had changed under Verner's law, from *h* (originally /χ/) to *g*.[17] This mutilation of the root made it harder to recognize the preterite as a pure reduplication. If anything, the preterite **hægait* looked more like something *inside* the stem had been changed, as the initial consonant of the reduplication was equal to the original anlaut-consonant. By reduction of the original stem (the second syllable), **hægait* was reanalysed as **hĕĭ(g)t*, and then changed into *hē$_2$t*, as a result of *a*-umlaut. The details of the development are neatly laid out in Van Coetsem (1983, 1990). A supporting argument is the Old English preterite form *heht*, where the second *h* is a trace of the reduplication. As such, it is a missing-link between Gothic *haíháit* and Middle Dutch *hiet* (with <ie> developed from *ē$_2$*). The result of this wholesale restructuring of class VII verbs is that they came to fit the ablaut pattern in West-Germanic strong verbs (and no longer had the odd reduplication), but, for some verbs at least, mirror-wise, with the historical *ŏ*-grade, reflected in Germanic as *ă*, now ending up in the present. This exaptation took as its point of departure the non-transparent morphology of class VII reduplication.

A third exaptation of the *ŏ*-grade is its use in the Germanic modal verbs. In Proto-Germanic, the Indo-European perfect developed into the preterite, but a number of old static perfects of Indo-European held out. These verbs had perfect morphology, but present-static meaning, and are commonly referred to as preterite-presents. An example is Proto-Germanic **wait* 'knows' (Gothic *wait*, Old Norse *veit*, Old English *wāt*, Old High German *weiȝ*) from Proto-Indo-European **wóyde* 'knows' (Greek

[15]There are some verbs that have both reduplication and ablaut as preterite markers in Gothic, e.g. *lētan* 'let' – *laílōt*.

[16]The <ai> vowel in the reduplicating part is an /æ/.

[17]Vernerization of the anlaut-consonant of the stem was lost in Gothic.

(w)oīda ‘I know’) (Ringe 2006: 153), or Proto-Germanic **(ga)man* ‘remembers’ (Gothic *(ga)man*, Old Norse *man*, Old English *(ġe)man*) from Proto-Indo-European **memóne* ‘remembers’ (Ringe 2006: 153). The *ŏ*-grade was recognized as an ablaut vowel, as the plural had zero-grade, just like strong preterites: 1SG *man* contrasts with 1PL *munum* (the Germanic *u* being the reflex of the Indo-European zero-grade). The group of preterite-presents thrived in Germanic (Prokosch 1939: 188), and some of these verbs have either no perfect stem in Proto-Indo-European or not even a related present or aorist stem. Proto-Germanic **kann* ‘knows’ (Gothic *kann*, Old Norse *kann*, Old English *cann*, Old High German *kan*), for instance, cannot be related to an Indo-European perfect, but can be related to a present with a nasal infix **ǵneh₃-* ‘recognize’, present **ǵn̥nhéh₃ti* ‘recognizes’ (Sanskrit *jānā́ti*, Tocharian A 2SG *knānat*). This suggests that the stative perfect was still productive in Proto-Germanic (Ringe 2006: 154). The problem is compounded when root-etymologies can be established, but reconstructing the stem is hard or impossible because of scant attestation in other Indo-European languages, e.g. for Proto-Germanic **ann* ‘grants’, **mag* ‘can’ and **skal* ‘owes’, and when there are no known Indo-European cognates at all, for instance with Proto-Germanic **mōt* ‘is allowed to’ and **lais* ‘knows’ (Ringe 2006: 154–155).

By coining new preterite-presents, apart from those inherited from Indo-European, the category of these stative perfects shifted semantically. In Proto-Indo-European, the emphasis was on the state resulting from a completed action. This could be either a psychological state (cf. Greek *(w)oīda* ‘I know’) or a physical state (cf. Greek *ólōla*, ‘I am lost/destroyed’). In Proto-Germanic, the expanded group displays higher semantic homogeneity, as the members of this group seem to converge on psychological states or (dynamic) modality (or impersonal verbs like **ganah* and **daug*):

(33) Proto-Germanic
**wait* ‘know’ (<Proto-Indo-European **wóyde* ‘knows’)
**(ga)dars* ‘dare’ (<Proto-Indo-European **$d^{h}ed^{h}órse$* ‘dares’)
**(ga)man* ‘remember’ (<Proto-Indo-European **memóne* ‘remembers’)
**ganah* ‘it is enough’ (<Proto-Indo-European **$h_2eh_2nó(n)ḱe$* ‘is at’)
**aih* ‘posesses’ (<Proto-Indo-European **$h_2eh_2óyḱe$* ‘possesses’)
**ōg* ‘be afraid’ (<Proto-Indo-European **$h_2eh_2óg^{h}e$* ‘is upset’)
**þarf* ‘needs’ (<Proto-Indo-European **tetórpe* ‘enjoys’)
**daug* ‘be useful’ (<Proto-Indo-European **$d^{h}ed^{h}ówg^{h}e$* ‘is productive’)
**ar* ‘is’ (<Proto-Indo-European **$h_1eh_1óre$* ‘is there, has arrived’)
**kann* ‘recognizes, knows how’
**ann* ‘grants’
**mag* ‘can’
**skal* ‘owes’
**mōt* ‘is allowed to’
**lais* ‘knows’

Later in their development, the preterite-presents developed into modal auxiliaries, pruning the group of the 15 verbs mentioned in (33), so that non-modal verbs were increasingly dismissed from the group, or changed their meanings to become core modals (see Harbert 2007: 286; Plank 1984: 311–312). In English *need*, originally not part of the preterite-presents, took over the characteristic zero-ending for 3SG of the preterite-present morphology. In colloquial German, the same happened with *brauchen* (Gaeta 2010: 149). This shows that the group of preterite-presents were felt as a group, with modal meanings.

The above is certainly not an comprehensive overview of the exaptations of the *ŏ*-grade / zero-grade alternation in Germanic. In different varieties and in different verbs, other exaptive changes may occur. In some varieties of English the difference between *was* (with the reflex of Indo-European *ŏ*-grade) and *were*, for instance, originally a tense/number difference much in line with other strong verbs, was exaptively reanalysed as a polarity marker (Schilling-Estes and Wolfram 1994: 289; Van de Velde and Norde 2016: 23; Willis 2016: 213–215).

Summarising we can say that part of what was originally the Proto-Indo-European perfect morphology has undergone successive waves of exaptation. Its *ŏ*-grade was exapted into a marker of mental states and impersonal verbs, later exapted into a marker for modality. The *ŏ*-grade was also exapted into a singular number marker in the Proto-Germanic preterite. Later, in West-Germanic, there was an additional exaptation to mark the present of some class VII verbs, namely those with an /a/ in the present.

The use of the vowel gradation (*ŏ*-grade, realized as *ă* in Germanic) to signal singular number in the preterite may have been helped by the zero-ending for the inflection in 1/3SG in the preterite. Speakers of Germanic may have inferred from the verbal output-configurations they were confronted with, that the ablaut functioned as a portmanteau strategy for tense and number. In the absence of explicit morphological marking for 1/3SG, and with the difficulties of processing zero-affixes in output-oriented constructional schemata (see above), a reanalysis suggested itself so that the morphological residue in the form of vowel gradation that accompanied the person endings of the singular perfect (reconstructed as *-h_2*, *-th_2* and *-e* in Proto-Indo-European (Clackson 2007: 148), now took over the function of those endings. Construction Morphology's emphasis on the output-oriented nature of morphology explains why Germanic strengthened the association of the *ŏ*-grade both with tense and with number: in Proto-Indo-European the perfect was recognizable by (i) specific endings (*-h_2*, *-th_2* and *-e* for 1/2/3SG, a distinct set from the 'eventive' endings in the present and the aorist), (ii) the *ŏ*-grade/zero-grade for singular and plural, respectively, and (iii) reduplication. The endings were actually the most reliable markers, as neither the *ŏ*-grade nor the reduplication were exclusively associated with the perfect (see above). As soon as the specific endings were lost, and as reduplication remained a marginal strategy in Germanic preterites, strategy (ii) was beefed up. Indeed, Germanic strongly invested in ablaut (see also Mailhammer 2008: 281). A Germanic form like *baid* would then not have been analysed as an ablauting past with a zero 1/3SG ending, but would have refunctionalized the ablaut vowel *ă* as a portmanteau morpheme for PAST:1/3SG. I

have tried to render this refunctionalization in Construction Morphology formulas in (34) and (35), following the representation of ablaut in Booij (2010: 241), in adjusted form.[18]

(34) PROTO-INDO-EUROPEAN *$b^heb^hóyd^he$
$[b^h\text{-}e\text{-}yd^h]_{\text{V-Present}}$ ↔ [atelic TRUST] ≈ $[b^he\text{-}b^h\text{-}o\text{-}yd^h]_{\text{V-Perfect}}\text{-}e_i$ ↔ [state resulting of completed TRUST]-3SG_i

(35) PROTO-GERMANIC *$baid$
$[b\text{-}e\text{-}id]_{\text{V-Present}}$ ↔ [present WAIT] ≈ $[b\text{-}a\text{-}id]_{\text{V-Preterite}}$ ↔ [past-singular WAIT]

For the exaptation to the modal auxiliaries, the evolution could tentatively be formalized as in (36)–(38). Here the exaptation relied on the fact that the forms with the *ŏ*-grade had no preterite meaning. The semantic side of the output form like *wait* failed to be associated by language users with the constructional schema used in (35). Speakers of Germanic thus took recourse to another solution: they exapted the *ŏ*-grade by reanalysing it as a marker of psych/impersonal verbs, and later modal verbs. Though it seems like an infringement on the one-form-one-meaning isomorphism, the phenomenon that a morphological form means one thing in one construction and another in another construction is not uncommon. In German for instance, the *-er* can be an agent nominalizer (German *Arbeit-er* 'work-er') or can be a plural suffix (*Kind-er* 'children'). This underscores the reality of constructions in morphology. In a concatenative theory with separate morphemes, the meaning difference is harder to make sense of.

(36) PROTO-INDO-EUROPEAN *$\underset{\frown}{u}oid\text{-}h_2e$ 'know'.
$[\underset{\frown}{u}\text{-}e\text{-}id\text{-}]_{\text{V-Present}}$ ↔ [atelic SEE] ≈ $[\underset{\frown}{u}\text{-}o\text{-}id\text{-}]\text{-}h_2e_k$ ↔ [state resulting of completed process SEE]-1SG_k

(37) EARLY-PROTO-GERMANIC *$wait$
$[w\text{-}a\text{-}it]$ ↔ [singular present-of-psych/impersonal-SEM KNOW] ≈ $[w\text{-}Ø\text{-}it\text{-}]$ ↔ [plural present-of-psych/impersonal-SEM KNOW]

(38) LATE-PROTO-GERMANIC, COMMON-GERMANIC *$kann$
$[k\text{-}a\text{-}nn_i$ / $m\text{-}a\text{-}g_j$ / $\ldots_k]$ ↔ [singular present-of-modal CAN_i / MAY_j / $\ldots_k]$ ≈ $[k\text{-}Ø\text{-}nn_i$ / $m\text{-}Ø\text{-}g_j$ / $\ldots_k]$ ↔ [plural present-of-modal $\text{CAN}_i/\text{MAY}_j/\ldots_k$]

4 Conclusions

The last thirty years witnessed a boom in studies that showed that morphological change is more regular that what had been implicitly or explicitly been assumed since De Saussure, who in his *Cours de linguistique générale* expressed pessimism about coming up with regular tendencies in diachronic linguistics (see De Saussure

[18]The 'present' in Proto-Indo-European is best seen as atelic aspect (Bartolotta 2009).

1955: 131, 134). Grammaticalization theory (Lehmann 2002; Hopper and Traugott 2003; Narrog and Heine 2011 for overviews) has convincingly shown that morphological change does follow predictable pathways. This is clear from (i) the fact that the same pathways occur in unrelated languages (Heine and Kuteva 2002) and in different periods in time, and (ii) the fact that there is a massive (though not exclusive) tendency for unidirectionality. Despite this deep insight about regularity in morphological change, however, there is no escape in acknowledging that there are numerous changes that happen in a much more haphazard fashion. Unidirectionality may be flouted more often than early grammaticalization-enthusiasts realized (Norde 2009), and language change can proceed differently in related languages, in response to the structural environment (Fischer 2007). Analogy is a forceful factor in morphological change, but it is notoriously hard to predict where and when it will strike (Hock 2003). A concept that brings out the unpredictability and capriciousness of morphological change is exaptation (Lass 1990; Norde and Van de Velde 2016), a notion borrowed from evolutionary theory for the opportunistic refunctionalization of an existing, often obsolescent form for a new function that is not directly related to its former function. While it is not straightforward to come up with good criteria to determine whether a refunctionalization is 'opportunistic', and hence 'unexpected', there are a number of symptoms that are associated with it. One of these symptoms is that morphemes undergo exaptation much more rarely than grammaticalization, and as a consequence, a morpheme generally does not undergo successive waves of exaptation. In this article, I have undertaken to show that this is not necessarily the case. Exaptation is fairly wide-spread, and may target the same morphemes over and over. There is often a tangential relation between the old and the new function, but that does not mean it is an 'expected' case of grammaticalization. Indeed, what is often called 'secondary grammaticalization', the lateral shift from one grammatical function to another in an already grammaticalized morpheme, may often be more insightfully classified as exaptation, reserving the term grammaticalization for the transition from a fully lexical element to the morphosyntactic realm (see Von Mengden 2016 for a lengthy treatment of this proposal). To illustrate this, I have looked at two of the most prolific morphological patterns in Germanic, which are of Indo-European descent: one from the nominal domain (the stem-building *-n*-affix), and one from the verbal domain (the verbal *ŏ*-grade).

The motivation for exaptation is to be sought in the way morphology works: rather than concatenations of morphemes, language users are confronted with words that are sanctioned by one or more construction schemata (see Booij & Audring, this volume). Crucially, these construction schemata are output-oriented: morphemes are not independent carriers of meaning, but obtain their meaning by occurring in a paradigmatically related set of words. Language users may or may not see structure in those words, and associate certain recurring parts on the formal side with regularities on the semantic side. This is basically a process of abductive reasoning, as the words themselves do not necessarily converge on one possible structure, but may be motivated by multiple constructional schemata (Booij & Audring, this volume, and Van de Velde et al. 2013 for diachrony). Diachronically, this allows for morphological change, especially when under the influence of sound

change or of a break in the regular transmission of language over generations, an original motivation gets obscured. Say a word is licensed by a constructional schema consisting of three parts [X Y Z] ↔ [A B C]. If Z erodes under sound laws, the constructional schema can either change to [X Y Ø] ↔ [A B C], where meaning part C is now represented by a paradigmatic zero, but alternatively, the language user could abductively arrive at a new schema [X Y] ↔ [A B + C], with meaning B + C corresponding to a portmanteau morpheme Y. In another scenario, the meaning part of the original [X Y Z] ↔ [A B C] schema may bleach (e.g. by 'hyperanalysis', Croft 2000: 121–126), so that one of the formal elements now becomes morphological residue: [X Y Z] ↔ [A Ø C]. This offers opportunities for a new meaning creeping in, associated with the 'spandrel' Y (see Van de Velde and Norde 2016: 5, 7, 21, 26–27 for this term). This new meaning may come from the surrounding context, by way of 'pragmatic strengthening' (Hopper and Traugott 2003: 94) or 'hypoanalysis' (Croft 2000: 126–130), or may be a completely new category, for instance a category borrowed in language contact. Refunctionalization of obsolete or obsolescent morphology is called 'exaptation'. As pointed out in Van de Velde and Norde (2016), linguists have been somewhat hesitant to adopt the notion of exaptation for various reasons. One of the reasons is the disbelief in functionless morphology (see Vincent 1995: 435), and this disbelief is understandable if one operates with a traditional morphological theory that views morphemes as carriers of meaning. Construction Morphology, by contrast, has less of a problem with functionless morphology. Formal material may be part and parcel of a constructional schema. Semiotic pressures are likely to kick in, however, leading to new form-function mappings. As a result, exaptation appears to be more pervasive than linguists have been inclined to think.

References

Andersen, H. 1973. Abductive and deductive change. *Language* 49: 765–793.

Anthwal, N., L. Leena Joshi, and A.S. Tucker. 2013. Evolution of the mammalian middle ear and jaw: Adaptations and novel structures'. *Journal of Anatomy* 222: 147–160.

Bammesberger, A. 1992. The place of English in Germanic and Indo-European. In *The Cambridge history of the English language*, Volume I: The beginnings to 1066, ed. R.M. Hogg, 26–66. Cambridge: Cambridge University Press.

Bartolotta, A. 2009. Root lexical features and inflectional marking of tense in Proto-Indo-European. *Journal of Linguistics* 45: 505–532.

Beekes, R.S.P. 2011. *Comparative Indo-European linguistics: An introduction*. Amsterdam: John Benjamins.

Berteloot, A. 2005. "... eens wisen subtiils menschen ..." Over de verbuiging van het adjectief in het Middelnederlands. In *Gehugdic sis samnungun thinro. Liber amicorum Willy Pijnenburg*, ed. A. Quak and T. Schoonheim, 23–37. Groningen: Gopher Publishers.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2012. *De constructie van taal. Rede uitgesproken door Prof. dr. Geert Booij ter gelegenheid van zijn afscheid als hoogleraar op het gebied van morfologie en het lexicon aan de Universiteit Leiden op vrijdag 7 september 2012*. Leiden: Universiteit Leiden. https://openaccess.leidenuniv.nl/handle/1887/19754.

Braunmüller, K. 2008. Observations on the origins of definiteness in ancient Germanic. *Sprachwissenschaft* 33: 351–371.
Brugmann, K., and B. Delbrück. 1889. *Grundriss der vergleichenden Grammatik der Indogermanischen Sprachen. Zweiter Band*. Strassburg: Karl J. Trübner.
———. 1893. *Grundriss der vergleichenden Grammatik der Indogermanischen Sprachen. Dritter Band*. Strassburg: Karl J. Trübner.
Carlson, G.N. 1977. *Reference to kinds in English*. PhD thesis. Amherst: University of Massachusetts.
Clackson, J. 2007. *Indo-European linguistics. An introduction*. Cambridge: Cambridge University Press.
Conradie, J.C. 2017. The re-inflecting of Afrikaans. Paper presented at *A Germanic Sandwich 2017*. Münster, March 2017.
Corver, N. 2016. Emotion in the build of Dutch. Deviation, augmentation and duplication. *Tijdschrift voor Nederlandse Taal- en Letterkunde* 132: 232–275.
Croft, W. 2000. *Explaining language change: An evolutionary approach*. Harlow: Longman.
Davies, M. 2010. *The Corpus of Historical American English (COHA): 400 million words, 1810-2009*. Available online at https://corpus.byu.edu/coha/.
De Cuypere, L. 2005. Exploring exaptation in language change. *Folia Linguistica Historica* 26: 13–26.
De Saussure, F. 1955/1916. *Cours de linguistique générale. Publié par Charles Bally et Albert Sechehaye avec la collaboration de Albert Riedlinger*. 5th ed. Paris: Payot.
Fischer, O.C.M. 2000. The position of the adjective in Old English. In *Generative theory and corpus studies*, ed. R. Bermúdez-Otero, D. Denison, R.M. Hogg, and C.B. McCully, 153–181. Berlin: Mouton de Gruyter.
———. 2001. The position of the adjective in (Old) English from an iconic perspective. In *The motivated sign, Iconicity in language and literature,* ed. O. Fischer and M. Nänny, vol. 2, 249–276. Amsterdam: John Benjamins.
———. 2004. Developments in the category adjective from Old to Middle English. *Studies in Medieval English Language and Literature* 19: 1–36.
———. 2007. *Morphosyntactic change. Functional and formal perspectives*. Oxford: Oxford University Press.
Fortson, B.W., IV. 2010. *Indo-European language and culture. An introduction*. 2nd ed. Chichester: Wiley-Blackwell.
Gaeta, L. 2010. Analogical change. In *The Continuum companion to historical linguistics*, ed. S. Luraghi and V. Bubenik, 147–160. London: Continuum.
Gardani, F. 2016. Allogenous exaptation. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 227–260. Amsterdam: John Benjamins.
Gould, S.J. 1997. The exaptive excellence of spandrels as a term and prototype. *Proceedings of the National Academy of Sciences* 94: 10750–10755.
Grimm, J. 1967/1837. *Deutsche Grammatik IV*. Hildesheim: Georg Olms.
Harbert, W. 2007. *The Germanic languages*. Cambridge: Cambridge University Press.
Heine, B. 2003. On degrammaticalization. In *Historical linguistics 2001: selected papers from the 15th International Conference on Historical Linguistics, Melbourne, 13–17 August 2001*, ed. B.J. Blake and K. Burridge, 163–179. Amsterdam: John Benjamins.
Heine, B., and T. Kuteva. 2002. *World lexicon of grammaticalization*. Cambridge: Cambridge University Press.
Himmelmann, N.P. 2004. Lexicalization and grammaticization: Opposite or orthogonal? In *What makes grammaticalization? A look from its fringes and its components*, ed. W. Bisang, N.P. Himmelmann, and B. Wiemer, 21–42. Berlin: Mouton de Gruyter.
Hirt, H. 1927. *Indogermanische Grammatik. Teil III: das Nomen*. Heidelberg: Carl Winter.
Hock, H.H. 2003. Analogical change. In *The handbook of historical linguistics*, ed. B.D. Joseph and R.D. Janda, 441–460. Oxford: Blackwell.

Hopper, P.J. 1991. On some principles of grammaticalization. In *Approaches to grammaticalization, Volume I: Focus on theoretical and methodological issues*, ed. E.C. Traugott and B. Heine, 17–35. Amsterdam: John Benjamins.
Hopper, P.J., and E.C. Traugott. 2003. *Grammaticalization*. 2nd ed. Cambridge: Cambridge University Press.
Kluge, F. 1913. *Urgermanisch*. Strassburg: Trübner.
Kroonen, G. 2011. *The Proto-Germanic N-stems: A study in diachronic morphonology*. Amsterdam: Rodopi.
Kurzová, H. 1993. *From Indo-European to Latin: The evolution of a morphosyntactic type*. Amsterdam: John Benjamins.
Larson, G., Ph.A. Stephens, J.J. Tehrani, and R.H. Layton. 2013. Exaptating exaptation. *Trends in Ecology and Evolution* 28: 497–498.
Lass, R. 1990. How to do things with junk: Exaptation in language evolution. *Journal of Linguistics* 26: 79–102.
———. 1997. *Historical linguistics and language change*. Cambridge: Cambridge University Press.
———. 2017. Review of: M. Norde and F. Van de Velde (Eds.), *Exaptation and language change. Diachronica* 34: 117–126.
Lehmann, Ch. 2002. *Thoughts on grammaticalization*. 2nd ed. Erfurt: Arbeitspapiere des Seminars für Sprachwissenschaft der Universität Erfurt.
Mailhammer, R. 2008. Ablaut variation in the proto-Germanic noun: The long arm of the strong verbs. *Sprachwissenschaft* 33: 279–300.
Marynissen, A. 1996. *De flexie van het substantief in het 13de-eeuwse ambtelijke Middelnederlands. Een taalgeografische studie*. Leuven: Peeters.
Mitchell, B. 1985. *Old English syntax*. Vol. I. Oxford: Clarendon Press.
Narrog, H. 2016. Exaptation in Japanese and beyond. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 93–120. Amsterdam: John Benjamins.
Narrog, H., and B. Heine, eds. 2011. *The Oxford handbook of grammaticalization*. Oxford: Oxford University Press.
Norde, M. 2009. *Degrammaticalization*. Oxford: Oxford University Press.
Norde, M., and G. Trousdale. 2016. Exaptation from the perspective of construction morphology. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 163–195. Amsterdam: John Benjamins.
Norde, M., and F. Van de Velde, eds. 2016. *Exaptation and language change*. Amsterdam: John Benjamins.
Nübling, D. 2008. Was tun mit Flexionsklassen? Deklinationsklassen und ihr Wandel im Deutschen und seinen Dialekten. *Zeitschrift für Dialektologie und Linguistik* 75: 282–330.
Perridon, H. 2011. *Changing functions of PIE *(e)n in Germanic'*. Paper presented at the workshop on exaptation at the *20th International Conference on Historical Linguistics (ICHL)*, Osaka, 25–30 July 2011.
Petré, P. 2013. On the distribution and merger of *is* and *bið* in Old and Middle English. *Transactions of the Philological Society* 111: 301–325.
Philippa, M., F. Debrabandere, A. Quak, T. Schoonheim, and N. Van der Sijs. 2003-2009. *Etymologisch Woordenboek van het Nederlands*. Amsterdam: Amsterdam University Press.
Plank, F. 1984. The modals story retold. *Studies in Language* 8: 305–364.
Pokorny, J. 1959. *Indogermanisches Etymologisches Wörterbuch*. Bern: Francke Verlag.
Prokosch, E. 1939. *A comparative Germanic grammar*. Philadelphia: Linguistic society of America.
Pronk, T. 2015. Singulative *n*-stems in Indo-European. *Transactions of the Philological Society* 113: 327–348.
Ranheimsæter, H. 1945. *Flektierte und unflektierte Nominativformen im deutschen Adjektivsystem*. Oslo: Tanum.
Ringe, D. 2006. *From Proto-Indo-European to Proto-Germanic*. Oxford: Oxford University Press.

Schilling-Estes, N., and W. Wolfram. 1994. Convergent explanation and alternative regularization patterns: *were/weren't* levelling in a vernacular English variety. *Language Variation and Change* 6: 273–302.

Simon, H. 2010. 'Exaptation' in der Sprachwandeltheorie: eine Begriffspräzisierung. In *Prozesse sprachlicher Verstärkung: Typen formaler Resegmentierung und semantischer Remotivierung*, ed. R. Harnisch, 41–57. Berlin: Mouton de Gruyter.

Smith, J-Ch. 2011. Change and continuity in form-function relationships. In *The Cambridge history of the Romance languages*, ed. M. Maiden, J.-Ch. Smith, and A. Ledgeway, 268–317. Cambridge: Cambridge University Press.

Spamer, J.B. 1979. The development of the definite article in English: A case study of syntactic change. *Glossa* 13: 241–250.

Streitberg, Wilhelm. 1920. *Gotisches Elementarbuch*. 5/6 ed. Heidelberg: Carl Winter.

Traugott, E.C. 1992. Syntax. In *The Cambridge history of the English language*, Volume I: The beginnings to 1066, ed. R.M. Hogg, 168–289. Cambridge: Cambridge University Press.

———. 2004. Exaptation and grammaticalization. In *Linguistic studies based on corpora*, ed. M. Akimoto, 133–156. Tokyo: Hituzi Syobo.

Van Bree, C. 1987. *Historische grammatica van het Nederlands*. Dordrecht: Foris.

Van Coetsem, F. 1983. The development of the Germanic reduplicating class: Reanalysis and competition in morphological change. In *Language change*, ed. I. Rauch and G.F. Carr, 39–88. Bloomington: Indiana University Press.

———. 1990. *Ablaut and the reduplication in the Germanic verb*. Heidelberg: Carl Winter.

Van de Velde, F. 2006. Herhaalde exaptatie. Een diachrone analyse van de Germaanse adjectiefflexie. In *Nederlands tussen Duits en Engels*, ed. M. Hüning, A. Verhagen, U. Vogl, and T. van der Wouden, 47–69. Leiden: Stichting Neerlandistiek Leiden.

———. 2009. *De nominale constituent. Structuur en geschiedenis*. Leuven: Leuven University Press.

Van de Velde, F., and M. Norde. 2016. Exaptatation. Taking stock of a controversial notion in linguistics. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 1–35. Amsterdam: John Benjamins.

Van de Velde, F., and J. Van der Horst. 2013. Homoplasy in diachronic grammar. *Language Sciences* 36: 66–77.

Van de Velde, F., and F. Weerman. 2014. The resilient nature of adjectival inflection in Dutch. In *Adjectives in Germanic and Romance*, ed. P. Sleeman, F. Van de Velde, and H. Perridon, 113–145. Amsterdam: John Benjamins.

Van de Velde, F., H. De Smet, and L. Ghesquière. 2013. On multiple source constructions in language change. *Studies in Language* 37: 473–489.

Van de Velde, F., P. Sleeman, and H. Perridon. 2014. The adjective in Germanic and Romance: Development, differences and similarities. In *Adjectives in Germanic and Romance*, ed. P. Sleeman, F. Van de Velde, and H. Perridon, 1–32. Amsterdam: John Benjamins.

Van Loey, A. 1964. *Schönfelds historische grammatica van het Nederlands*. 7th ed. Zutphen: Thieme.

Van Marle, J. 1995. On the fate of adjectival declension in overseas Dutch (with some notes on the history of Dutch). In *Historical linguistics 1993: Papers from the 11th International Conference on Historical Linguistics, Los Angeles, 16–20 August 1993*, ed. H. Andersen, 283–294. Amsterdam: John Benjamins.

Van Wijk, N. 1929/1912. *Franck's etymologisch woordenbook der Nederlandsche taal*. 2nd ed. 's Gravenhage: Martinus Nijhoff.

Vincent, N. 1995. Exaptation and grammaticalization. In *Historical linguistics 1993: Papers from the 11th International Conference on Historical Linguistics, Los Angeles, 16-20 August 1993*, ed. H. Andersen, 433–445. Amsterdam: John Benjamins.

Von Mengden, F. 2016. Functional changes and (meta-)linguistic evolution. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 121–162. Amsterdam: John Benjamins.

Wall, A., Octavio de Toledo, and Á.S. Huerta. 2016. Exploring and recycling: Topichood and the evolution of Ibero-Romance articles. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 341–375. Amsterdam: John Benjamins.

Willis, D. 2010. Degrammaticalization and obsolescent morphology: Evidence from Slavonic. In *Grammaticalization: Current views and issues*, ed. E. Stathi, E. Gehweiler, and E. König, 151–178. Amsterdam: John Benjamins.

———. 2016. Exaptation and degrammaticalization within an acquisition-based model of abductive reanalysis. In *Exaptation and language change*, ed. M. Norde and F. Van de Velde, 197–225. Amsterdam: John Benjamins.

Wischer, I. 2010. Sekretion und Exaptation als Mechanismen in der Wortbildung und Grammatik. In *Prozesse sprachlicher Verstärkung: Typen formaler Resegmentierung und semantischer Remotivierung*, ed. R. Harnisch, 29–40. Berlin: Mouton de Gruyter.

Part V
Psycholinguistic Aspects

Learning Morphological Constructions

Vsevolod Kapatsinski

Abstract The great variability of morphological structure across languages makes it uncontroversial that morphology is learned. Yet, morphology presents formidable learning challenges, on par with those of syntax. This article takes a constructionist perspective in assuming that morphological constructions are a major outcome of the learning process. However, the existence of morphological paradigms in many languages suggests that they are often not the only outcome. The article reviews domain-general approaches to achieving this outcome. The primary focus is on mechanisms proposed within the associative/connectionist tradition, which are compared with Bayesian approaches. The issues discussed include the role of prediction and prediction error in learning, generative vs. discriminative learning models, directionality of associations, the roles of (unexpectedly) present vs. absent stimuli, general-to-specific vs. specific-to-general learning, and the roles of type and token frequency. In the process, the notion of a construction itself is shown to be more complicated that it first appears.

Keywords Learning · Morphology · Connectionism · Bayes · Type frequency · Token frequency · Contingency learning · Schema · Linguistic constructions · Morphological paradigms · Productivity

1 Introduction

Construction Grammar views language as a 'constructicon', a network of form-meaning mappings called 'constructions' (e.g. Booij 2010; Goldberg 1995, 2002). The central role assigned to form-meaning pairings in the grammar is the defining feature of the constructionist approach: if one does not believe in the importance of constructions, one can hardly call oneself a constructionist. Construction-

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ist approaches in this sense include several varieties of Construction Grammar (Fillmore et al. 1988; Goldberg 1995; Croft 2001; inter alia), Construction Morphology (Booij 2010), Cognitive Grammar (Langacker 1987; Nesset 2008) and Network Theory (Bybee 1985, 2001; Kapatsinski 2005, 2013). In morphology and phonology, a construction is also often called a "first-order" (Nesset 2008) or "product-oriented" (Bybee 1985, 2001) schema.

This article focuses on how constructions are learned, with a special focus on morphological constructions, those that construct words. These constructions are primarily responsible for morphological creativity, our ability to produce novel forms of known words, which allows us to go beyond retrieving memorized wordforms from long-term memory. Morphological constructions include traditional concatenative morphemes, as in (1). However, constructionist approaches to grammar eschew serial step-by-step, morpheme-by-morpheme derivations, relying on direct form-meaning mappings as much as possible (e.g. Booij 2010: 4–5). For this reason, morphological constructions can also include other forms that reliably co-occur with a meaning, such as phonaesthemes, in (2), and templates, in (3), even if they can be decomposed into smaller parts (cf. Booij 2010: 15–16; Goldberg 2006: 5). Morphological constructions vary in phonological and semantic specificity (Booij 2010: 10–13). For example, the construction in (1) can contain stems of any length, while that in (3) requires the stem to fit a bimoraic template. Nonetheless, there is something that all morphological constructions share: they are all mappings between a form and a meaning, the size of a word, with part of the word's form underspecified. The representations in (1)–(3) depart from

1.	[. . . z] ∼PLURAL.NOUN, as in *dogs* and *watches*	
2.	[*gl* . . .]∼LIGHT, as in *glow* and *glisten*	
3.	[μμtʃan]∼FEMININE.NICKNAME, in Japanese	(Poser 1990)

those in Booij (2010) is that they do not contain labeled internal constituents; e.g. there is no open slot in (1) labeled 'N(oun)'. As noted by Booij (2010: 2), the generalization that a plural construction like $[[\ldots]_{N}z]_{N}$ contains an open slot where nouns can be inserted comes from noticing a paradigmatic relationship between singular and plural constructions. Learning paradigmatic relationships is logically separate from learning form-meaning mappings and is treated below in Sect. 5. Because the notion of a slot depends on paradigmatic generalization, non-concatenative schemas that do not contain an open slot, such as the phonaestheme in (2), are included in the constructicon alongside more traditional constructions under the present approach. While it does not contain an open slot, a phonaestheme is still a form-meaning mapping; thus, a learning mechanism that searches for form-meaning mappings is likely to extract it from the linguistic input alongside the more traditional constructions in (1) and (3). Indeed, a major point of constructionist approaches to language is that the grammar contains product-oriented schemas

whose specified parts span morpheme boundaries (e.g. Booij 2010: 5; Bybee 2001: 126–129; Kapatsinski 2013; see also Baayen et al. 2011).

2 Mechanisms of Learning

The mechanisms that allow us to acquire morphology have been a focus of intense debate for the last 30 years. Here, I focus on those mechanisms compatible with a constructionist perspective on morphology, i.e. those that consider morphological constructions to be a primary outcome of learning. Not all theories of morphological learning meet this criterion (Booij 2010: 4–5, 258–259). For example, the models of Albright and Hayes' (2003), Becker and Gouskova (2016) and Taatgen and Anderson (2002) induce operations and contexts in which they apply rather than constructions. Analogical models can also be set up not to induce sublexical constructions (or generalizations over words) at all, instead relying on analogy to memorized holistic wordforms (e.g. the analogical model in Albright and Hayes 2003).

Before we proceed to controversies surrounding the learning mechanisms responsible for morphology acquisition, I would like to briefly outline what I mean by a learning mechanism. The literature on language acquisition has been dominated by the debate between proponents of domain-general and domain-specific learning mechanisms, and the intricate patterns of morphology have been described as posing insurmountable challenges to domain-general learning mechanisms (Clahsen 1999; Pinker and Prince 1988; but cf. Baayen et al. 2011; Dąbrowska 2004; Kapatsinski 2005; Ramscar and Yarlett 2007; Ramscar et al. 2013b, *inter alia* for counter-arguments). What then is a learning mechanism? In this article, I adopt the view of candidate learning mechanisms as alternative proposals regarding how specific experiences change the learner's knowledge, understood as the network of connections constituting the learner's mind/brain. At the most basic level, this knowledge is knowledge of statistical contingencies in the environment, including – crucially – the contingencies involving one's own actions. In the case of learning a language, the learner needs not only to learn the co-occurrence structure of one's linguistic environment but also to learn to reproduce it in service of his/her communicative goals.

At the broadest level, domain-general approaches to contingency learning can be divided into Bayesian and associationist ones. These approaches differ dramatically in their assumptions about the outcome of learning. According to the Bayesian approach, learners aim to infer the causal structure of the world, rather than mere knowledge of co-occurrences (see also Waldmann and Holyoak 1992). The Bayesian learner aims to build a **generative** model of the environment, in which events are associated with (possibly unobservable) causes that give rise to them. For example, whenever O'Donnell's (2015) Bayesian learner of morphology encounters a word, it tries to infer whether the speaker generated that form by retrieving it from memory, or by building it up from its component morphemes. Over time, the

learner updates the probabilities associated with individual words and their parts, with the aim of discovering which (kinds of) words should be built from their parts, and which should instead be retrieved from memory. Within the constructionist framework that does not draw such a sharp line between lexical retrieval and grammatical computation (Langacker 1987), one could think of the learner as trying to infer which construction(s) the speaker used to produce the word the learner has just encountered.

In contrast, **discriminative** models such as Baayen et al. (2011) aim to discover what parts of words most reliably predict various features of the words' meanings, without trying to recover the process by which the word was generated. Rather than reconstructing this process, the aim of the learner is to discover discriminative cues that can best serve to predict the meaning the speaker intends to express. For a discriminative learner, the ideal outcome of learning is a system that correctly predicts important events (**outcomes**) from **cues**, earlier, or more easily observable environmental events. Cues need not cause outcomes; they merely need to be useful for predicting them.

Another major class of associative models aims to discover associative structures that allow for effective cued retrieval of memories via pattern completion (Kahana 2002). These models are inspired by Hebb's (1949) proposal that "neurons that fire together wire together" and, for this reason, are often called **Hebbian** learning models. Unlike discriminative models, Hebbian models are non-directional: where a discriminative model aims to acquire cue➔outcome associations that allow one to predict outcomes (the consequential events one wishes to anticipate or infer) from cues, a Hebbian model aims to acquire associations in all possible directions, which would allow one to infer the whole network of associates when any single associate is perceived. A crucial prediction of Hebbian models is associative symmetry: the strength of an A➔B association should be predictable from the strength of the B➔A association. Associative symmetry is consistent with the notion of a construction as an undirected form-meaning pairing, a Saussurean sign, rather than a pair of links, form➔meaning and meaning➔form that can potentially differ in strength (cf. Ramscar et al. 2010). A number of studies of paired associate learning – an experimental paradigm in which participants are asked to memorize a list of word pairs like *eagle-beer* – have supported associative symmetry (Kahana 2002). However, associative symmetry seems to dissipate as a pair is repeatedly retrieved in a single direction (Caplan et al. 2014). Thus, one might expect that constructions one tends to produce but not hear or vice versa, are not true Saussurean signs.

An additional unique characteristic of Hebbian models is that these models are not **error-driven**. This distinguishes them from both Bayesian and discriminative models. Both generative Bayesian and discriminative models learn from prediction errors. The aim of a learner is to make correct predictions. When an error-driven learner makes a correct prediction, it has no evidence that its current beliefs are in error. There is therefore no reason for the learner to learn anything, changing its beliefs. In contrast, when its predictions are incorrect, the learner assigns blame for the error, punishing the associations that were rooting for the wrong predictions, and rewarding those that were rooting for the right one. In order to learn, the error-driven

learner must make prediction errors, failing to anticipate environmental events. In contrast, Hebbian learners simply increase the weight of an association between two stimuli whenever they occur together and decrease it when one occurs without the other. As a result, learning in a Hebbian model is independent of surprise: a given event changes the association weights constituting the network's beliefs equally whether or not its occurrence was anticipated by the learner.

A crucial prediction of discriminative error-driven models is cue competition; particularly, as exemplified by the blocking effect (Kamin 1969).[1] In a blocking experiment, the learner is trained in two stages. In the first stage, an outcome (say, electric shock) is predicted by one cue (say, a tone). In the second stage, the learner encounters a combination of cues (e.g. the tone from Stage I and a light) paired with the same outcome. Blocking is observed if the learner fails to associate the new cue introduced in Stage II with the outcome; in our example, failing to learn a light➔shock association, and therefore failing to learn to fear the light. A discriminative model predicts this result because, if the learner expects the cue on the basis of tone alone by the start of Stage II, they will not learn anything during Stage II.

When discriminative models are coupled with the notion of learned selective attention, the idea that we learn to attend to useful cues (e.g. Mackintosh 1975), an additional prediction follows. Namely, cues that are non-discriminative – that are present in the environment regardless of outcome – will be ignored. Evidence for this prediction in construction learning – specifically, word learning – is provided by Ramscar et al. (2013b). Ramscar and colleagues presented children and adults with a cross-situational learning task (Yu and Smith 2007, et seq), illustrated in Fig. 1. In this task, the learner encounters multiple objects on every trial so that the form-meaning mappings within that situation are ambiguous. It is then only by keeping track of form-meaning co-occurrences across trials that the learner is able to learn the system of form-meaning mappings. In Ramscar et al.'s experiment, one object, illustrated here by  , was present on every trial. Both children and adults associated *dax* with  and *pid* with , demonstrating cross-situational learning. However, adults also thought that *wug* meant but children did not, thinking instead that it should mean either or . Children learned to ignore the uninformative cue. The results for children are therefore consistent with discriminative models of learning such as Mackintosh (1975) and Rescorla and Wagner (1972).

In Fig. 1, the visual feature , is least useful to discriminate between daxes and pids, while all three visual features are equally **characteristic** of daxes and pids: they have equal within-category frequencies. However, it is also possible to set up a category structure in which the non-discriminative feature is more frequent than others *within* categories; e.g. most pids may be but most daxes may also be . In that design, a feature may be useful for discriminating pids from daxes and yet not characteristic of either pids or daxes. Such a feature is discriminative but not

[1] Bayesian models make a similar prediction, except that competition occurs between inferred causes rather than predictive cues.

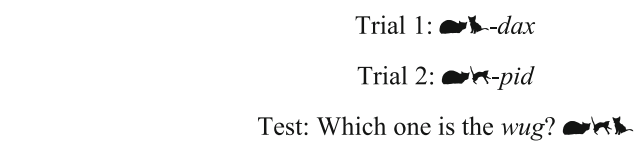

Fig. 1 Cross-situational word learning task in Ramscar et al. (2013a). The first two trials above were repeated during training. The third trial is the crucial test trial, which followed training

characteristic. Conversely, a feature may commonly occur in both pids and daxes, and would therefore be characteristic of both but not discriminative.

Whereas discriminative features are important for predicting whether one will encounter a dax or a pid, the characteristic features are ones that are most likely to be generated from sampling daxes or pids. Carvalho and Goldstone (2016) and Zaki et al. (2016) used eyetracking to directly examine which visual features of category examples the learners focus on as training progresses. Both teams found that the results crucially depend on trial order in the experiment. When one alternates between the categories, as in the Ramscar et al. (2013b) experiment, even adult participants eventually focus on the features that distinguish the categories.[2] When one instead presents examples of each category as a separate block of trials, the learner instead focuses on the features that are most characteristic of each category even if they are not discriminative. These results indicate that the statistics learners focus on critically depend on the temporal dynamics of the learning situation (see also Ramscar et al. 2010). While the learning-theoretic literature is currently dominated by the debate between discriminative associative and generative Bayesian models of learning, there are indications that the learning task may influence whether the learners (attempt to) build a generative or discriminative model of the environment (see also Hsu and Griffiths 2009, 2010).

In morphological construction learning, one can ask whether the defining features of a construction's form are those that are the best discriminative cues to the construction's meaning, or those that are most characteristic of the construction. The former can be operationalized as the probability of the meaning given the form relative to its probability in the absence of the form, $\Delta p = p(\text{meaning}|\text{form}) - p(\text{form}|\neg\text{meaning})$, while the latter corresponds to p(form|meaning); see Ellis (2006). Another way to frame this question is whether the strength of the entire construction depends on the extent to which it can serve as a reliable cue to the meaning for the listener. The results described above suggest that the answer to this question should depend on how exactly particular constructions are learned by individuals, an issue we return to below.

[2]This result suggests that the difference between child and adult learners in Ramscar et al. (2013b) may be quantitative rather than qualitative in nature: children may be habituated by repetition more quickly than adults are, and therefore shift attention away from repeated stimuli more quickly than an adult would.

Kamin's (1969) demonstration of blocking ushered in an era of discriminative dominance in learning theory, with Rescorla and Wagner (1972) quickly emerging as the dominant model of associative learning. However, blocking is not always observed with this design. Furthermore, absence of blocking in humans is particularly likely when the humans are engaged in a cognitively demanding secondary task (DeHower and Beckers 2003; Sternberg and McClelland 2009, Vadillo and Matute 2010). For this reason, it is perhaps more prudent to conclude that both Hebbian and error-driven mechanisms are involved in associative learning and that prediction-making or learning from prediction error can be inhibited by placing demands on the relevant areas of the brain. Indeed, neurocomputational work has suggested that the two mechanisms can also be localized to specific neural networks (particularly, the basal ganglia for error-driven learning vs. the hippocampal and cortical systems for Hebbian learning; Ashby et al. 2007; McClelland 2001; McClelland et al. 1995). From this perspective, it is unlikely that we will discover that learning is always discriminative or that it never is. Rather, we need to consider the goals the learner has and the temporal dynamics and processing demands of the learning situations she encounters, as well as the characteristics of the learner herself (e.g. age), to determine what is learned by particular kinds of learners from particular kinds of learning experiences. Acquisition of morphological constructions is an extended process that depends on many different kinds of learning experiences.

Most studies of construction learning have focused on perceptual experience at the expense of production, and theories of construction learning have likewise suggested that perceptual experience is all-important. Taatgen and Anderson (2002: 129) write, in criticism of prior network-based models of morphology learning, "When the child actually has to produce a past tense, the network is used without any learning, as there is no feedback to adjust its weights. This implies language production itself has no impact at all on performance, defying the general idea that practice is an important aspect of learning." The roles of production practice and the feedback one receives from the listener remain sadly underexplored in the empirical literature (cf. Weir 1962). For this reason, the review below will likewise focus on learning morphology from perceptual experience. However, I will attempt to point to areas where the picture is likely to change dramatically when learning from production is explored in greater detail.

I will begin this review with the issue of directionality of form-meaning mappings at the macro-level, examining whether learners pay attention both to the usefulness of a form in discriminating meanings and the probability of a form given a meaning. I will then proceed to examining learning at the micro-level: what is learned from an individual encounter with a form-meaning pairing. Finally, I will introduce another major type of mapping involved in morphology, a paradigmatic mapping between 'corresponding forms' before discussing the controversial issue of abstraction in construction learning. While this discussion will be largely associationist in nature, we will finish with an overview of areas where the associationist framework may prove insufficient.

3 Directionality

Learning constructions requires keeping track of form-meaning co-occurrences. Theories of construction learning vary in the kinds of statistics about form-meaning co-occurrence they presume learners to track. A principal question is whether the statistical relationships learners track are directional – and, if they are directional, then whether one direction dominates over the other in construction learning. For example, if one views constructions as *cues* to meaning for the listener, it is intuitive to consider the strength of a construction to depend on the probability of the meaning of the construction given its form; p(meaning|form) or Δp as defined above. Alternatively, a construction could be thought of as the way in which a meaning is typically (or at least frequently) expressed (e.g. Kapatsinski 2013). From this perspective, the strength of a construction should depend on the probability of the form given the meaning; p(form|meaning).

Importantly, these statistics do not always agree. My own research has focused on disentangling them using miniature artificial languages, which afford precise control over the statistical patterns of the grammar. In a recent experiment, I exposed human learners – adult native English speakers – to languages exhibiting a subtractive morphological pattern that deleted the final vowel. As illustrated in Table 1, the vowel deletion always produced plural forms of the shape CVCVC, with a particular consonant, [k], overattested in the final position (Kapatsinski 2017). After training, the participants were presented with shorter, CVCV singulars and asked to rate plurals featuring either addition of [k], *basi*➔*basik*, or deletion of the final vowel (*basi*➔*bas*). For example, participants would hear *bas* followed by *basik* and be asked "is this the right plural form for this singular?" As in training, each form was paired with a picture of the referent. Deleting the final vowel of a CVCV singular involves the same operation witnessed in training but results in an output that sounds nothing like the plural forms one has experienced. In contrast, adding a [k] produces a form that fits the plural schema but involves deriving the plural in a novel way. The ratings of [k] addition should therefore reflect the strength of the plural schema.

The experimental manipulation was whether participants were also presented with additional CVCVk forms, boosting the CVCVk schema. These additional forms were paired with either singular meanings, plural meanings or both, as illustrated in Table 2. Note that adding CVCVk forms paired with plural referents increases p(form|meaning): CVCVk becomes a more prevalent plural

Table 1 A subtractive morphological pattern presented to human participants by Kapatsinski (2017)

SG	PL
Baloki	Balok
Kiruko	Kiruk
Borena	Boren
Dalefu	Dalef
Farisa	Faris
Kalupa	Kalup

Table 2 Training stimuli added to the experimental languages, from Kapatsinski (2017)

SO language		Homophone language		PO language	
CVCVk in the wrong meaning		CVCVk in both meanings		CVCVk in the right meaning	
SG	PL	SG	PL	SG	PL
Korik	–	Korik	Korik	–	Korik
Malik	–	Malik	Malik	–	Malik
Menik	–	Menik	Menik	–	Menik
Penuk	–	Penuk	Penuk	–	Penuk
Pinek	–	Pinek	Pinek	–	Pinek
Selak	–	Selak	Selak	–	Selak
Stanok	–	Stanok	Stanok	–	Stanok

shape. Adding CVCVk forms paired with singular referents does not affect p(form|meaning): CVCVk is a typical plural shape whether or not it also co-occurs with other meanings. Therefore, if participants keep track only of p(form|meaning) or p(form,meaning), the PO Language in Table 2 should be identical to the Homophone Language, with both languages producing higher ratings of CVCVk plurals compared to the SO Language.

However, adding CVCVk forms paired with singular meanings *reduces* p(meaning|form): if CVCVk occurs in both the Singular and the Plural, it is no longer a good cue to plurality for the listener. If it occurs in the singular more than in the plural (as in the SO language), then CVCVk cues that the form is *not* plural. Therefore, ratings of CVCVk plurals should be higher in the PO Language than in the Homophone Language and lowest in the SO Language.

The results were consistent with lack of attention to p(meaning|form), the extent to which CVCVk helps discriminate between plural and singular: there was no hint of a difference between the PO Language and the Homophone Language. Furthermore, both languages had significantly higher ratings of CVCVk plurals than the SO Language, which did not differ significantly from the Baseline language that featured only the stimuli in Table 1. In both cases, lack of a significant difference is unlikely to be due to insufficient power, as Bayesian analyses suggested strong positive evidence in favor of the null.

Thus, ratings of CVCVk plural forms depended on the prevalence of CVCVk forms among plurals, but not on the prevalence of CVCVk outside of that paradigm cell (Fig. 2). These results are consistent with the notion of a first-order or product-oriented schema that is learned by generalizing over forms sharing a meaning, without regard to whether the typical features of these forms would be helpful for identifying the meaning to a listener.

It is tempting to conclude from these data that schema strength is always proportional to p(form|meaning) – or, perhaps, even simple frequency of the

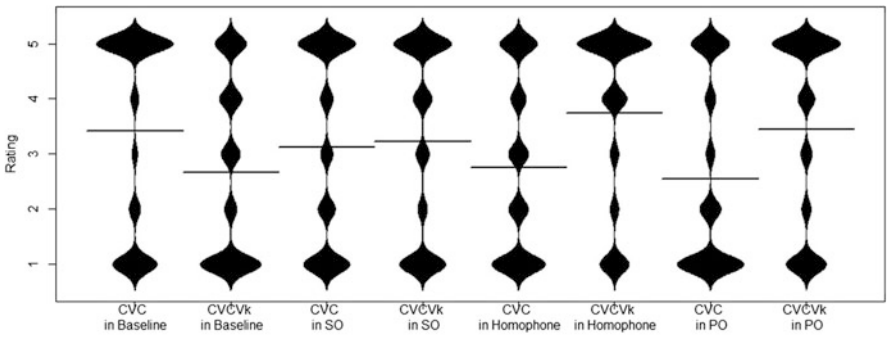

Fig. 2 Ratings of CVCV➔CVC vs. CVCV➔CVCVk after training on the baseline language (stimuli in Table 1) vs. the experimental languages (stimuli in Table 1 plus additional stimuli in Table 2). The ratings vary from "1" = "almost certainly NOT the right plural", ☹ to "5" = "almost certainly the right plural", ☺

form-meaning pairing[3] – and is unaffected by *p*(meaning|form) or Δp; Kapatsinski (2013). In other words, the speaker is insensitive to the ambiguity of the forms she produces. However, naturalistic language learning provides additional kinds of experiences that have not been explored experimentally, and that may give rise to such sensitivity. On every trial, the participants in Kapatsinski (2013, 2017) saw the picture of the referent 500 ms before the onset of the wordform. In this way, the meaning was available before the form, affording more opportunities to predict form from meaning than to predict meaning from form (Ramscar et al. 2010). This aspect of the design likely matches the typical perceptual experience of the natural language learner, in that parents usually name objects that their children are already looking at (Pereira et al. 2014). However, it may be important that children usually continue looking at a recently named object. This continued looking may allow for training form➔meaning connections, and result in sensitivity to p(meaning|form). In contrast, the experiment above –like other experiments on construction learning – may have disfavored updating of these statistics because the picture disappeared immediately after being named. After the form was presented, the meaning was no longer available.

An alternative source of sensitivity to ambiguity is feedback from the interlocutor. When one produces a form in a communicative situation, that production may either succeed or fail in communicating the intended meaning to the listener. If the listener indicates communication failure in response to a form one has

[3] p(form|meaning) = p(form,meaning)/p(meaning), where p(form,meaning) is frequency of the form-meaning mapping and p(meaning) is the sum of these frequencies across all forms sharing a meaning. Assuming that forms sharing a meaning compete with each other for selection, with the outcome of this competition determined by relative schema strength, schema strength could be proportional to either frequency of the schema or the conditional probability of form given meaning without any consequences for the outcome of the competition.

just produced, one may learn to avoid that form in the future. In fact, precisely this kind of adjustment in response to listener feedback is documented by Buz et al. (2016), Maniwa et al. (2009), Seyfarth et al. (2016), and Schertz (2013) in phonetics. Goldstein and Schwade (2010) have also argued that pre-linguistic vocalizations are shaped into speech by the same process of reinforcement learning. To the extent that ambiguity results in misunderstanding, reinforcement learning will result in context-sensitive avoidance of ambiguity; in other words, sensitivity to p(meaning|form). If this is true, then our experiments on morphology learning are missing a crucial ingredient for modeling morphology learning "in the wild" and the likely trajectories of language change (see also Kirby et al. 2008).

4 Presences and Absences

As noted earlier, construction learning can be thought of as learning the form-meaning contingencies of the linguistic environment. In the preceding section, we have focused on the contingencies one ends up learning over the course of the experiment. Here, we focus instead on what is learned from a single trial, experiencing a form paired with a meaning (or two).

In order to learn the form-meaning contingencies of one's language, one ought to strengthen associations between forms and meanings that co-occur, and to weaken associations between forms and meanings that do not co-occur. For example, consider the sequence of cross-situational learning trials shown in Fig. 3. On Trial 3, the learner knows of two forms and three meanings. One of these forms occurs together with two of the meanings.

In principle, given no strong beliefs about constraints on co-occurrence, Trial 3 provides evidence for increasing the strengths of associations between present forms and present meanings, *wug*-  and *wug*-  , and for decreasing the associations between present forms and absent meanings, *wug*-  . It also provides evidence against associations between absent forms and present meanings, *blig*-  and *blig*-  , and – finally – in favor of associations between absent forms and absent meanings, *blig*-. However, not all of these associations may in fact be updated on Trial 3, and those that are updated may not be updated to the same degree.[4] Note also that the same questions do not arise on Trial 1: at that point, the learner has

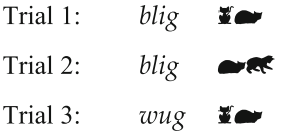

Fig. 3 An example of cross-situational word learning

[4]One may also consider updating *blig*- in the opposite, non-normative direction based on the fact that unused connections are pruned.

Table 3 The directions in which a veridical contingency learner would update connections between forms and meanings on Trial 3

			
Wug	+	+	−
Blig	−	−	+

not experienced any forms other than *blig*. He therefore has no reason to update any connections involving absent forms. Absent stimuli must be *unexpectedly* absent for the absence to make an impact on the learner's beliefs (e.g. Tassoni 1995).[5]

Prediction-based theories of associative learning make a distinction between cues and outcomes. Cues are used by the learner to predict outcomes. Because of this, they tend to precede the outcomes in time – though one might also use a cue that tends to follow a less easily detectable outcome to predict that the outcome must have occurred (e.g. symptoms of diseases; Arcediano et al. 2003, 2005). Depending on the within-trial temporal dynamics of the task, either forms or meanings can serve as cues in a cross-situational learning experiment (Ramscar et al. 2010). If forms precede meanings, forms will serve as cues, while meanings will serve as outcomes. If the order is reversed, the cue-outcome status will be reversed as well. Importantly, what remains the most influential theory of associative learning, the Rescorla-Wagner model (RW, Rescorla and Wagner 1972), updates associations of present cues but does not learn anything about absent cues: because outcomes are predicted but cues are not, cues are never *unexpectedly* absent. Thus, if forms are treated as cues to meanings, the RW model predicts that the learner will learn nothing about *blig*, the absent form, on Trial 3. If meanings are cues to forms, then the RW model will not learn anything about the absent meaning,  , on Trial 3.

Generalizations of the RW model proposed since the mid-1990s have relaxed the assumption that nothing is learned about absent cues (Tassoni 1995; van Hamme and Wasserman 1994). However, they have generally argued that presences are more salient than absences, and therefore that associations involving present stimuli (whether cues or outcomes) are updated more than the associations of absent ones. Empirical data for this proposal has been provided by Wasserman and colleagues (Wasserman et al. 1990, et seq). McKenzie and Mikkelsen (2007) provided a normative, Bayesian justification for absences having less of an effect on beliefs about contingencies: given that every stimulus is present less often than it is absent, absences are generally less unexpected than presences. As beliefs should only be changed when the learner encounters an unexpected event – i.e. an event that his beliefs led him not to expect – the absence of something generally shifts beliefs less than a present stimulus. The greater frequency of absences is also generally true of

[5]This point is traditionally emphasized by error-driven models of learning, where unexpected means predicted but not observed. This point may therefore appear to be inconsistent with the Hebbian approach taken to modeling the data below, which does not rely on prediction. However, even in the Hebbian framework, in order to notice the absence of something, one needs to have experienced it. Otherwise, there is no representation for the absent stimulus in the learner's mind.

construction learning: any given form is absent more often than it is present, and any given meaning is expressed in a minority of utterances.

In recent work, Zara Harmon and I have examined the role of presences and absences in morphological construction learning (Harmon and Kapatsinski 2017; Kapatsinski and Harmon 2017). In this work, we exposed participants to a miniature artificial language with four distinct suffixes vying for two meanings. Each unaffixed noun was paired with a picture of a single large creature. Nouns bearing the plural suffixes *dan* or *sil* were paired with pictures of multiple large creatures. In contrast, each noun bearing a diminutive suffix, *shoon* or *nem*, was paired with a picture of a single small creature. Crucially, one of the suffixes was far more common than the others, in both type and token frequency: it occurred with more nouns and was experienced more often. For half of the participants, it was the plural suffix *dan*; for the others, it was the diminutive suffix *nem*. After exposure to the language, each participant was tested using both a comprehension task and a production task, both of which crucially involved a novel meaning, diminutive plural (multiple small creatures). We observed an intriguing dissociation: in comprehension, participants were less likely to click on the novel meaning when they heard a noun bearing the frequent suffix. The frequent form entrenched to the meaning with which it was experienced (see also Xu and Tenenbaum, 2007). In production, however, the frequent suffix was the one participants were most likely to use to express the novel meaning (Harmon and Kapatsinski 2017; see also Naigles and Gelman 1995; Gershkoff-Stowe and Smith 1997). Thus, the suffix the participants were most likely to use to express the novel meaning was the suffix they were least likely to map onto the novel meaning in comprehension. The worst cue to the diminutive plural meaning was preferentially used to express it.

Interestingly, both of the frequency effects – entrenchment of frequent forms in the experienced meaning in comprehension and extension of frequent forms to novel meanings in production – can be obtained from the same simple associative learning model (Kapatsinski and Harmon 2017). Let us assume that, in our experiment, forms are outcomes predicted by semantic cues extracted from the pictures. This is a sensible assumption because the onset of each form followed the onset of the corresponding picture by 500 ms. Let us further assume that comprehension is accomplished by using the meaning➔form connections in reverse, with the weight of the form➔meaning connection transferred from the corresponding form➔meaning connection. This assumption is admittedly controversial. However, some such mechanism is needed for knowledge acquired from experience in which meanings precede and therefore cue forms to be used for comprehension – which involves using a form as a cue to meaning.

Through simple Hebbian learning, frequent forms wire with the semantic features of their co-occurring referents more than infrequent forms do. Note that the novel meaning (diminutive plural) shares features with the experienced meanings (plural non-diminutive and diminutive singular). The frequent form will therefore be evoked by the novel meaning more than the infrequent forms: when *nem*∼[SINGULAR; DIMINUTIVE] is frequent, the diminutive feature of the diminutive plural meaning will evoke *nem* more than the plural feature will evoke

dan or *sil*. Therefore, frequent forms are expected to be preferentially produced to express the novel meaning. Speaking diachronically, frequent forms are expected to be extended to novel uses (see also Bybee 2003; Zipf 1949), resulting in the well-documented synchronic correlation between frequency and polysemy (Piantadosi et al. 2012; Zipf 1949).

Mapping a form onto the novel meaning in comprehension involves ignoring the fact that one of the novel meaning's features does not match the previously encountered features of the form's referents. For example, when *nem*∼[SINGULAR;+DIMINUTIVE] is frequent, *nem* strongly wires with SINGULAR, which distinguishes the familiar meaning from the novel meaning. As a result, *nem* activates the familiar meaning (diminutive singular) much more strongly than it activates the novel meaning (diminutive plural), preventing participants from mapping it onto the novel meaning in comprehension. When *nem* is infrequent, the difference in activations between meanings is smaller, and the novel meaning is a plausible contender. Thus, as one encounters *nem* with diminutive singular referents, one becomes less and less likely to map it onto a diminutive plural referent (Xu and Tenenbaum 2007). With increasing frequency, what starts out as a simple diminutive form is restricted to singular diminutives in comprehension – even as it becomes increasingly likely to be used to express all kinds of diminutives in production.

Importantly, the production-comprehension dissociation is obtained in a bidirectional model that uses the same set of connections for both production and comprehension. However, interestingly, the predictions for both production and comprehension hold only as long as connections involving absent stimuli are updated less than those that involve present ones (Kapatsinski and Harmon 2017).

Harmon and Kapatsinski (2017) also show that the synonyms of frequent forms are pushed out of the shared meaning. For example, when the plural suffix *dan* is frequent, the other plural suffix, *sil*, is seldom mapped onto the plural non-diminutive meaning in comprehension. Instead, it is mapped onto the novel diminutive plural meaning. This result suggests the existence of semantic push chains, where a frequently used construction can push other constructions out of the area of semantic space it occupies (Aronoff 2016). Kapatsinski (2017, Chap. 6) shows that accounting for this effect in an associative framework requires updating connections involving absent cues. In this case – because in our experiment meanings preceded forms in training – absent cues are absent meanings. If connections involving absent meanings are updated, then the more often a meaning occurs, the more it is dissociated from forms that do not co-occur with it on those occasions. Thus, the more often the plural non-diminutive meaning occurs together with *dan*, the more it is dissociated from *sil*. The novel diminutive plural meaning differs from the experienced meaning of *sil* in the value of the diminutive feature. As [PL;-DIM]∼*dan* exposures accumulate, *sil* becomes worse and worse at evoking -DIM, and as a result becomes more and more eligible to be mapped onto diminutive plural.

A possible example of this kind of push chain in natural language is presented by Torres Cacoullos and Walker (2009) who show that in Quebec English *will* is disfavored by 2nd person subjects, which favor *going to*, and favored by 1st person

subjects. This is a dramatic change from the time when *will*'s principal competitor was *shall*, favored by 1st person subjects. As *going to* was extended to future uses, *will* was pushed out of 2nd person contexts that used to favor it. Competition between forms for areas of semantic space may also be crucial for learning a large vocabulary with the speed of a human child (Landauer and Dumais 1997; McMurray et al. 2012): if words compete for semantic space, then learning the meaning of one word constrains the meanings of other words. In this way, learning the meaning of a word one encounters automatically produces knowledge about the meanings of other, unencountered words whose meanings one has not quite nailed down yet. Finally, a similar mechanism (statistical pre-emption) may account for retreat from overgeneralization in language acquisition. In particular, Boyd and Goldberg (2011) have argued that learners can acquire the knowledge that a-Adjectives like *alive* cannot occur pre-nominally (**Pass me the alive cat*) from encountering another construction serving the same function, the relative clause (*Pass me the cat that is alive*). It may be that encountering the relative clause construction in the context of *alive* leads one to disassociate *alive* and the adjective phrase construction.

In recent years, research on studying syntactic construction learning has focused on the roles of pre-emption vs. entrenchment in retreat from overgeneralization (e.g. Ambridge et al. 2008, 2012; Boyd and Goldberg 2011). According to entrenchment theory, frequently encountering a form with a particular meaning leads one to infer that the form is restricted to that meaning. According to pre-emption theory, encountering a meaning expressed by a particular form prevents other forms from associating with the same meaning. The discussion above suggests that pre-emption and entrenchment need not be considered distinct and incompatible mechanisms, alternative explanations for retreat from overgeneralization. Instead, both pre-emption and entrenchment effects can emerge from a single associative learning mechanism. Furthermore, both pre-emption and entrenchment are largely comprehension-side effects, which are in conflict with the tendency to extend frequent forms to novel meanings in production. Yet, this tendency to extend frequent forms in production can also fall out from the same associative learning mechanism – indeed the same set of bidirectional form-meaning connections – that gives rise to entrenchment and pre-emption in comprehension.

5 Paradigmatic Mappings

Construction grammarians vary in whether they think that constructions are all there is to grammar. For example, to Hilpert (2008: 9), "knowledge of grammar **is** knowledge of constructions." Similarly, Croft (2001: 46) claims that "the grammatical knowledge of a speaker is knowledge of constructions (as form-meaning pairings), lexical items (also as form-meaning pairings), and the mapping between lexical items and the constructions they fit in . . . " In contrast, Goldberg (2002: 349) explicitly leaves a role for "paraphrase relations" between near-synonymous

constructions, which Cappelle (2006) has called allostructions, e.g. *I gave her a book* vs. *I gave a book to her*. Paraphrase relations between constructions can be thought of as paradigmatic mappings such as [NP_i V NP_j NP_k]∼[NP_i V NP_k *to* NP_j] that allow one – when need arises – to transform one construction into the other.

However, arguably, the need seldom arises in syntax (Goldberg 2002): instead of accessing a form and then generating another form from it, one could simply output the accessed form. How often does a speaker formulate a sentence using one of the near-synonymous constructions first and then, unsatisfied, transform it into the other? Usually, there is little cost to producing the allostruction accessed first. Furthermore, rejecting it and producing the other allostruction may not require transforming the accessed allostruction using a paradigmatic mapping. Instead, top-down inhibition of the selected allostruction could allow the shared meaning to activate its competitor without any need for paradigmatic mappings. The same mechanism could also be posited for selection of allophones or allomorphs, with the contextually inappropriate allo-forms inhibited by the context and/or the contextually appropriate ones activated. Again, no paradigmatic mappings are necessarily needed.

A similar problem faces proposals that antonyms like *deep* and *shallow* are linked by paradigmatic mappings (Ervin 1961; Jones et al. 2007; Murphy 2006): it is difficult to imagine situations in which such mappings would be used. Suppose one accesses *shallow* while trying to express the meaning DEEP but recovers from this error, producing *deep*. As in other cases we have discussed, the inappropriate accessed form can be simply suppressed so that *deep*, a stronger associate of the to-be-expressed semantics, wins the competition for production. There is no need for a paradigmatic *deep*➔*shallow* association.

This leaves only one place in grammar where paradigmatic mappings are in fact needed and frequently used, and that is morphology. Morphology requires paradigmatic mappings whenever the shape of the to-be-produced form depends on what other forms of the same word are like. For example, in Russian a noun that ends in a non-palatalized consonant in the Nominative Singular case like *kot* 'tomcat' forms its Genitive Plural by the addition of *–ov#*, thus *kot∼kotov*. On the other hand, a noun that ends in *-a* in the Nominative Singular loses that *–a* in the Genitive Plural, sometimes gaining or losing a vowel inside the stem, thus *koʃka* '(female) cat' becomes *koʃek*. This system is easily captured by paradigmatic associations, where $C_i\#_{Nom.Sg}\sim C_i ov\#_{Gen.Pl}$ and $C_i a\#_{Nom.Sg}\sim C_i\#_{Gen.Pl}$. However, it cannot be captured by form-meaning associations alone. There are two distinct Genitive Plural schemas, with the choice determined by characteristics of another, paradigmatically related form. In addition, the fact that the same consonants can occur at the ends of stems in both Masculine and Feminine Genitives precludes a syntagmatic account of schema choice in the Genitive Plural.

The Russian Genitive is not an isolated case, a strange aberration on the face of morphology. For example, Łubowicz (2007) reports that in Polish the Locative is marked by either *-e* or *-u*, and that *-e* triggers palatalization. However, palatalized

Nominatives take *-u* rather than *-e*. In this case, it is impossible to correctly select *-e* vs. *-u* without knowing what the Nominative ends in: in the Locative, both suffixes are preceded by the same consonants.

There is substantial individual variability in the extent to which paradigmatic associations are learned, even by native speakers. In particular, Dąbrowska (2012) shows that productivity of paradigmatic mappings forming the Polish inflectional system is quite variable among adult native Polish speakers. Paradigmatic associations may not in fact be possessed by most speakers of most languages. Nonetheless, at least some speakers of some languages do acquire them as part of learning morphology, and acquisition of paradigmatic mappings can be observed in laboratory experiments, though with some difficulty (Braine et al. 1990; Brooks et al. 1993; Frigo and McDonald 1998; Williams, 2003). How is this task accomplished?

Ervin (1961) and McNeill (1963, 1966) have suggested that paradigmatic mappings pose a challenge to associationist learning theory. The paradigms they focused on were paradigms of antonyms, the relations between *deep* and *shallow*, *big* and *little*, *large* and *small*. Antonyms were found to be frequently produced in free association tests, especially by adults. For example, in response to *shallow* a child might say *pool* – which often follows *shallow* – while an adult would be more likely to say *deep*. McNeill writes:

> [I]t is assumed that one factor critical to the formation of associative bonds [between words] is the experience of words in contiguity. Thus, frequent responses [in the free association test] are words that have frequently been placed into contiguity with their stimuli. [. . . However, antonyms and other words from the same grammatical class] rarely appear together in sentences. They have a relation to one another different from co-occurrence. Words of the same grammatical class share privileges of occurrence, which means that they replace one another in speech. We might say *the hole is too deep*, or *the hole is too shallow* but we never say *the hole is too deep and shallow*. Thus the opportunity for learning paradigmatic responses seems to be absent under ordinary circumstances of speaking or listening to speech. (McNeill 1966: 548–549)

Of course, it is not true that words from the same part of speech rarely appear together in sentences and antonyms are even more likely to co-occur than unrelated words from the same form class. We do in fact often say things like *the hole is neither too deep nor too shallow* or *both deep and shallow holes can be dangerous to the unwary traveler.* It is now clear that associations between antonymous adjectives can be explained by syntagmatic co-occurrence (Fellbaum 1996; Jones et al. 2007; Justeson and Katz 1991) due to the existence of a set of specialized syntactic constructions that utilize pairs of antonyms to emphasize or downplay contrast (Murphy 2006).

Interestingly, adjectives appear to form mini-paradigms of canonical antonyms. According to Jones et al. (2007), these mini-paradigms are mappings between schemas or constructions, i.e. what Nesset (2008) has called second-order schemas:

> An antonym pair is said to be canonical if the two words are associated by 'convention' as well as by semantic relatedness, for example, private/public. In other words, canonical antonym pairings have been learnt as pairings of lexical units (i.e., pairings of form-sense combinations), not just derived by semantic rules (i.e., sense-sense pairings). (Jones et al. 2007: 131)

Speakers of a language seem to have intuitions about which pairs of antonyms 'belong together'. For example, Justeson and Katz (1991) note that speakers of English intuit that *big* belongs with *little* while *small* belongs with *large*. However, Jones et al. (2007) show that canonical antonyms co-occur more often than non-canonical antonyms. Thus seemingly paradigmatic associations between antonyms can be acquired from syntagmatic co-occurrence. May this also be true of the truly paradigmatic mappings of morphology?

One indication to this effect is provided by work in computational linguistics: computational models that seek to identify sets of words sharing a stem are found to benefit from paying attention to co-occurrence (Baroni et al. 2002; Xu and Croft 1998). Morphologically related words are far more likely to co-occur within a limited window of text than any other word pairs. It may well be the case that learning paradigmatic mappings requires the learner to experience the words she needs to associate and generalize over in close temporal proximity. At the very least, the opportunities for learning paradigmatic mappings syntagmatically appear to be there in natural language input.

Recently, Amy Smolek and I have explored the importance of temporal proximity experimentally. Our work has focused on exposing human learners to miniature artificial languages featuring a stem change, velar palatalization, triggered by a plural suffix (Smolek and Kapatsinski in preparation). These languages feature two kinds of paradigmatic mappings, faithful and unfaithful. The faithful mappings involve two wordforms that share the stem allomorph (e.g. *blut-bluta*), while the unfaithful mappings feature a stem change (e.g. *bluk*∼*blutʃa*). In a recent experiment, we have focused on whether faithful and unfaithful mappings benefit from the exemplifying wordform pairs being presented as such, with the members of a pair being temporally adjacent and in a fixed base➔derived order (Smolek and Kapatsinski in preparation). For example, some participants would experience the stimuli in a ChangeObvious order: … zut_{SG} $\boldsymbol{blaik_{\text{SG}}}$ $\boldsymbol{blaitʃa_{\text{PL}}}$ $blupa_{\text{PL}}$ $zuta_{\text{PL}}$ $blup_{\text{SG}}$ …, others would experience them in a NoChangeObvious order: … $blaik_{\text{SG}}$ $\boldsymbol{zut_{\text{SG}}}$ $\boldsymbol{zuta_{\text{PL}}}$ $blaitʃa_{\text{PL}}$ $\boldsymbol{blup_{\text{SG}}}$ $\boldsymbol{blupa_{\text{PL}}}$ … while control participants experienced either an entirely random word order (NeitherObvious) or experienced all singular-plural pairs presented as such (BothObvious).

Theories of grammar differ in their predictions regarding the benefits of adjacency for faithful and unfaithful mappings. Whereas Construction Morphology emphasizes that both require generalization over word pairs (Booij 2010: 2; Chap. 10), other constructionist theorists have proposed that unfaithful mappings may arise from adherence to generalizations made over individual, unpaired wordforms (Bybee 2001: 126–129; Kapatsinski 2013). Product-oriented schemas generalize over forms belonging to a single cell of a morphological paradigm, e.g. "plurals tend to end in [tʃ]" and may demand changes to the stem. Such changes would then be carried out under pressure from trying to produce a form that has the features that are characteristic of plurals (like adding a [k] to a CVCV singular in Sect. 3). Because product-oriented schemas are generalizations over forms that belong to a single paradigm cell, they should not benefit from temporal adjacency between wordforms belonging to different paradigm cells. If *all* unfaithful mappings can be

attributed to such schemas, placing corresponding singulars and plurals next to each other should not help them.[6] In contrast, if at least some such mappings are due to paradigmatic generalizations over pairs of related words, such $k_{SG} \leftrightarrow t\int_{PL}$, then we may expect them to benefit from the words in a pair being presented next to each other.

For their part, faithful mappings have often been proposed to be the default, e.g. Hayes (2004), McCarthy (1998). Under this hypothesis, there is no need to learn not to change the stem; this is something one knows innately. Therefore, faithful mappings should not benefit from making it obvious that the stem has not changed by placing words sharing the stem next to each other.

Our results suggest that temporal adjacency of corresponding wordforms helps both faithful and unfaithful mappings. Participants in the ChangeObvious conditions palatalized consonants more than participants in all other conditions. Crucially, they palatalized both the right consonants and the wrong ones. It is only by making NoChange obvious in the BothObvious condition that palatalization rates of the wrong consonants could be decreased. Both faithful and unfaithful mappings benefitted from adjacency. This suggests that both are acquired – at least in part – by noticing relationships between and generalizing over pairs of corresponding words, a result that is consistent with Construction Morphology.

6 Abstraction vs. Specification

In contrast to the generative view of grammar acquisition as setting a small number of parameters (Chomsky 1981), usage-based approaches to language have emphasized the need to acquire a large number of fairly specific constructions like the *way* construction exemplified by *I verbed my way up the slope* and have hypothesized that acquisition involves memorizing specific utterances followed by gradual generalization, eventually culminating in abstract constructions like Subject-Verb-Object (Tomasello 2003; see also Braine 1963). This **item-based** approach thus posits a specific-to-general order of acquisition. The initial state consists of a few mappings between specific forms and meanings. This idea is supported by findings that, in any given context, inexperienced learners produce a smaller variety of forms than more experienced learners do (see Ambridge and Lieven 2011, for a review).

On the other hand, connectionist models of language have proposed a largely general-to-specific acquisition order, starting from a state where every form-meaning mapping is possible and gradually pruning the mappings not supported by experience, narrowing down both the class of forms mapping onto a meaning and

[6]Instead, unfaithful mappings might benefit from encountering the outputs of such mappings as a block at an early point during the experiment (a la Carvalho and Goldstone 2016), when the learner's impression of what plural forms are like is still easily malleable.

the class of meanings mapping onto a form (e.g. McMurray et al. 2012; Rogers and McClelland 2004; see also Kapatsinski 2013). Since connectionist models conceive of the mind as being much like the brain, this proposal is motivated primarily by the finding that learning in the brain tends to involve more pruning of unused or error-generating synaptic connections than strengthening of ones that are frequently used or help prevent error (see Baayen et al. 2011; McMurray et al. 2012).

In the older associative learning literature from which the connectionist tradition arises, the idea of a general-to-specific acquisition order goes all the way back to the foundational work of Pavlov (1927), who noticed that a conditioned response is initially triggered by many different stimuli, with the range of stimuli gradually narrowing with further experience. Pavlov (1927) proposed a functional explanation for this finding: in predicting a biologically significant event like food or electric shock, one better be safe than sorry. If one detects anything resembling a cue to shock or food, one better react to it. In contrast, stimuli ought to trigger specific behavioral responses. For example, though both electric shock and nausea are aversive unconditional stimuli, they trigger different preparatory responses, which are themselves quite specific. Functionally, if a behavior has worked to avoid or diminish shock, one is best off practicing and automatizing that specific behavior, rather than thinking that a broad range of behaviors would serve just as well. Similarly, if a form has worked to communicate a meaning in the past, one is best off reusing that form to express a meaning if that meaning that is at all similar (see Naigles and Gelman 1995) rather than attempting to produce a less familiar form that one may not have seen work in the past and finds difficult to plan and execute. For this reason, production may involve selection of specific forms one has practiced, but conditioning of that specific sequence of motor movements may grow in sophistication over time.

Researchers within the constructionist approach to morphology have argued that paradigmatic mappings are associations between constructions, second-order schemas (Kapatsinski 2013; Nesset 2008). This perspective is supported by Köpcke and Wecker (2017), who observed that inexperienced learners of German map all sorts of singulars onto *–en* while more experienced learners are much more selective about the kinds of singulars that correspond to *–en* plurals. These data can be interpreted as indicating that the *-en* plural construction is developed first and only later associated with specific singular constructions. However, the general-to-specific acquisition order suggests an alternative explanation. When producing plurals, *-en* is an outcome that, for an adult, is conditioned by both meaning to be expressed and other forms of the same word. For a young child, the form may simply not be conditioned on as many things. If form-meaning associations are – on average – easier to learn than paradigmatic associations (a conjecture supported by a wealth of evidence reviewed above, then plural formation will start out conditioned primarily by the plural meaning and slowly acquire paradigmatic conditioning

7 Type and Token Frequency

Constructions vary in productivity: some are readily extended to apply to new items, while others are restricted to the items that one has witnessed exemplifying them. How does one decide to extend a construction to a new item?

Undoubtedly, the major correlate of productivity is type frequency: other things being equal, constructions that apply to many distinct items are extended to new items more readily than those that apply to only a small set (Bybee 2001). However, there is disagreement regarding the source of the effect. Why does type frequency increase productivity?

Associative models consider type frequency to be a correlate of the real culprit, the diversity of contexts that are associated with the construction (Hare et al. 1995). Any new context is likely to share features with some of the experienced contexts. The more diverse the set of contexts in which a construction has been observed, the more likely a new context is to share features with one or more of the contexts that trigger the use of the construction. Furthermore, the more diverse the set of examples of a construction, the more abstract that construction will be. Experimentally, Suttle and Goldberg (2011) have shown that extending a syntactic construction to a novel verb is more acceptable when the construction has been encountered with verbs of many different semantic classes, even when type frequency is controlled. Similar results have also been observed with visual category learning, where broader categories are extended more readily than narrower ones, even when extension involves going beyond the range of experienced examples (Cohen et al. 2001).

Some support for an independent effect of diversity also comes from the fact that the histories of languages are full of examples of a new construction overtaking other, initially more type-frequent constructions. The English past tense suffix *-ed* is a classic example. In such cases, the new construction must initially have lower type frequency but higher productivity than the older constructions it eventually surpasses, indicating that productivity is not fully determined by type frequency. The German plural *-s* has been argued to be a synchronic example of a highly productive construction of low type frequency (a 'minority default', Clahsen 1999; Boudelaa and Gaskell 2002; though cf. Köpcke 1998). The existence of such cases suggests that productivity is not fully determined by type frequency, though it may not be solely determined by diversity either. In particular, a new construction may be more productive than established constructions precisely because it is new, either because of a general preference for novelty, because it is better suited to new words coming into the language, or because it tends to be exemplified by infrequent, recently borrowed words.

When a construction is low in type frequency, it is unlikely to be extracted from the few types that exemplify it at all (Bybee 2001; Gómez 2002; Madlener 2016). For example, Gómez (2002) has shown that discontinuous constructions like a__b are more likely to be extracted and extended to new intervening items when a large number of distinct items occurs in the open slot. However, there may be reasons for parsing out a construction despite low type frequency; for example, the *cran-* of

cranberry, a long word-initial string that is concatenated with a morpheme that does have high type frequency may be parsed out despite occurring in only one word. In other words, type frequency may be particularly important for constructions that would not be parsed out otherwise (see also Gómez 2002). Easily parsable constructions may show productivity despite low type frequency. It may therefore not be an accident that the minority defaults proposed in the literature have all been more phonologically transparent than their competitors.

While the effects of type frequency and diversity are relatively well-established, there is no agreement regarding the effect of Increasing the token frequency of the construction without increasing its type frequency. For example, Albright and Hayes (2003), in their study of extending English past tense patterns to new words, were unable to detect any influence of single-form analogy, even for neighbors of frequent forms like *take*. Perfors et al. (2014), in a training study, were also unable to find any effect of token frequency.

Within usage-based linguistics, Bybee (2001) has claimed that high token frequency may cause a morphological construction to become restricted to the set of words in which it has (frequently) occurred. She reasons that a word can either be accessed directly, or through its parts (see also Baayen et al. 1997). On the occasions it is accessed directly, the smaller constructions contained within it are not accessed. Therefore, on average, a construction exemplified by frequent words will be less productive than one exemplified by rare words, as a lot of the tokens of the former construction will not be recognized as such. Note, however, that this claim is in fact consistent with the idea that *increasing* the token frequency of a construction without increasing its type frequency does nothing. Suppose that a construction is exemplified by a word whose frequency is rising. At some point, the construction stops being parsed out of the word (if it even was parsed out of it at the beginning). From that point on, additional increases in frequency will provide no further support to the construction but neither will they decrease its productivity.

According to other theories, increases in token frequency may reduce productivity. For example, according to Baayen (1992), productivity can be seen as the likelihood of encountering a novel instance of the construction in question, quantified as the proportion of the construction's tokens constituted by hapax legomena (types that one has encountered only once). From this perspective, productivity can be reduced by increasing the token frequency of a construction without increasing its type frequency because any increase in token frequency of previously encountered types reduces the proportion of hapax legomena among the construction's tokens and lowers the learner's estimated likelihood of encountering novel instances of the construction. When one does encounter a novel instance of the construction, it is therefore more surprising and less acceptable. While Baayen does not specify how the estimate of productivity is used in generating novel instances of the construction, i.e. extending the construction to new uses, one might propose that the speaker would hesitate in extending an unproductive construction to new uses because he estimates the result to be unacceptable to the listener.

O'Donnell (2015) likewise predicts that increases in token frequency can reduce productivity. To him, productive constructions are exemplified by words whose probabilities are equal to the product of the probabilities of the constructions from which they are assembled. These are the words that the learner estimates to be derived by productively combining constructions. Increasing the token frequency of a word beyond this number makes it more likely that the word will be considered to be one that the speaker retrieves from the lexicon as a whole, reducing the support it provides for the constructions it exemplifies.

This idea is closely related to the relative frequency proposal of Hay (2001, 2003). Hay builds on the idea that morphological constructions will not be parsed out of frequent words and argues that the relevant frequency measure is *relative* frequency of that word relative to its parts. If one assumes that the word and its parts race for recognition, then the word will win the race more often if it is frequent and if its parts are not. For example, while the two words *swiftly* and *softly* have similar token frequencies, *softly* is more likely to be decomposed than *swiftly* because *soft* is more frequent than *swift*. Therefore, *softly* provides more support to *-ly* than *swift* does. Hay does find that suffixes exemplified by words with high relative frequencies are less productive than those exemplified by words with low relative frequencies, controlling for absolute token frequency.

Finally, analogical models suggest that token frequency should increase productivity. Nosofsky (1988) has shown that colored chips, were more likely to be placed in a category when they were similar to a frequently encountered exemplar of that category. Building on this work, Barðdal (2008) has argued that a morphological pattern can be extended to new words either by analogy, which involves retrieval of individual examples of the construction to serve as analogical models, or by using a schema, which involves parsing the construction out of the forms that exemplify it. Analogical extension may benefit from high token frequency of analogical models, though the evidence for analogical extension in morphology is scant. For example, Albright and Hayes (2003) find that their participants are not particularly likely to produce irregular past tense forms for novel verbs that are very similar to a highly frequent irregular. If we accept Barðdal's framework, then the paucity of positive effects of token frequency suggests that morphological patterns are usually extended to new words by application of sublexical constructions.

Following the seminal study by Goldberg et al. (2004), empirical work on construction learning has focused on the way token frequency is distributed over the types exemplifying a construction. Goldberg et al. (2004) noticed that the within-construction distributions of token frequencies are highly skewed (Zipfian) in natural languages, with the bulk of the examples of a construction attributable to one particular type but many types exemplified by only one token each. They argued that this skewed distribution is optimal for learning a construction. The high-frequency type serves as the prototypical use of the construction, providing the learner with a foothold on its meaning. The low-frequency types maintain the construction's productivity. In an innovative study manipulating the input of second language learners in the classroom, Madlener (2016) showed that experiencing

a range of examples (high type frequency) is indeed important for learning a productive construction, and that this is especially so when one of the examples is much more frequent than others.

Whereas Goldberg et al. (2004) have argued that the Zipfian distribution is optimal for learning the construction's semantics, an alternative interpretation of their results is that the dominance of a single exemplar leads to entrenchment. Compared to a more uniform distribution where all examples occur with similar frequencies, the skewed distribution restricts the construction to the range of uses experienced. Such a restriction can be beneficial, in that it prevents generalization from becoming overgeneralization as a construction is extended beyond the range of legitimate uses, but it is not a general improvement in learning the semantics of the construction. Goldberg et al. (2004) exposed participants to a novel 'appearance' construction that was exemplified by five verbs. They manipulated the token frequency distribution over verbs. In one condition the construction was exemplified by a single verb half the time. In the other, the examples were more evenly distributed across verbs. Participants were tested on a comprehension task, choosing between a scene of appearance and some other related scene (e.g. a flower appearing out of the ground vs. growing taller). Participants who experienced a more skewed token frequency distribution were more accurate at restricting their choices to the meaning of appearance. Within the context of this experiment, this result can be seen as indicating better learning of the construction in the skewed condition. However, a more general interpretation is that the decreased variability of that condition causes the construction's range of uses to narrow, whether or not this narrowing is beneficial. Madlener's (2016) study provides support for this interpretation, by showing that the Zipfian distribution exemplified by too few types can prevent the construction from being productive.

Where does this leave us? While there is clear evidence for diversity and type frequency effects, more work needs to be done to examine the conditions under which high token frequency hurts and helps a construction. At least two avenues of exploration suggest themselves.

First, the effects of token frequency may differ in production, comprehension and judgment tasks. As shown by Harmon and Kapatsinski (2017), a frequently used construction may be extended to new contexts because of its high accessibility, despite high frequency leading to entrenchment in comprehension. Harmon and Kapatsinski (2017) further show that semantic extension is not due to a *preference* for frequent forms but rather to their high accessibility. When participants are asked to choose between the frequent form and infrequent form, so both forms are made available, participants are equally likely to choose either form to express the novel meaning. When they need to produce the form to express this same meaning, they go for the frequent form because the other form is relatively inaccessible. While the frequent forms in the Harmon & Kapatsinski study had both high type and token frequency, accessibility is known to be strongly affected by token frequency (Oldfield and Wingfield 1965). Therefore, token frequency may well increase the

productivity of a construction in production while leading to entrenchment in comprehension tasks, such as those examined by Goldberg et al. (2004).

Second, the distinction between type and token frequency is less clear than it appears. From a statistical inference perspective, a new type may be taken to provide evidence regarding the productivity of a construction and its range of uses because it is an independent observation of the construction, whereas tokens of the same type may not be (Perfors et al. 2014). Every new type one encounters provides evidence that the construction is productive, that it can generate novel examples. This suggests that the same construction exemplified by the same set of examples can vary in productivity depending on whether those examples are treated as distinct types or different tokens of the same type. For example, Xu and Tenenbaum (2007) have shown that children restrict a form (*fep*) to the meaning of Dalmatian if they encounter *fep* paired with three different Dalmatians. In contrast, token frequency had no effect: presenting the same Dalmatian three times led to the same pattern of extending *fep* to all dogs as presenting it once (see also Perfors et al. 2014). At first glance, this is rather surprising. If identical tokens of the same Dalmatian are understood as being independent samples from the population of feps, they may be expected to contribute independently to the learner's estimate of the extent of this population. When many draws from a population of feps draw the same fep, one can infer that there are no other feps. The lack of token frequency effects on entrenchment in this experiment may thus have to do with the participants' assumptions about why the stimulus is repeated. When repetition of a token is explained by factors other than the productivity of a construction, it provides no information about construction productivity, in the same way that wet grass provides no information about whether it just rained if it can be attributed to the sprinklers being on (Kruschke 2006; see also Boyd and Goldberg 2011). The sprinklers "explain away" the wet grass. In Xu and Tenenbaum's (2007) experiment, the children may have explained away the additional presentations of *fep* paired with the same exact Dalmatian by inferring that the adult repeats the same exact thing to make sure they remember it. Changing the child's beliefs about why they are repeatedly shown the same form-meaning pairing may then make tokens into distinct types.

In addition, learners may often be unable to tell whether two tokens are of different types. For example, if the token of one type is not remembered in full detail by the time the token of another type is encountered, the learner may be quite uncertain that they belong to distinct types. This is a common situation when the learner encounters a large number of novel types while learning the construction, especially if examples of all types are randomly intermixed. As a result, token frequency may well behave like type frequency in such situations, with each example treated as an independent sample. In contrast, when one is presented with several instances of one type in a row, it is very clear that they are all the same. With such presentations (e.g. Xu and Tenenbaum 2007), it is quite likely that token frequency will have no effect – either because additional tokens of a type are ignored as a result of habituation or because they are not taken to be independent samples

from the population of the construction's instances. As in other areas of construction learning, it is worth paying attention to the tasks the learner faces, both as they learn the construction and as they use it.

8 Beyond Constructions?

Constructions are **bidirectional** form-meaning mappings. For example, Booij (2010: 5) explicitly equates them with Saussurean signs and represents the mappings involved using single bidirectional arrows. Any challenge to bidirectionality is therefore a challenge to constructions defined in this way. One possible challenge – the dissociation between frequency effects in production and comprehension – has already been considered in detail above (Sect. 3) and found to not be so challenging after all (see also Kapatsinski, forthcoming, for other examples).

However, a greater challenge is presented by Ramscar et al.'s (2010) finding that the temporal dynamics of learning episodes can be arranged so that the learner updates the form➔meaning associations without updating the corresponding meaning➔form associations. These findings do suggest that the form➔meaning connections are not literally the same connections as the meaning➔form ones. The strongest bidirectionality claim one can therefore make is that form➔meaning connections tend to be equal to the corresponding meaning➔form connections in strength (associative symmetry; Asch and Ebenholtz 1962).

This weaker notion of bidirectionality may be upheld despite the results of Ramscar et al. (2010) if the learning episodes of real-world language acquisition allow for updating both form➔meaning and meaning➔form connections, and the learner strives to do so. A plausible learning scenario is as follows. When a learner perceives A followed by B, the learner forms the A➔B association as the stimuli are coming in. Having perceived B, the learner endeavors to form a B➔A association. Under normal circumstances, for a proficient learner in a domain like language that calls for bidirectionality,[7] this effort is likely to succeed. For example, Pereira et al. (2014) show that word learning episodes in first language acquisition tend to involve the child looking at the referent both before and after perceiving the name. Overloading the learner's mind may prevent bidirectional connection updating (Ramscar et al. 2010) but it is not clear that such overloading is characteristic of construction learning outside of the experimental context.

[7]With respect to form-meaning mappings, language calls for bidirectionality because a listener who encounters a form and links it to a meaning wishes to be able to reproduce what she just heard when expressing the same meaning. Similarly, when acquiring a morphological paradigm, one wishes to be able to fill in any form in a paradigm given any other form (Ackerman and Malouf 2013). Unfortunately, we know very little about directionality in paradigm learning (though see Jun and Albright 2017, for first steps in addressing this question).

If one does accept the ubiquity of symmetrical form←→meaning connections that is posited by constructionist approach to language, one may still wonder if constructions are all there is to grammar (Croft 2001; Goldberg 2002; Hilpert 2008). We have already noted that paradigmatic mappings appear to be necessary for capturing morphology in languages that possess multiple inflectional classes (see also Booij 2010; Nesset 2008). Strictly speaking, these mappings expand the grammar beyond constructions understood as form-meaning mappings. In addition, the data on subtraction reported above suggest the need for at least one operation (see Kapatsinski (forthcoming) for the full details). While many participants showed evidence of acquiring a CVCVk construction, many did not, deleting final vowels across the board in production, even when this would result in a CVC form unlike any they have experienced in training. In other words, across-the-board subtraction was found to be learnable from a short perceptual experience (see also Horwood 2001; Kurisu 2001; for natural-language examples). Across-the-board subtraction cannot be learned by making generalizations about the forms that occupy various paradigm cells and then linking those generalizations together (Nesset 2008): no matter how much one learns about plural forms on their own, one will not learn to prefer CVC over CVCVC. Generalizing subtraction from CVCVCV singulars to CVCV singulars therefore requires learning an operation, deletion of the final vowel. In Kapatsinski (2013, forthcoming) I argue that learning deletion is actually learning that certain aspects of the base (here, the final segment) should not be copied into the production plan one constructs when generating a novel form of a known word. Under this account, constructions and paradigmatic mappings are in competition with generalizations about what activated memory representations should and should not be copied into the production plan.

9 Beyond Associations?

While the discussion above has been framed in an associationist framework, associationism is not the only approach to learning theory. At present, the major alternative approach is Bayesian statistical inference. Because Bayesian models build a model of the world, they are sensitive to characteristics of and assumptions about the sampling process that generates the training trials. For example, in the cross-situational learning experiment illustrated in Fig. 3, the learner is presented with two pictures and one word on every trial. As a result, the correct referent of the word is present whenever the word is presented but the name of a referent is often absent when the referent is present. A Bayesian learner would acquire a generative model of the sampling process that generates two pictures and a word on every trial. This model would then lead the learner to treat the absence of a word from a particular trial as being less informative than the absence of a picture: the p_{form},$a_{picture}$ probabilities will suffer more than the a_{form},$p_{picture}$ ones. This prediction does not directly follow from associative approaches to learning where the salience of present and absent stimuli need not be determined by informativeness (McKenzie

and Mikkelsen 2007). Another important prediction of Bayesian models is that instructions matter, as manipulating the instructions can change the learners' beliefs about the causal structure of the world. For example, Waldmann (2000) has argued that exposure to the same set of cue-outcome contingencies gives rise to different beliefs depending on whether the cues (in his case, various substances in the blood of patients) are treated as causes or consequences of outcomes (diseases); though cf. Arcediano et al. (2003). These predictions await testing for morphological learning.

Nonetheless, it is clear that inference is not all there is to learning. For example, Bayesian inference necessarily predicts that, unless one can explain away the repetitions, repeatedly encountering a form being used in a certain way would lead one to infer that the form cannot be used in any other way (Regier and Gahl 2004; Xu and Tenenbaum 2007). Harmon and Kapatsinski's (2017) data discussed above show that high frequency of a form-meaning mapping does lead to entrenchment in comprehension but it leads the speaker to extend the form to new uses in production. An analogy may help understand why. The more you spend time reading books, the more confident you become that they are for reading and not for, say, swatting flies. Yet, the more time you spend reading rather than swatting flies, the more accessible books become relative to the flyswatter. For an avid reader, the books are close at hand, ready to be used, but the flyswatter might be hanging far away on a distant wall. Therefore, when such a person needs to swat a fly, they are likely to reach for a nearby book rather than to wander off in search of a flyswatter, despite never having seen books used for this purpose, and knowing full well that this is not what they are for. If one succeeds in squashing a fly with a book, and nothing terrible happens – the book is undamaged, and one is not kicked out of the library – one is likely to re-use the book for this purpose. In this way, accessible tools can be extended to novel uses precisely because they are highly accessible (Zipf 1949), not because they have been inferred to be usable in this way. Kapatsinski and Harmon (2017) show that, unlike Bayesian learning, bidirectional associative learning can account for this process. In our model, forms become more and more accessible in the context of meanings that are like those with which they have been paired in the learner's experience. At the same time, familiar meanings become more and more accessible in the context of forms that have been repeatedly paired with them. Entrenchment in comprehension peacefully coexists with extension of frequent forms to new uses in production. The processes of reinforcement learning can then either lead the user to avoid using a frequent tool for the new purpose – if the book is damaged by flyswatting or miscommunication results from extending a construction to a new meaning – or to reinforce the new tool-task association (see Kapatsinski (forthcoming), for a review of other examples of non-Bayesian learning).

10 Conclusion

Constructionist approaches to language have emphasized that the grammar, like the lexicon, is a system for conveying meaning. Because of this, much of our grammatical knowledge is knowledge of form-meaning mappings, which are called constructions. Like lexical knowledge, this knowledge is learned from experience. In this chapter, I surveyed the possible learning mechanisms for acquiring form-meaning mappings, associationist and Bayesian, and discussed the major differences between them. I have argued that learning constructions is based on both perceptual experience and production experience, though most of the empirical data on construction learning addresses learning in perception. Furthermore, most of the data are based on perceptual experiences with a specific temporal structure, where the meaning is available before the form. In associative learning terms, meanings have tended to be cues and forms – outcomes. Addressing these limitations of the research conducted to date is a major direction for future experimental studies of construction learning.

Despite its limitations, the research to date has already yielded a wealth of information about construction learning from perceptual data. In particular, this research has suggested that observing a form paired with a meaning, with the meaning available before the form is perceived, leads one to increase the strength of the meaning➔form association involving the present form and the present meaning. Importantly, this association can then be used in reverse to extract meaning when the form is perceived: even if acquired directionally, linguistic knowledge must be used bidirectionally. Somewhat paradoxically, bidirectional learning can lead to interesting dissociations between the effects of construction frequency in production and perception. In production, frequent forms are extended to new meanings (semantic extension), while in comprehension, they are restricted to the meanings with which they have been experienced (entrenchment).

An experience with a form-meaning mapping does not merely increment the frequency of that construction. It also leads one to reduce the weights of the associations involving the presented meaning and other, unexpectedly absent forms, though not as much. Associations involving absent meanings (i.e. absent cues) may also be updated, but far less easily. As suggested by Tassoni (1995) within the associative learning literature, present stimuli are more salient than absent ones, and absent outcomes are more salient than absent cues.

While constructions are an important and indispensable part of grammar, morphology often demands additional generalizations. These include paradigmatic mappings and conditioned operations. Paradigmatic mappings appear to pose a learning challenge because the to-be-associated form units do not intuitively appear to occur in temporal proximity, though this intuition is likely to be incorrect.

Producing a new form of a known word involves constructing a new production plan that is filled in by elements of form. These formal elements can be described as outcomes, conditioned by formal features of other forms and the semantic features of the meaning one wishes to express. Learning the full system then

involves gradual acquisition of the conditioning. From this perspective, acquisition proceeds in a general-to-specific direction. While the outcomes may be as specific as they will ever be from the very beginning, they are triggered by an ever more specific range of cues. At the beginning, forms are used across a wide range of contexts and gradually restricted to the target range of uses. Every form-meaning mapping is initially acceptable, with some losing acceptability as others are repeatedly experienced. Conditioning by other, related forms grows more slowly than conditioning by meaning. As a result, early grammar looks more product-oriented, more construction-based than later grammar, in which paradigmatic mappings play a larger role. However, this may not be a qualitative change in the grammar, but rather simply a side-effect of increasing specificity of conditioning.

I believe that the associative framework outlined above is a fruitful way to approach acquisition of morphology. However, Bayesian learning theory suggests that this framework is not without its limitations, e.g. lack of a direct representation of uncertainty regarding the strength of a particular association. My personal hope is that Bayesian insights are incorporated into a theory of learning that incorporates inferential processes but does not reduce learning to inference. Morphology is a particularly rich field – or perhaps a particularly tangled forest – in which to search for this holy grail.

References

Ackerman, F., and R. Malouf. 2013. Morphological organization: The low conditional entropy conjecture. *Language* 89 (3): 429–464.

Albright, A., and B. Hayes. 2003. Rules vs. analogy in English past tenses: A computational/experimental study. *Cognition* 90 (2): 119–161.

Ambridge, B., and E.V. Lieven. 2011. *Child language acquisition: Contrasting theoretical approaches*. Cambridge: Cambridge University Press.

Ambridge, B., J.M. Pine, C.F. Rowland, and C.R. Young. 2008. The effect of verb semantic class and verb frequency (entrenchment) on children's and adults' graded judgments of argument-structure overgeneralisation errors. *Cognition* 106 (1): 87–129.

Ambridge, B., J.M. Pine, C.F. Rowland, and F. Chang. 2012. The roles of verb semantics, entrenchment and morphophonology in the retreat from dative argument structure overgeneralization errors. *Language* 88 (1): 45–81.

Arcediano, F., M. Escobar, and R.R. Miller. 2003. Temporal integration and temporal backward associations in human and nonhuman subjects. *Animal Learning & Behavior* 31 (3): 242–256.

———. 2005. Bidirectional associations in humans and rats. *Journal of Experimental Psychology: Animal Behavior Processes* 31 (3): 301–318.

Asch, S.E., and S.M. Ebenholtz. 1962. The principle of associative symmetry. *Proceedings of the American Philosophical Society* 106 (2): 135–163.

Aronoff, M. 2016. Competition and the lexicon. In *Livelli di Analisi e fenomeni di interfaccia. Atti del XLVII Congresso Internazionale della Società di Linguistica Italiana*, ed. A. Elia, C. Iacobini, and M. Voghera, 39–52. Roma: Bulzoni Editore.

Ashby, F.G., J.M. Ennis, and B.J. Spiering. 2007. A neurobiological theory of automaticity in perceptual categorization. *Psychological Review* 114: 632–656.

Baayen, R.H. 1992. Quantitative aspects of morphological productivity. In *Yearbook of morphology 1991*, ed. G. Booij and J. van Marle, 109–149. Dordrecht: Kluwer.

Baayen, R.H., T. Dijkstra, and R. Schreuder. 1997. Singulars and plurals in Dutch: Evidence for a parallel dual-route model. *Journal of Memory and Language* 37 (1): 94–117.

Baayen, R.H., P. Milin, D.F. Đurđević, P. Hendrix, and M. Marelli. 2011. An amorphous model for morphological processing in visual comprehension based on naive discriminative learning. *Psychological Review* 118 (3): 438–481.

Barðdal, J. 2008. *Productivity: Evidence from case and argument structure in Icelandic*. Amsterdam: John Benjamins.

Baroni, M., J. Matiasek, and H. Trost. 2002. Unsupervised discovery of morphologically related words based on orthographic and semantic similarity. In *Proceedings of the workshop on Morphological and Phonological Learning of ACL/SIGPHON-2002*, 48–57. Philadelphia.

Becker, M., and M. Gouskova. 2016. Source-oriented generalizations as grammar inference in Russian vowel deletion. *Linguistic Inquiry* 47 (3): 391–425.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

Boudelaa, S., and M.G. Gaskell. 2002. A re-examination of the default system for Arabic plurals. *Language & Cognitive Processes* 17 (3): 321–343.

Boyd, J.K., and A.E. Goldberg. 2011. Learning what not to say: The role of statistical preemption and categorization in a-adjective production. *Language* 87 (1): 55–83.

Braine, M.D. 1963. The ontogeny of English phrase structure. *Language* 39: 1–14.

Braine, M.D., R.E. Brody, P.J. Brooks, V. Sudhalter, J.A. Ross, L. Catalano, and S.M. Fisch. 1990. Exploring language acquisition in children with a miniature artificial language: Effects of item and pattern frequency, arbitrary subclasses, and correction. *Journal of Memory & Language* 29 (5): 591–610.

Brooks, P.J., M.D.S. Braine, L. Catalano, R.E. Brody, and V. Sudhalter. 1993. Acquisition of gender-like noun subclasses in an artificial language: The contribution of phonological markers to learning. *Journal of Memory & Language* 32: 79–95.

Buz, E., M.K. Tanenhaus, and T.F. Jaeger. 2016. Dynamically adapted context-specific hyper-articulation: Feedback from interlocutors affects speakers' subsequent pronunciations. *Journal of Memory and Language* 89: 68–86.

Bybee, J. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam: John Benjamins.

———. 2001. *Phonology and language use*. Cambridge: Cambridge University Press.

———. 2003. Cognitive processes in grammaticalization. In *The new psychology of language*, ed. M. Tomasello, vol. 2, 145–167. Mahwah: Lawrence Erlbaum.

Caplan, Jeremy B., Kathy L. Boulton, and Christina L. Gagné. 2014. Associative asymmetry of compound words. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 40: 1163–1171.

Cappelle, B. 2006. Particle placement and the case for "allostructions". *Constructions* SV1(7): 1–28.

Carvalho, P.F., and R.L. Goldstone. 2016. *The encoding of characteristic and diagnostic properties during interleaved and blocked category learning*. Paper presented at the 57th annual meeting of the Psychonomic Society, Boston, MA, November 17–20.

Chomsky, N. 1981. Principles and parameters in syntactic theory. In *Explanation in linguistics: The logical problem of language acquisition*, ed. N. Hornstein and D. Lightfoot, 32–75. London: Longman.

Clahsen, H. 1999. Lexical entries and rules of language: A multidisciplinary study of German inflection. *Behavioral and Brain Sciences* 22 (6): 991–1013.

Cohen, A.L., R.M. Nosofsky, and S.R. Zaki. 2001. Category variability, exemplar similarity, and perceptual classification. *Memory & Cognition* 29 (8): 1165–1175.

Croft, W. 2001. *Radical construction grammar: Syntactic theory in typological perspective*. Oxford: Oxford University Press.

Dąbrowska, E. 2004. *Language, mind and brain: Some psychological and neurological constraints on theories of grammar*. Edinburgh: Edinburgh University Press.

———. 2012. Different speakers, different grammars: Individual differences in native language attainment. *Linguistic Approaches to Bilingualism* 2 (3): 219–253.

De Houwer, J., and T. Beckers. 2003. Secondary task difficulty modulates forward blocking in human contingency learning. *Quarterly Journal of Experimental Psychology* 56B (4): 345–357.

Ellis, N.C. 2006. Language acquisition as rational contingency learning. *Applied Linguistics* 27 (1): 1–24.

Ervin, S.M. 1961. Changes with age in the verbal determinants of word-association. *American Journal of Psychology* 74: 361–372.

Fellbaum, C. 1996. Co-occurrence and antonymy. *International Journal of Lexicography* 8 (4): 281–303.

Fillmore, C.J., P. Kay, and M.C. O'Connor. 1988. Regularity and idiomaticity in grammatical constructions: The case of let alone. *Language* 64 (3): 501–538.

Frigo, L., and J.L. McDonald. 1998. Properties of phonological markers that affect the acquisition of gender-like subclasses. *Journal of Memory and Language* 39 (2): 218–245.

Gershkoff-Stowe, L., and L.B. Smith. 1997. A curvilinear trend in naming errors as a function of early vocabulary growth. *Cognitive Psychology* 34 (1): 37–71.

Goldberg, A.E. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: Chicago University Press.

———. 2002. Surface generalizations: An alternative to alternations. *Cognitive Linguistics* 13 (4): 327–356.

———. 2006. *Constructions at work: The nature of generalization in language*. Oxford: Oxford University Press.

Goldberg, A.E., D.M. Casenhiser, and N. Sethuraman. 2004. Learning argument structure generalizations. *Cognitive Linguistics* 15: 289–316.

Goldstein, M.H., and J.A. Schwade. 2010. From birds to words: Perception of structure in social interactions guides vocal development and language learning. In *The Oxford handbook of developmental behavioral neuroscience*, ed. M.S. Blumberg, J.H. Freeman, and S.R. Robinson, 708–729. Oxford: Oxford University Press.

Gómez, R.L. 2002. Variability and detection of invariant structure. *Psychological Science* 13 (5): 431–436.

Hare, M., J.L. Elman, and K.G. Daugherty. 1995. Default generalisation in connectionist networks. *Language and Cognitive Processes* 10 (6): 601–630.

Harmon, Z., and V. Kapatsinski. 2017. Putting old tools to new uses: The role of form accessibility in semantic extension. *Cognitive Psychology* 98: 22–44.

Hay, J. 2001. Lexical frequency in morphology: Is everything relative? *Linguistics* 39 (6): 1041–1070.

———. 2003. *Causes and consequences of word structure*. London: Routledge.

Hayes, B. 2004. Phonological acquisition in optimality theory: The early stages. In *Constraints in phonological acquisition*, ed. R. Kager, J. Pater, and W. Zonneveld, 158–203. Cambridge: Cambridge University Press.

Hebb, D.O. 1949. *The organization of behavior: A neuropsychological approach*. New York: Wiley.

Hilpert, M. 2008. *Germanic future constructions: A usage-based approach to language change*. Amsterdam: John Benjamins.

Horwood, G. 2001. *Anti-faithfulness and subtractive morphology*. Ms., Rutgers University, available as ROA, 466-0901.

Hsu, A., and T.L. Griffiths. 2009. Differential use of implicit negative evidence in generative and discriminative language learning. *Advances in Neural Information Processing Systems* 22: 754–762.

Hsu, A.S., and T.E. Griffiths. 2010. Effects of generative and discriminative learning on use of category variability. *Proceedings of the Annual Conference of the Cognitive Science Society* 32: 242–247.

Jones, S., C. Paradis, M.L. Murphy, and C. Willners. 2007. Googling for 'opposites': A web-based study of antonym canonicity. *Corpora* 2 (2): 129–154.

Jun, J., and A. Albright. 2017. Speakers' knowledge of alternations is asymmetrical: Evidence from Seoul Korean verb paradigms. *Journal of Linguistics* 53: 567–611.

Justeson, J.S., and S.M. Katz. 1991. Co-occurrences of antonymous adjectives and their contexts. *Computational Linguistics* 17: 1–19.

Kahana, M.J. 2002. Associative symmetry and memory theory. *Memory & Cognition* 30: 823–840.

Kamin, L.J. 1969. Predictability, surprise, attention, and conditioning. In *Punishment and aversive behavior*, ed. B.A. Campbell and R.M. Church, 279–296. New York: Appleton-Century-Crofts.

Kapatsinski, V. 2005. *Productivity of Russian stem extensions: Evidence for and a formalization of network theory*. MA thesis, The University of New Mexico.

———. 2013. Conspiring to mean: Experimental and computational evidence for a usage-based harmonic approach to morphophonology. *Language* 89 (1): 110–148.

———. 2017. Learning a subtractive morphological system: Statistics and representations. *Proceedings of the Boston University Conference on Language Development* 41 (1): 357–372.

———. Forthcoming. *Changing minds changing tools: From learning theory to language acquisition to language change*. Cambridge, MA: MIT Press.

Kapatsinski, V., and Z. Harmon. 2017. A Hebbian account of entrenchment and (over-)extension in language learning. *Proceedings of the Annual Conference of the Cognitive Science Society* 39: 2366–2371.

Kirby, S., H. Cornish, and K. Smith. 2008. Cumulative cultural evolution in the laboratory: An experimental approach to the origins of structure in human language. *Proceedings of the National Academy of Sciences* 105 (31): 10681–10686.

Köpcke, K.-M. 1998. The acquisition of plural marking in English and German revisited: Schemata versus rules. *Journal of Child Language* 25 (2): 293–319.

Köpcke, K.-M., and V. Wecker. 2017. Source-and product-oriented strategies in L2 acquisition of plural marking in German. *Morphology* 27: 77–103.

Kruschke, J.K. 2006. Locally Bayesian learning with applications to retrospective revaluation and highlighting. *Psychological Review* 113 (4): 677–699.

Kurisu, K. 2001. *The phonology of morpheme realization.* Doctoral dissertation, UC Santa Cruz.

Landauer, T.K., and S.T. Dumais. 1997. A solution to Plato's problem: The latent semantic analysis theory of acquisition, induction, and representation of knowledge. *Psychological Review* 104 (2): 211–240.

Langacker, R. 1987. *Foundations of cognitive grammar*, Theoretical prerequisites. Vol. 1. Stanford: Stanford University Press.

Łubowicz, A. 2007. Paradigmatic contrast in polish. *Journal of Slavic Linguistics* 15: 229–262.

Mackintosh, N.J. 1975. A theory of attention: Variations in the associability of stimuli with reinforcement. *Psychological Review* 82 (4): 276–298.

Madlener, K. 2016. Input optimization: Effects of type and token frequency manipulations in instructed second language learning. In *Experience counts: Frequency effects in language*, ed. H. Behrens and S. Pfänder, 133–174. Berlin: Walter de Gruyter.

Maniwa, K., A. Jongman, and T. Wade. 2009. Acoustic characteristics of clearly spoken English fricatives. *The Journal of the Acoustical Society of America* 125 (6): 3962–3973.

McCarthy, J.J. 1998. Morpheme structure constraints and paradigm occultation. *Chicago Linguistic Society* 32 (2): 123–150.

McClelland, J.L. 2001. Failures to learn and their remediation: A Hebbian account. In *Mechanisms of cognitive development: Behavioral and neural perspectives*, ed. J.L. McClelland and R.S. Siegler, 97–121. Mahwah: Erlbaum.

McClelland, J.L., B.L. McNaughton, and R.C. O'Reilly. 1995. Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. *Psychological Review* 102 (3): 419–457.

McKenzie, C.R., and L.A. Mikkelsen. 2007. A Bayesian view of covariation assessment. *Cognitive Psychology* 54 (1): 33–61.

McMurray, B., J.S. Horst, and L.K. Samuelson. 2012. Word learning emerges from the interaction of online referent selection and slow associative learning. *Psychological Review* 119 (4): 831–877.

McNeill, D. 1963. The origin of associations within the same grammatical class. *Journal of Verbal Learning & Verbal Behavior* 2 (3): 250–262.

———. 1966. A study of word association. *Journal of Verbal Learning & Verbal Behavior* 5: 548–557.

Murphy, M.L. 2006. Antonyms as lexical constructions: Or, why *paradigmatic construction* is not an oxymoron. *Constructions* SV1(8): 1–37.

Naigles, L.G., and S.A. Gelman. 1995. Overextensions in comprehension and production revisited: Preferential-looking in a study of *dog*, *cat*, and *cow*. *Journal of Child Language* 22 (1): 19–46.

Nesset, T. 2008. *Abstract phonology in a concrete model. Cognitive linguistics and the morphology-phonology interface*. Berlin: Mouton de Gruyter.

Nosofsky, R.M. 1988. Similarity, frequency, and category representations. *Journal of Experimental Psychology: Learning, Memory, & Cognition* 14 (1): 54–65.

O'Donnell, T.J. 2015. *Productivity and reuse in language: A theory of linguistic computation and storage*. Cambridge, MA: MIT Press.

Oldfield, R.C., and A. Wingfield. 1965. Response latencies in naming objects. *Quarterly Journal of Experimental Psychology* 17: 273–281.

Pavlov, I.P. 1927. *Conditioned reflexes. An nvestigation of the physiological activity of the cerebral cortex*. Mineola: Dover.

Pereira, A.F., L.B. Smith, and C. Yu. 2014. A bottom-up view of toddler word learning. *Psychonomic Bulletin & Review* 21 (1): 178–185.

Perfors, A., K. Ransom, and D.J. Navarro. 2014. People ignore token frequency when deciding how widely to generalize. *Proceedings of the Annual Conference of the Cognitive Science Society* 36: 2759–2764.

Piantadosi, S.T., H. Tily, and E. Gibson. 2012. The communicative function of ambiguity in language. *Cognition* 122 (3): 280–291.

Pinker, S., and A. Prince. 1988. On language and connectionism: Analysis of a parallel distributed processing model of language acquisition. *Cognition* 28 (1): 73–193.

Poser, W.J. 1990. Evidence for foot structure in Japanese. *Language* 66 (1): 78–105.

Ramscar, M., and D. Yarlett. 2007. Linguistic self-correction in the absence of feedback: A new approach to the logical problem of language acquisition. *Cognitive Science* 31 (6): 927–960.

Ramscar, M., D. Yarlett, M. Dye, K. Denny, and K. Thorpe. 2010. The effects of feature-label-order and their implications for symbolic learning. *Cognitive Science* 34 (6): 909–957.

Ramscar, M., M. Dye, and J. Klein. 2013a. Children value informativity over logic in word learning. *Psychological Science* 24 (6): 1017–1023.

Ramscar, M., M. Dye, and S.M. McCauley. 2013b. Error and expectation in language learning: The curious absence of mouses in adult speech. *Language* 89 (4): 760–793.

Regier, T., and S. Gahl. 2004. Learning the unlearnable: The role of missing evidence. *Cognition* 93 (2): 147–155.

Rescorla, R.A., and A.R. Wagner. 1972. A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. In *Classical conditioning II: Current research and theory*, ed. A.H. Black and W.F. Prokasy, 64–99. New York: Appleton-Century-Crofts.

Rogers, T.T., and J.L. McClelland. 2004. *Semantic cognition: A parallel distributed processing approach*. Cambridge, MA: MIT Press.

Schertz, J. 2013. Exaggeration of featural contrasts in clarifications of misheard speech in English. *Journal of Phonetics* 41 (3): 249–263.

Seyfarth, S., E. Buz, and T.F. Jaeger. 2016. Dynamic hyperarticulation of coda voicing contrasts. *The Journal of the Acoustical Society of America* 139 (2): EL31–EL37.

Smolek, A., and V. Kapatsinski. in preparation. *The importance of contiguity for learning paradigmatic mappings*. Ms., U Oregon.

Sternberg, D., and J.L. McClelland. 2009. When should we expect indirect effects in human contingency learning. *Proceedings of the Annual Conference of the Cognitive Science Society* 31: 206–211.

Suttle, L., and A.E. Goldberg. 2011. The partial productivity of constructions as induction. *Linguistics* 49 (6): 1237–1269.

Taatgen, N.A., and J.R. Anderson. 2002. Why do children learn to say "broke"? A model of learning the past tense without feedback. *Cognition* 86 (2): 123–155.

Tassoni, C.J. 1995. The least mean squares network with information coding: A model of cue learning. *Journal of Experimental Psychology: Learning, Memory, & Cognition* 21 (1): 193–204.

Tomasello, M. 2003. *Constructing a language: A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.

Torres Cacoullos, R., and J.A. Walker. 2009. The present of the English future: Grammatical variation and collocations in discourse. *Language* 85 (2): 321–354.

Vadillo, M.A., and H. Matute. 2010. Augmentation in contingency learning under time pressure. *British Journal of Psychology* 101 (3): 579–589.

van Hamme, L.J., and E.A. Wasserman. 1994. Cue competition in causality judgments: The role of nonpresentation of compound stimulus elements. *Learning & Motivation* 25 (2): 127–151.

Waldmann, M.R. 2000. Competition among causes but not effects in predictive and diagnostic learning. *Journal of Experimental Psychology: Learning, Memory, & Cognition* 26 (1): 53–76.

Waldmann, M.R., and K.J. Holyoak. 1992. Predictive and diagnostic learning within causal models: Asymmetries in cue competition. *Journal of Experimental Psychology: General* 121 (2): 222–236.

Wasserman, E.A., W.W. Dorner, and S.-F. Kao. 1990. Contributions of specific cell information to judgments to interevent contingency. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 16: 509–521.

Weir, R.H. 1962. *Language in the crib*. The Hague: Mouton.

Williams, J.N. 2003. Inducing abstract linguistic representations: Human and connectionist learning of noun classes. In *The lexicon-syntax interface in second language acquisition*, ed. R. van Hout, A. Hulk, F. Kuiken, and R.J. Towell, 151–174. Amsterdam: John Benjamins.

Xu, J., and W.B. Croft. 1998. Corpus-based stemming using co-occurrence of word variants. *ACM Transactions on Information Systems* 16 (1): 61–81.

Xu, F., and J.B. Tenenbaum. 2007. Word learning as Bayesian inference. *Psychological Review* 114 (2): 245–272.

Yu, C., and L.B. Smith. 2007. Rapid word learning under uncertainty via cross-situational statistics. *Psychological Science* 18 (5): 414–420.

Zaki, S., A. Rich, and S. Stacy. 2016. *The sequence of items in category learning: Modeling and eye-tracking data*. Paper presented at the 57th annual meeting of the Psychonomic Society, Boston, MA, November 17–20.

Zipf, G.K. 1949. *Human behavior and the principle of least effort: An introduction to human ecology*. Cambridge, MA: Addison-Wesley Press.

Processing and Representation of Morphological Complexity in Native Language Comprehension and Production

Pienie Zwitserlood

Abstract Psycholinguistic research has been concerned with the processing and representation of morphologically complex words for many decades. Leading questions are whether complex words are stored as wholes, or parsed during listening and reading – and assembled from their constituents during speaking. This chapter reviews psycholinguistic theories and data – mainly from English, Dutch and German – on the role of morphology in in language comprehension and production. Processing theories range from full storage independent of morphological complexity to full parsing of complex words. Parsing and composition – for which there is ample evidence from many languages – require morphemes to be stored, in addition to information as to how morphemes are combined, or to whole-word representations specifying the combination. Next to evidence for (de)composition, many studies indeed show that complex words as a whole play a role during processing, often demonstrated by effects of whole-word frequency. Processing models have been developed to account for such effects, taking into account differences between inflection, derivation and compounding – supported by neuroimaging studies – as well as the semantic transparency of the combination, often investigated with complex verbs and compounds. What is lacking, is an integrative model for the representation of complex words that accommodates the wealth of experimental data from both production and comprehension. This is where recent approaches from linguistic morphology may become relevant. The article concludes with a brief evaluation of proposals from construction morphology, and how they may accommodate what is known about online morphological representation and processing and in adult native speakers.

Keywords Composition · Language comprehension · Language production · Parsing · Transparency · Whole-word representation · Word processing

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1 Introduction

Psycholinguistics is concerned with the psychological factors and neural structures that allow us to produce, understand and acquire language. The discipline started to emerge only in the 1950s, with roots in nineteenth-century neurology, experimental psychology, behaviourism, and of course linguistics. Invaluable insights in lexical process and representation have been gained ever since, and theories have been put forward to model speech processing from sub-phonetic detail to complex meaning and structure (Cutler 1995; Hagoort 2005; Hickok and Poeppel 2000), and speech production from concepts to linguistic form (Dell 1988; Levelt 1989; Levelt et al. 1999). Common to these theories is a division of labour between stored knowledge – conceptual, structural, lexical, sub-lexical – and procedures or processes operating on this knowledge.

One major research theme in psycholinguistics concerns word-internal structure, focusing on morphological processing, in terms of morphemic parsing (during comprehension) and of composition (during production), and on the representation of morphological structure in the mental lexicon. Major issues concern the compositionality and semantic transparency of complex words, and functional differences between regular and irregular inflection (see Marslen-Wilson 2007 for an overview). This chapter addresses the processing and representation of morphologically complex words by adults in their native language, foregoing acquisition of morphology, and morphology in bi- or multilingual processing (see Giraudo and Dal Maso 2018, this volume). The focus is on processing and representation from a cognitive perspective, leaving out most of linguistic theory on morphology – although processing models have heavily borrowed from linguistics. The issues addressed are the following: (1) are complex words parsed, during language understanding, and composed from their morphemes, during language production; (2) do complex words possess a (supplementary) unified lexical representation; (3) what role do frequency of use, regularity, compositionality, and semantic transparency play with respect to the first two questions. After a description of the most common psycholinguistic theories/models for morphological complexity, I selectively review relevant data that speak to questions (1)–(3), including brief descriptions of the main methods used. Weighing the evidence, I evaluate psycholinguistic models with respect to their ability to accommodate the findings, and assess what current proposals from linguistics may have to contribute to processing theories of morphological complexity.

2 Theories of Morphological Processing

While for decades, the linguistics literature had been teeming with work on morphology, psycholinguistic research on morphological processing only started to emerge in the 1970s. Data from pioneers such as Osgood (Osgood and Hoosain

1974), Manelis and Tharp (1977), Stanners and colleagues (1979) and, last but not least, Taft and Forster (Taft 1979; Taft and Forster 1975, 1976) inspired early models on morphological processing and representation. These studies all used visual stimuli, and concentrated on inflection and derivation. Experimental work on the role of morphology in speech perception came much later (Marslen-Wilson et al. 1994; Schriefers et al. 1991; Tyler et al. 1988; Wurm 1997; Zwitserlood 2003, 2004).

Meanwhile, there is an extensive body of psycholinguistic literature on the role of morphology in word recognition, still mainly in the visual domain (see Amenta and Crepaldi 2012; Clahsen 2016; Feldman 2013; Frost and Grainger 2000, for overviews). Models of morphological processing and representation in language comprehension have become quite refined, and some claims had to be abandoned or modified on the basis of new experimental insights. In contrast, the empirical harvest from the field of language production is still rather meagre, but there exist clear and outspoken theories on the role of morphemes in speaking (Dell 1988; Levelt et al. 1999; Caramazza 1997). In what follows, the models for morphology in language comprehension are complemented by production theories.

Processing models for morphology take a particular stance as to whether morphologically complex words are processed via decomposition/parsing or via retrieval from lexical memory, and whether complex word forms are handled by a single or by a dual system (see Smolka et al. 2007 for this distinction). On the one side of the continuum between full storage and full parsing, connectionist network models assume a single associative-memory system that computes meaning representations directly from orthographic representations (Baayen et al. 2011; Gonnerman et al. 2007; Plaut 2011; Rueckl et al. 1997; Westermann and Ruh 2012). The morphological "representations" emerging from such models are an epiphenomenon of their form-to-meaning mappings. As a case in point, in the supralexical model proposed by Giraudo and colleagues (Giraudo and Grainger 2001; Giraudo and Voga 2014) simplex and complex words are accessed as full-form word units. On the way to semantic information, there is an abstract level at which words – not morphemes – cluster together due to form-meaning interactions – which results in the activation, by a complex word, of other words with which meaning is shared – including the words that constitute its morphemes. Note that there is no parsing at any level, and that effects of morphological relatedness stem from systematic form-meaning interactions. In all these models, there is a single system and a single process for all types of words.

On the other side, there are single-system models that assume obligatory decomposition, by means of which all complex word forms are parsed into stems and affixes, before whole-word representations are accessed (Taft 1979; Taft and Forster 1975). Such whole-word representations are often labeled "lemmas" (Schreuder and Baayen 1995; Taft 2004). These models thus implement a single system, in which different processes (parsing, whole-word lemma access) operate in a consecutive manner, and in which representations exist both for words and morphemic constituents.

Mixed approaches combine decomposition and access to full forms, with the two processes running in parallel. Decomposition can only be applied to complex words that are formed productively, while words with unproductive patterns are stored in the lexicon (Chialant and Caramazza 1995; Clahsen 1999; Marslen-Wilson et al. 1994; Pinker 1999; Pinker and Ullman 2002; Schreuder and Baayen 1995). However, these models differ in their definition of productive forms that undergo parsing, and consequently also with respect to which words are to be retrieved from memory as unproductive forms. Models also disagree as to which of the processes, parsing or retrieval, is considered the more essential and faster process, and finally, as to whether parsing and retrieval are incorporated in a single system (so-called dual-route race models: Frost et al. 1997; Schreuder and Baayen 1995), or in two distinct systems, with symbolic rule computation for regular morphology and associative memory for the processing of irregular morphology (Brovetto and Ullman 2005; Clahsen 1999; Pinker and Ullman 2002; Prasada and Pinker 1993; Ullman 2001; Veríssimo and Clahsen 2009).

Given this wealth of theories for language comprehension, it may come as a surprise that the production of complex words has been neglected for a long time. Where language comprehension takes the written or spoken input to gain access to word forms and/or morphemes stored in the lexicon and to their corresponding concepts, producing speech or written language proceeds from concepts to speech or written output. Of course, it is possible to translate the claims made for comprehension into claims for producing complex words. As an example, a model such as Taft's (2004) would assume that when producing complex words, whole-word representations are accessed first, before the constituent morphemes are retrieved and used for speaking. In fact, this comes very close to the claims made for morphologically complex words by Levelt and colleagues in their language-production model (Levelt 1989; Levelt et al. 1999). Levelt and colleagues, adopting a dual-stage approach for speech production (Dell 1988; Dell and O'Seaghdha 1992; Garrett 1988), assume that whole-word lexical representations, here also called "lemmas", are accessed on the basis of the semantic-conceptual information that specifies the speaker's intentions. These lemmas are abstract; they do not specify lexical form (neither morphemes, phonemes nor syllabic structure), but they code for (morpho)syntactic properties of lexical entries (such as word class, or gender). Morphemes are the units at the so-called word-form or lexeme level that specifies the phonemic information of word forms. Note that the theory proposed by Levelt and colleagues handles morphologically complex words in one system, in which constituent morphemes are accessed for words whose complexity is manifest in their surface form (e.g., *cupboard*, *worker*, *walked*), independent of their semantic transparency (e.g., *Löwenzahn* 'dandelion, lit. tooth of a lion' and *Backenzahn* 'molar, lit. cheek tooth'). But irregular words (e.g., *bought*) and words with "degenerate morphology" (e.g., *replicate*) have their own lexemes.

So, when a complex word such as *teddybear*, *teddybeer* or *teddybär* is produced, its single lemma specifies that is a noun, and has common gender (in Dutch) or masculine gender (in German). The morphemes *teddy* and *bear*, with their phonemic make up, become available at the subsequent lexeme level. Morphemes

thus constitute the building blocks for speaking, and complex words are constructed or composed from their constituents. While Levelt and other researchers assume a two-step process for producing complex words, this is different in the model by Caramazza and colleagues (Caramazza 1997; Caramazza and Miozzo 1997), who dispense with the lemma level and have syntactic properties linked up with word-form information at the lexeme level. This view implies full lexical storage of morphologically complex word forms in production, for which there is some evidence (Janssen et al. 2008). But note that work by the same group indicates that morphology does play a role during speech production – at least in language-impaired patients (Badecker and Caramazza 1991; Badecker et al. 1990).

3 Evidence for Parsing and Composition in Language Processing

The many and diverse claims made by processing theories of morphological complexity inspired, and were inspired by, a wealth of experimental studies into morphological processing and representation. Most studies are concerned with language comprehension – reading, mainly – but evidence from language production is accumulating. Because it is impossible to review the thousands of studies on morphological processing, I decided to focus on issues and data that are most critical for the models introduced above. The first issue (Sect. 3.1) concerns regularity and frequency, mainly of inflected forms, the second part (Sect. 3.2) considers compositionality and semantic transparency of derived and compounded words to assess the relationship between morphology, form (phonological, orthographic), and semantics.

3.1 Regular and Irregular Inflection

Nominal and verbal inflection in languages such as English, German or Dutch present a prime case for the distinction between productive (=regular) and unproductive (=irregular) forms made earlier. There is no doubt that inflection is compositional in the sense that the meaning of the root is preserved, and thus presents an excellent testing ground for predictions made by different processing models. No wonder that the processing of regular and irregular inflection – exemplified in the "past tense debate" – has kept the research community busy for a long time. Processing differences between regular and irregular inflection are taken as support for two different systems: decomposition vs. retrieval from memory. Some studies directly compared reaction times for regular (*baked*) and irregular (*hung*) forms, but there are many confounding factors with such a design. Even if regular and irregular past-tense forms are matched for word frequency

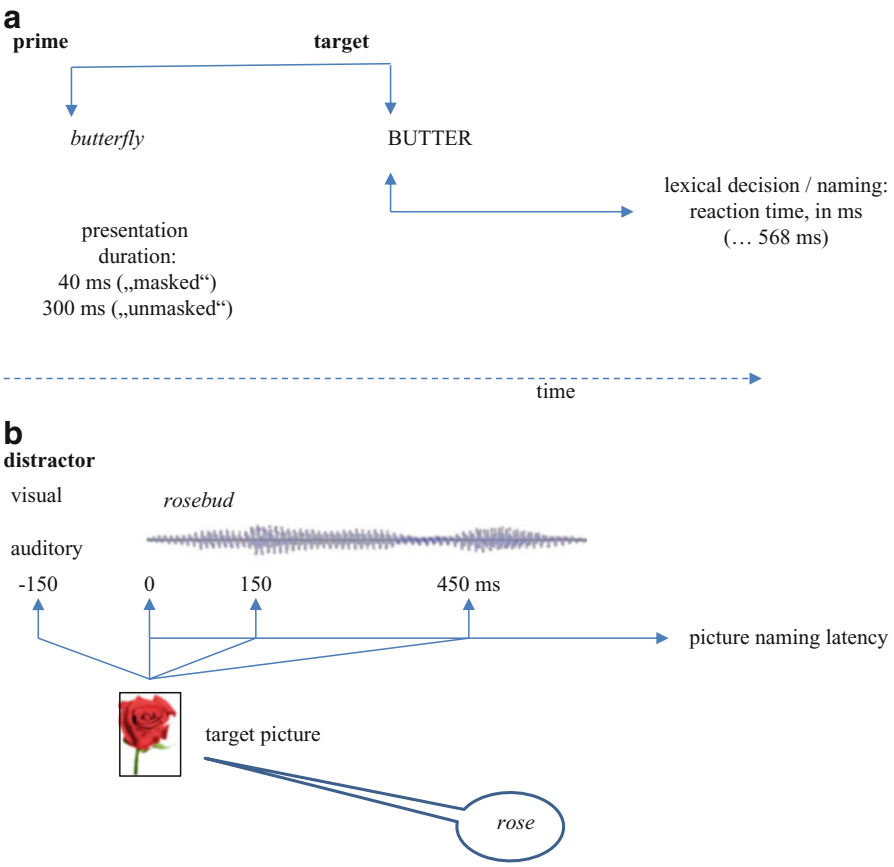


Fig. 1 Priming paradigms; (**a**) visual priming, (**b**) picture-word interference

(their frequency of occurrence in the language, a powerful predictor of reaction time), they still differ in numerous aspects, such as length (number of letters/speech sounds), number of syllables, or bigram frequency. This is why most studies use the priming technique, in which the effects of a prime, usually an inflected word, on the processing speed of a target, usually a base (e.g., WORK), are assessed by comparing related (e.g., *worked*) and unrelated (e.g., *poured*) primes to the same target. Participants in such studies react to the targets only, for example by deciding, by button push, whether a target is a word or not (lexical decision task) or by reading out loud the target words (naming task). See Fig. 1a for an illustration.

Stanners et al. (1979) showed that regular past-tense forms (*poured*) primed their base-form targets (POUR*)* just as effectively as identical primes (*pour-* POUR). Base forms of irregular verbs (*hang)* were also primed by their past-tense primes (*hung-*HANG*)*, but to a lesser extent than by identical primes (*hang-*HANG). Stanners and colleagues coined the concepts of “full” and “partial” activation. “Full” activation

resulted from repeated access to the base form that is shared by all other regularly inflected forms. Decomposition of the prime word leads to activation of its base. The subsequent target corresponds to this base form and thus receives "full" activation. This is different for irregular verbs, for which all inflectional variants, as well as the base, are stored separately in the mental lexicon. This yields only "partial" activation of base forms when the irregular past tense form serves as prime, and the priming observed is attributed mainly to semantic similarity. These and similar findings lay the cornerstone for dual-mechanism accounts for inflection (e.g., Clahsen 1999; Pinker and Ullman 2002; Prasada and Pinker 1993).

Subsequent studies corroborated processing differences between regular and irregular verbs: In English, full priming was found for regular verbs, and either partial priming (Napps 1989) or no priming at all for irregular verbs (Marslen-Wilson 1999). A similar difference was reported for German participles (Sonnenstuhl et al. 1999). Evidence from studies on the neural underpinnings of inflectional processing, using functional imaging techniques, underscores the distinction between decomposition (left inferior frontal areas) and retrieval (bilateral, temporal regions) from lexical memory (see Bozic et al. 2010; Marslen-Wilson et al. 2014; Marslen-Wilson 2007 for overviews).

The picture became somewhat clouded when priming studies in Italian (Orsolini and Marslen-Wilson 1997) and French (Meunier and Marslen-Wilson 2004) revealed similar past-tense or participle priming effects for regular/productive and irregular/unproductive verbs. Such findings do not fit a strict distinction between decomposition of regular forms and lexical storage of irregular forms. Moreover, in a study on German participles (Smolka et al. 2013), differences in priming patterns between regular, semi-regular and irregular verbs seemed quantitative rather than qualitative. As noted before, dual-route models differ as to the factors that determine access via one or the other route. Next to regularity, factors include affix type (Colé et al. 1989; Cutler et al. 1985; Marslen-Wilson et al. 1994; Taft 1994), affix productivity and homonymy (Bertram et al. 1999, 2000), and word frequency: Frequent complex words may be accessed more quickly via direct access than via decomposition, independent of regularity (Burani and Laudanna 1992; Chialant and Caramazza 1995; Laudanna and Burani 1995; but see Clahsen 2016; Marslen-Wilson 2007). Note that next to material properties, priming effects also depend on the conditions, the number of related trials in the experiment, and, importantly, on the participants' task (see Drews and Zwitserlood 1995; Raveh and Rueckl 2000).

By now, there is ample evidence that frequent regular forms are accessed via their full-forms rather than being parsed (for English: Alegre and Gordon 1999; Stemberger and MacWhinney 1986; for Finnish: Lehtonen and Laine 2003; Soveri et al. 2007). This holds for verbal as well as for nominal (plural) inflection. Baayen et al. (1997b) were the first to show that for Dutch frequent plural forms (e.g., *ogen* 'eyes') are recognized faster than infrequent plural forms (e.g., *neuzen* 'noses'), even when their lemma frequency (that takes all inflected forms into account) was matched. This result – labeled plural dominance – was replicated for Dutch and German (Baayen et al. 2003; Beyersmann et al. 2015, with a production task) as

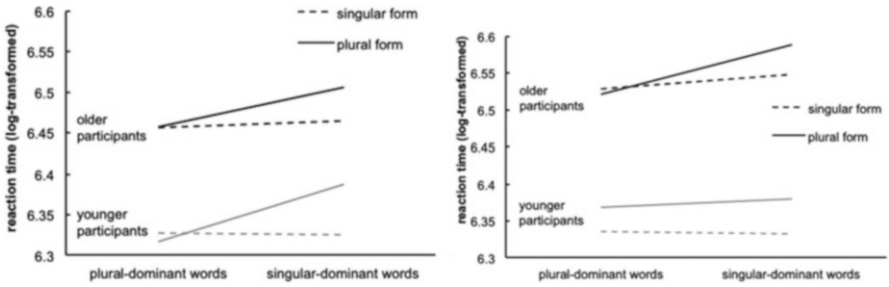


Fig. 2 Reaction times to singular- and plural-dominant nouns. Data from Dutch (left) and German (right) young and older adults (Data from Reifegerste et al. 2017)

well as for French (New et al. 2004), Spanish (Dominguez et al. 1999), and Italian (Baayen et al. 1997a). In a study with young and older native speakers of Dutch and German, Reifegerste et al. (2017) fully replicated the plural dominance effect for Dutch, independent of age, as well as for the older Germans. Interestingly, the young Germans showed evidence for decomposition of all plural forms – whether plural dominant or not (see Fig. 2 for the data). This is all the more surprising since the German plural system has five different plural affixes: -Ø, -(e)n, -e, -er, and –s, and some of these allow for ablauting, through fronting of the stressed stem vowel.

All the above data show is that there is no clear-cut processing distinction between productive/regular and unproductive/irregular words. The processing system is not fixed but rather malleable on the basis of experience. Frequency, along with many other factors, determines whether words are accessed from memory, or parsed into constituent morphemes. This is not easily reconciled with connectionist models that assume storage for all words, nor with theories that propose decomposition for all transparent, regular words, and direct memory access for irregular words only. Instead, the data fit best with dual-route models that incorporate parsing and direct access (Frost et al. 1997; Schreuder and Baayen 1995), in which the particular route taken is determined by a word's frequency, regularity, productivity, and whatever other factors may be discovered yet. Evidence for separate neural systems for decomposition and storage is sometimes recruited in favour of the regular/irregular distinction, but a neural separation is impartial to this debate. What is important is to find out exactly which complex words are handled by one or the other neural substrate (Marslen-Wilson 2007).

What has to be kept in mind is that much of the evidence summarized above was obtained in priming experiments. Given that prime words such as *poured* are related to their targets (POUR) with respect to morphology, meaning and form, the effects observed may in part be confounded by semantic and formal similarity. As a case in point, form overlap is different for *poured* and POUR vs. *hung* and HANG. Whereas the target POUR is fully contained in the prime *poured*, *hung* and HANG show the same form similarity as orthographic neighbours (e.g., *lung – long*). So, it is time to consider the processing of morphological complexity independent from semantic and form similarity.

3.2 Morphology, Semantics and Form

The inherent relation between morphological, semantic and form similarity has often been acknowledged in the literature, but there are only limited ways and means to tackle these "confounds", which of course reflect natural relationships among words but are considered a nuisance for singling out a separate contribution of morphology to word processing. In what follows; I review data from experimental work on derived and compounds words, whose semantic relation to their constituent word(s) can vary.

3.2.1 Morphology and Mere Form Similarity

A first confound to be considered is the form similarity, in terms of shared phonemes or graphemes, between complex words and their constituent morphemes. This is particularly relevant in priming studies. *Punishment* and *punish* share as much form overlap as *bulletin* and *bullet*, which are synchronically, in the contemporary mental lexicon of our participants, unrelated in meaning and/or morphology. So unless morphological relatedness is dissociated from this formal overlap, not much can be said about the nature of priming effects. One way to tackle this problem is to compare the size of effects of morphologically related word pairs and pairs with mere form overlap, and this has been done in priming experiments and picture-naming studies. In an early priming study of Dutch and German, Drews and Zwitserlood (1995) investigated the impact of mere form-related primes (e.g., *Schale*, bowl) and on the lexical decision or naming of contained word targets (e.g., SCHAL, scarf). Such form-related primes either induced no facilitation or even interference, relative to unrelated primes (e.g., *Hefe*, yeast), in clear contrast to the facilitation induced by morphologically related prime-target pairs (e.g., *Beine*, legs, as prime for BEIN, leg). This lack of priming by pairs of words that share mere form overlap has been shown and replicated time and again, in many languages (Dominguez et al. 2002; Feldman 2000; Feldman and Soltano 1999, Grainger et al. 1991, Longtin et al. 2003; Marslen-Wilson et al. 1994; Rastle et al. 2000; Zwitserlood 1994; see also Bölte et al. 2004; Dohmes et al. 2004, for effects in word production with the picture-word paradigm; see Fig. 1b).

Form-related pairs such as *harpoon* and HARP Consistently fail to show facilitation, independent of the timing or modality of primes and targets. This is different for pairs such as *corner* and CORN or *belly* and BELL, in which a potential stem is paired with an existing affix. Such words exist in many languages: *corner* is not someone who corns, *rato* is not a male rat in Spanish, *baguette* is not a small ring in French, *Wunder* does not mean "more sore" in German, and *meester* does not mean "more most" in Dutch. By now it has been shown in many languages that such pseudo-complex words induce facilitation, but only when briefly presented as masked prime for their pseudo-stem. The primes are presented for 40 or 50 milliseconds, and the immediately following target serves as a visual mask

(see Fig. 1a). This renders the prime unavailable for conscious recognition, but exactly under such circumstances does *corner* prime CORN, and *baguette* BAGUE (see Rastle and Davis 2008, for an overview).

Such effects are interpreted in terms of early, obligatory, modality-specific decomposition, independent of semantic and lexical factors (see Marlsen-Wilson 2007). This early decomposition– befitting models such as Taft's (Taft and Forster 1975), is pre-lexical, but for pseudo-complex words such as *belly* or *baguette*, the products of decomposition find no match with the word's mono-morphemic specification in the mental lexicon. This is why early facilitation goes awry when the paradigm – either with longer prime duration or cross-modal presentation of spoken primes and visual targets – picks up lexical rather than fleeting sub-lexical effects. For the purpose of disentangling effects morphological similarity and pure form overlap, it suffices that mere form effects clearly differ from the impact of genuine morphological relatedness.

3.3 Morphology and Semantics

A second, often neglected natural confound concerns the meaning relation between morphological relatives. In the language, morphological relatedness and semantic similarity are close friends, consequently, in experiments, morphologically related prime-target pairs are often strongly related in meaning. But unlike inflection, where stems and affixes are combined in a compositional manner and meaning preservation is maximal, derivation and compounding have less stable relations between the meaning of the morphemes and the meaning of the complex word. Even when derived words seem completely compositional, as with *worker* or *builder*, where *–er* expresses agentive, affixes are not always unequivocal but homonymic, as *–er* functions as comparative in *harder*, or even have synchronically no function, as shown above for pseudo-complex words such as *corner* or *brother*. Derived words and compounds are not compositional in the same sense that inflected words are; a transparent derivation such as *needless* means "without need", but also "superfluous" or "unnecessary". Many derived words lost the semantic relation to their base – *apartment*, *hardly*, and *restrain* being cases in point. The same holds for compounds; combinations of free morphemes such as *butterfly* and *blackguard* are synchronically not related to the meaning of their constituents. To assess whether morphology in language processing and representation represents a dimension in its own right, independent of semantics, it is important to find out whether semantically fully opaque complex words are stored as wholes, or whether there is a sensitivity to their constituent morphemes, during language comprehension and production.

This has been the aim of a growing number of studies, again using priming as the main technique. On the one hand, there is evidence from cross-modal priming studies that semantically opaque words such as *apartment* do not provide access to their stem (Marslen-Wilson et al. 1994; Reid and Marslen-Wilson 2003), but with a different paradigm, semantically transparent and opaque derived words showed very similar effects, both in reaction time and neurobiological measures (Bozic

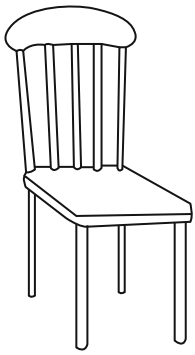
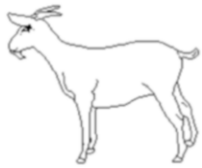
et al. 2007; Carota et al. 2016, for Italian). There seem to be substantial differences between languages as to the impact of semantic transparency, with clear evidence for the morphological complexity of semantically opaque words in Arabic and Hebrew (Bentin and Feldman 1990; Bick et al. 2010; Boudelaa and Marslen Wilson 2015; Frost et al. 2000; Kolan et al. 2011), but little support for anything but whole-word representations for English, even for completely transparent derived words (Marslen-Wilson et al. 2014). It is often difficult to know what exactly counts as semantically opaque, as even pseudo-complex words such as *corner* or *belly* are often labelled semantically opaque (cf. Rastle and Davis 2008).

The picture is different in German and Dutch, where pseudo-complex words (e.g., *Keller*, *meester,* Drews and Zwitserlood 1995) induced no priming of their pseudo-constituents (KELLE, MEEST). But we obtained clear constituent-priming effects for words that are morphologically complex even when their meaning cannot be derived from the combined meaning of their constituents (Dutch *drankorgel* 'drunkard, lit. drink organ'; German *entbinden* 'to give birth, lit. untie'; *Ziegenpeter* 'mumps, lit. goatpeter'). This was shown for transparent and opaque prefixed and particle verbs in German and Dutch (Lüttmann et al. 2011b; Smolka et al. 2014; Zwitserlood et al. 1996, 2005). Semantically opaque compounds were most often investigated with the picture-word paradigm, in which participants name pictures that are accompanied by so-called distractor words (the "primes" of picture naming). Figure 1b illustrates the paradigm, and Table 1 gives examples of a study reported in Dohmes et al. (2004).

Participants in the study named pictures with simple nouns (*rose, chair, goat*), and should not pay attention to distractor words that were presented concurrently. The naming latencies show that such distractors cannot be ignored, as the morphologically related distractors (that are processed by the language-comprehension system) influence the speed with which the pictures are named. Relative to unrelated distractors, naming is speeded by m'ore than 100 ms the presence of a morphologically related distractor. Importantly, semantically transparent (*Ziegenkäse* 'goat cheese') and opaque (*Ziegenpeter* 'mumps') distractors have an equal impact. This implies that these compounds provide access to their constituent morphemes, which speeds up the naming of pictures corresponding to their first (*Ziegen-* 'goat') or second (*-käse* 'cheese') constituent. In other studies, we have shown that facilitated naming is not due to mere form overlap, as distractors such as *neurose* 'neurosis', with the pseudo-constituents *neu* 'new' and *rose* 'rose', have a much smaller impact on naming a picture whose name overlaps with the distractor – the picture of a rose, in the example (Dohmes et al. 2004; Koester and Schiller 2011). The similar impact of transparent and opaque complex words has been replicated in Dutch and German (Gumnior et al. 2006; Koester and Schiller 2008, 2011; Verdonschot et al. 2012). The conclusion of these studies is that compounds in Dutch and German are parsed into their constituents, independent of their semantic transparency.

Although these studies use a production task (picture naming) they inform us about the processing of complex words – the distractors – by the comprehension system (see also Zwitserlood et al. 2000, 2002). We also investigated the actual production of compounds (*Handtasche* 'hand bag'), paired with semantically transparent (*Reisetasche* 'travel bag') or opaque (*Plaudertasche* 'chatterbox') distractor

Table 1 Results from two picture-word interference studies with morphologically complex distractors

	Distractor	Target picture	Mean latency and effect, in ms	
Second constituent				
Transparent	Korbstuhl (wicker chair)		686	110
Opaque	Dachstuhl (roof truss)		688	108
Unrelated	Bierglas (beer glass)		796	
First constituent				
Transparent	Ziegenkäse (goat cheese)		666	122
Opaque	Ziegenpeter (mumps)		673	115
Unrelated	Damenuhr (ladies' watch)		788	

Data from Dohmes et al. 2004

compounds. Again, the production of compounds was facilitated to the same extent by transparent and opaque compounds (Lüttmann et al. 2011a; see also Roelofs and Baayen 2002 for similar results with derived words). Finally, we even had participants name pictures with semantically opaque (*Löwenzahn* 'dandelion, lit. tooth of a lion') or transparent compounds (*Backenzahn* 'molar, lit. cheek tooth') that were accompanied by their constituents as distractor (*Backe*, *Löwe,* or *Zahn*). Again, we observed the same speeding of compound production by related distractors – independent of whether these were semantically transparent or opaque (Lorenz and Zwitserlood 2016; see Lorenz and Zwitserlood 2014, for data from aphasia).

The upshot of these results from comprehension and production studies is that – at least in Dutch and German – derived words and compounds show a clear sensitivity to their morphological make up, even in the absence of any relation to the meaning of their constituents. There are notable differences between languages, and we have to keep in mind that different paradigms and dependent measures may highlight different aspects of the processing and representation of complex words.

The involvement of left-inferior frontal brain networks was shown for English inflection, but not for derived words. This network seems to be actively involved in parsing – of complex words and of sentences alike. One might argue that the clear sensitivity of derived and compounded words, in Dutch and German, to their constituent morphemes does not reflect parsing – but representational complexity. The observed effects could indicate that complex words and their constituents are represented in a connected way, and activate each other during lexical processing, without decomposition into constituent morphemes. However, the production studies for derived words do not fit well with this interpretation, and are best seen as evidence for morphological composition – a process of putting together morphemes, and thus the production equivalent of decomposition or parsing at the level of morpheme-sized lexemes, during speaking. This is corroborated by Koester and Schiller (2011), who showed involvement of the left inferior frontal gyrus, reflecting combinatorial processing, during the production of complex words in Dutch (see also Leminen and Clahsen 2014).

For speaking, and probably also for language comprehension, the data for Dutch and German suggest an architecture in which complex words have a unitary lexical representation – a lemma – which serves as relay to the word's meaning in semantic memory. The architecture is illustrated in Fig. 3, adapted from Bölte et al. (2004), and evidently inspired by Levelt et al. (1999).

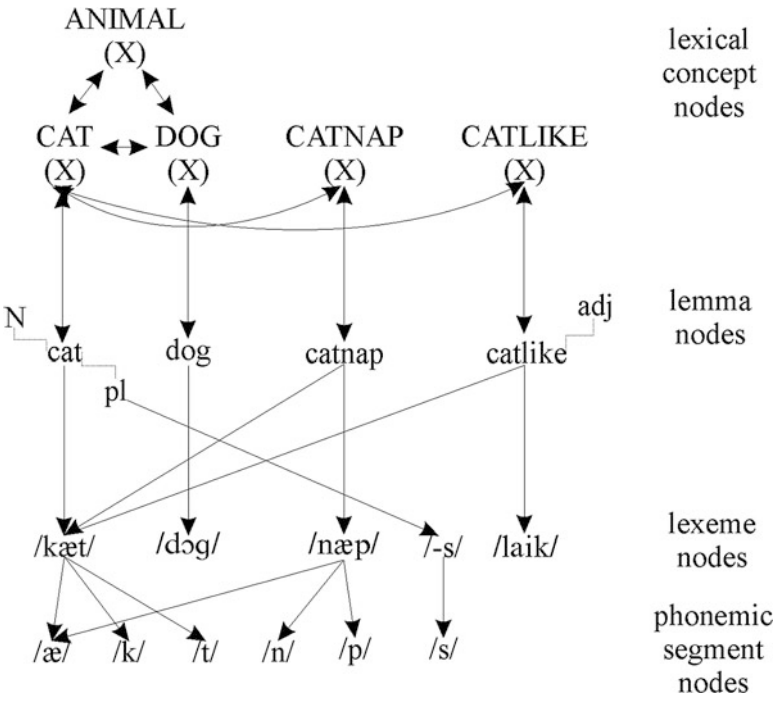


Fig. 3 Network model of spoken-word production (Adapted from Bölte et al. 2004)

Lemmas code syntactic properties (such as word class and gender) and specify inflectional information (plural, person, tense). Lemmas seem to be blind to morphology, and exist for semantically transparent and opaque complex words alike. It is at the word-form or lexeme level that multiple, morpheme-sized forms are addressed for compounds or derived words. In German and Dutch, morphologically complex words are thus specified in terms of their constituent morphemes independent of their semantic make-up, but pseudo-complex words such as *mandrill* or *Neurose* have a unitary word-form representation. Word-form representations are linked to the phonemic and orthographic segments that constitute the input – during listening or reading – or specify the output, during production. Relevant for the present purposes is the distinction between unitary lexical lemma representations, and morpheme-sized word forms.

4 Perspectives from Construction Morphology

The model illustrated in Fig. 3 specifies the types of information that come into play during the comprehension and production of complex words: Semantic, syntactic (lemma), morphological (lexeme or word form), phonological (segments, syllables). Not surprisingly, the same information is captured in the schemas of Construction Morphology, incorporating Jackendoff's Parallel Architecture: phonological, morphological, syntactic information interface with the meaning stratum, which comprises conceptual, pragmatic and discourse information (Booij 2010, 2016; Booij and Audring 2017; Jackendoff and Audring 2016). Schemas are "patterns that express regularities in the language" (Jackendoff 2015: 12). Complex words are seen as instantiations of schemas that mediate between meaning and phonological form, and may contain other words as building blocks. Complex words are stored in a redundant way – both in terms of their constituent morphemes, and as wholes. Schemas can have holistic properties that do not derive from their parts. Complex words are paradigmatically related in word families, as expressed by shared schema information. Schemas are not rules, and they are listed in the lexicon. Schemas are pieces of structure that can be assembled and "unified", and schemas vary in productivity. Importantly, schemas imply full storage of each and every word; what the schema provides is motivation and generalization – for unproductive patterns (*asleep, aboard*) as well as for non-existent bases (*gorgeous, curious*) (Booij and Audring 2018, Chap. 3 this volume), and even in the absence of overt marking (*sheep*, plural) and of semantic compositionality and transparency (*baseball, department*).

How might schemas accommodate the psycholinguistic evidence summarized in this chapter? First, schemas imply full entry: all words are stored, even regularly inflected words, which fits dual-route models that assume both morphemic and full-word representations (cf. Frost et al. 1997; Schreuder and Baayen 1995). Next, all complex words maintain their structural information, their relation to other words from the same paradigm, or to words sharing the same suffix, even in the absence

of semantic transparency (cf. Bölte et al. 2004; Lorenz and Zwitserlood 2016; Lüttmann et al. 2011a, b; Roelofs and Baayen 2002; Zwitserlood 1996). Moreover, treating phrasal constructions such as particle verbs as phrasal lexical items captured by schemas pulls them into the lexicon and explains the similarity of their behaviour to that of morphologically complex words such as prefix verbs (cf. Schriefers et al. 1991; Zwitserlood et al. 1996).

Thus, Construction Morphology can accommodate a number of findings from psycholinguistics, but it seems that this is confined to the representational rather than the processing side of morphology. Processes in Construction Morphology – schema unification is a such process – are clearly different from processes in real-time, online language use. A first problem is that during language comprehension or production in real time, the information represented at different layers of a schema – even within one layer – is not available at the same time, nor all of the time. In speech production, whole-word (or lemma) access to complex words seems to be blind to their internal structure, but both types of information derive from the same schema layer. A next major issue for a psychologically realistic application of Construction Morphology concerns the processing operations performed on stored schema information: what corresponds to lexical access, to parsing, to computation? Is there computation for non-productive schemas? Given the unitary representational format for different types of morphological complexity (derivation, inflection, compounding), are there different operations that correspond to the neural distinction between storage and computation (Bozic and Marslen-Wilson 2010; Marslen-Wilson et al. 2014)? It is clear that Construction Morphology has a lot to offer on the representational side of complex words, but the process side is undeveloped. Given that at least some proponents of Construction Morphology have gone the processing way, it will be exciting to see these problems solved "constructively".

References

Alegre, M., and P. Gordon. 1999. Frequency effects and the representational status of regular inflections. *Journal of Memory and Language* 40: 41–61.

Amenta, S., and D. Crepaldi. 2012. Morphological processing as we know it: An analytical review of morphological effects in visual word identification. *Frontiers in Language Sciences* 3 (232).

Baayen, R.H., C. Burani, and R. Schreuder. 1997a. Effects of semantic markedness in the processing of regular nominal singulars and plurals in Italian. In *Yearbook of morphology 1996*, ed. G. Booij and J. van Marle, 13–34. Dordrecht: Kluwer Academic Publishers.

Baayen, R.H., T. Dijkstra, and R. Schreuder. 1997b. Singulars and plurals in Dutch: Evidence for a parallel dual-route model. *Journal of Memory and Language* 37: 94–117.

Baayen, R.H., J. McQueen, T. Dijkstra, and R. Schreuder. 2003. Frequency effects in regular inflectional morphology: Revisiting Dutch plurals. In *Morphological structure in language processing*, ed. R.H. Baayen and R. Schreuder, 355–390. Berlin: Mouton de Gruyter.

Baayen, R.H., P. Milin, D.F. Đurđević, P. Hendrix, and M. Marelli. 2011. An amorphous model for morphological processing in visual comprehension based on naive discriminative learning. *Psychological Review* 118 (3): 438.

Badecker, W., and A. Caramazza. 1991. Morphological composition in the lexical output system. *Cognitive Neuropsychology* 8 (5): 335–367.

Badecker, W., A. Hillis, and A. Caramazza. 1990. Lexical morphology and its role in the writing process: Evidence from a case of acquired dysgraphia. *Cognition* 35 (3): 205–243.

Bentin, S., and L.B. Feldman. 1990. The contribution of morphological and semantic relatedness to repetition priming at short and long lags: Evidence from Hebrew. *The Quarterly Journal of Experimental Psychology* 42 (4): 693–711.

Bertram, R., M. Laine, and K. Karvinen. 1999. The interplay of word formation type, affixal homonymy, and productivity in lexical processing: Evidence from a morphologically rich language. *Journal of Psycholinguistic Research* 28 (3): 213–226.

Bertram, R., R.H. Baayen, and R. Schreuder. 2000. Effects of family size for complex words. *Journal of Memory and Language* 42 (3): 390–405.

Beyersmann, E., E.M. Dutton, S. Amer, N.O. Schiller, and B. Biedermann. 2015. The production of singular-and plural-dominant nouns in Dutch. *Language, Cognition and Neuroscience* 30: 867–876.

Bick, A.S., R. Frost, and G. Goelman. 2010. Imaging implicit morphological processing: Evidence from Hebrew. *Journal of Cognitive Neuroscience* 22 (9): 1955–1969.

Bölte, J., P. Zwitserlood, and P. Dohmes. 2004. Morphology in experimental speech production research. In *Current research on language production in Germany*, ed. Th. Pechman and Ch. Habel, 431–472. Berlin: Mouton.

Booij, G. 2010. *Construction morphology*. Oxford: Oxford University Press.

———. 2016. Construction morphology. In *The Cambridge handbook of morphology*, ed. A. Hippisley and G. Stump, 424–448. Cambridge: Cambridge University Press.

Booij, G., and J. Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41 (S2): 277–302.

Booij, G., and J. Audring. 2018. Partial motivation, multiple motivation, and the role of output schemas. This volume.

Boudelaa, S., and W.D. Marslen-Wilson. 2015. Structure, form, and meaning in the mental lexicon: Evidence from Arabic. *Language, Cognition and Neuroscience* 30 (8): 955–992.

Bozic, M., and W. Marslen-Wilson. 2010. Neurocognitive contexts for morphological complexity: Dissociating inflection and derivation. *Language and Linguistics Compass* 4 (11): 1063–1073.

Bozic, M., W.D. Marslen-Wilson, E.A. Stamatakis, M.H. Davis, and L.K. Tyler. 2007. Differentiating morphology, form, and meaning: Neural correlates of morphological complexity. *Journal of Cognitive Neuroscience* 19 (9): 1464–1475.

Bozic, M., L.K. Tyler, D.T. Ives, B. Randall, and W.D. Marslen-Wilson. 2010. Bihemispheric foundations for human speech comprehension. *Proceedings of the National Academy of Sciences* 107 (40): 17439–17444.

Brovetto, C., and M.T. Ullman. 2005. The mental representation and processing of Spanish verbal morphology. In *Selected proceedings of the 7th Hispanic linguistics symposium*, ed. D. Eddington, 98–105. Somerville: Cascadilla Proceedings Project.

Burani, C., and A. Laudanna. 1992. Units of representation for derived words in the lexicon. *Advances in Psychology* 94: 361–376.

Caramazza, A. 1997. How many levels of processing are there in lexical access? *Cognitive Neuropsychology* 14 (1): 177–208.

Caramazza, A., and M. Miozzo. 1997. The relation between syntactic and phonological knowledge in lexical access: Evidence from the 'tip-of-the-tongue' phenomenon. *Cognition* 64 (3): 309–343.

Carota, F., M. Bozic, and W.D. Marslen-Wilson. 2016. Decompositional representation of morphological complexity: Multivariate fMRI evidence from Italian. *Journal of Cognitive Neuroscience* 28: 1878. https://doi.org/10.1162/jocn_a_01009.

Chialant, D., and A. Caramazza. 1995. Where is morphology and how is it processed? The case of written word recognition. In *Morphological aspects of language processing*, ed. L.B. Feldman, 55–769. Hillsdale: Lawrence Erlbaum.

Clahsen, H. 1999. Lexical entries and rules of language: A multidisciplinary study of German inflection. *Brain and Behavioral Sciences: An Interdisciplinary Journal of Current Research* 22: 991–1060.

———. 2016. Experimental studies of morphology and morphological processing. In *The Cambridge handbook of morphology*, ed. A. Hippisley and G. Stump, 792–819. Cambridge: Cambridge University Press.

Colé, P., C. Beauvillain, and J. Segui. 1989. On the representation and processing of prefixed and suffixed derived words: A differential frequency effect. *Journal of Memory and Language* 28: 1–13.

Cutler, A. 1995. Spoken word recognition and production. In *Speech, language and communication*, 97–136. New York: Academic.

Cutler, A., J.A. Hawkins, and G. Gilligan. 1985. The suffixing preference: A processing explanation. *Linguistics* 23 (5): 723–758.

Dell, G.S. 1988. The retrieval of phonological forms in production: Tests of predictions from a connectionist model. *Journal of Memory and Language* 27 (2): 124–142.

Dell, G.S., and P.G. O'Seaghdha. 1992. Stages of lexical access in language production. *Cognition* 42 (1): 287–314.

Dohmes, P., P. Zwitserlood, and J. Bölte. 2004. The impact of semantic transparency of morphologically complex words on picture naming. *Brain and Language* 90: 203–212.

Dominguez, A., F. Cuetos, and J. Segui. 1999. The processing of grammatical gender and number in Spanish. *Journal of Psycholinguistic Research* 28: 485–498.

Dominguez, A., J. Segui, and F. Cuetos. 2002. The time-course of inflexional morphological priming. *Linguistics* 40 (2): 235–260.

Drews, E., and P. Zwitserlood. 1995. Orthographic and morphological similarity in visual word recognition. *Journal of Experimental Psychology: Human Perception and Performance* 21 (5): 1098–1116.

Feldman, L.B. 2000. Are morphological effects distinguishable from the effects of shared meaning and shared form? *Journal of Experimental Psychology: Learning, Memory and Cognition* 26 (6): 1431–1444.

———., ed. 2013. *Morphological aspects of language processing*. Hove: Psychology Press.

Feldman, L.B., and E.G. Soltano. 1999. Morphological priming: The role of prime duration, semantic transparency, and affix position. *Brain and Language* 68 (1–2): 33–39.

Frost, R., and J. Grainger. 2000. *Crosslinguistic perspectives on morphological processing*. Hove: Psychology Press.

Frost, R., K.I. Forster, and A. Deutsch. 1997. What can we learn from the morphology of Hebrew? A masked-priming investigation of morphological representation. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 23: 829.

Frost, R., A. Deutsch, O. Gilboa, M. Tannenbaum, and W. Marslen-Wilson. 2000. Morphological priming: Dissociation of phonological, semantic, and morphological factors. *Memory & Cognition* 28 (8): 1277–1128.

Garrett, M.F. 1988. Processes in language production. In *Linguistics: The Cambridge survey*, ed. F. Newmeyer, vol. 3, 69–96. Cambridge: Cambridge University Press.

Giraudo, H., and S. dal Maso. 2018. Towards a constructional approach of L2 morphological processing. This volume.

Giraudo, H., and J. Grainger. 2001. Priming complex words: Evidence for supralexical representation of morphology. *Psychonomic Bulletin & Review* 8 (1): 127–131.

Giraudo, H., and M. Voga. 2014. Measuring morphology: The tip of the iceberg? A retrospective on 10 years of morphological processing. *Cahiers de Grammaire* 22: 136–167.

Gonnerman, L.M., M.S. Seidenberg, and E.S. Andersen. 2007. Graded semantic and phonological similarity effects in priming: Evidence for a distributed connectionist approach to morphology. *Journal of Experimental Psychology: General* 136 (2): 323.

Grainger, J., P. Colé, and J. Segui. 1991. Masked morphological priming in visual word recognition. *Journal of Memory and Language* 30 (3): 370–384.

Gumnior, H., J. Bölte, and P. Zwitserlood. 2006. A chatterbox is a box: Morphology in German word production. *Language and Cognitive Processes* 21: 920–944.

Hagoort, P. 2005. On Broca, brain, and binding: A new framework. *Trends in Cognitive Sciences* 9 (9): 416–423.

Hickok, G., and D. Poeppel. 2000. Towards a functional neuroanatomy of speech perception. *Trends in Cognitive Sciences* 4 (4): 131–138.

Jackendoff, R. 2015. In defense of theory. *Cognitive Science* 41 (S2): 185–212.

Jackendoff, R., and J. Audring. 2016. Morphological schemas. *The Mental Lexicon* 11 (3): 467–493.

Janssen, N., Y. Bi, and A. Caramazza. 2008. A tale of two frequencies: Determining the speed of lexical access for Mandarin Chinese and English compounds. *Language and Cognitive Processes* 23 (7–8): 1191–1223.

Koester, D., and N.O. Schiller. 2008. Morphological priming in overt language production: Electrophysiological evidence from Dutch. *NeuroImage* 42 (4): 1622–1630.

———. 2011. The functional neuroanatomy of morphology in language production. *NeuroImage* 55 (2): 732–741.

Kolan, L., M. Leikin, and P. Zwitserlood. 2011. Morphological processing and lexical access in speech production in Hebrew: Evidence from picture-word interference. *Journal of Memory and Language* 65 (3): 286–298.

Laudanna, A., and C. Burani. 1995. Distributional properties of derivational affixes: Implications for processing. In *Morphological aspects of language processing*, ed. L.B. Feldmann, 345–364. Hillsdale: Lawrence Erlbaum.

Lehtonen, M., and M. Laine. 2003. How word frequency affects morphological processing in monolinguals and bilinguals. *Bilingualism: Language and Cognition* 6: 213–225.

Leminen, A., and H. Clahsen. 2014. Brain potentials to inflected adjectives: Beyond storage and decomposition. *Brain Research* 1543: 223–234.

Levelt, W.J.M. 1989. *Speaking. From intention to articulation*. Cambridge, MA: MIT Press.

Levelt, W.J., A. Roelofs, and A.S. Meyer. 1999. A theory of lexical access in speech production. *Behavioral and Brain Sciences* 22 (1): 1–38.

Longtin, C.M., J. Segui, and P.A. Hallé. 2003. Morphological priming without morphological relationship. *Language and Cognitive Processes* 18 (3): 313–334.

Lorenz, A., and P. Zwitserlood. 2014. Processing of nominal compounds and gender-marked determiners in aphasia: Evidence from German. *Cognitive Neuropsychology* 31: 40–74.

———. 2016. Semantically transparent and opaque compounds in German noun-phrase production: Evidence for morphemes in speaking. *Frontiers in Psychology* 7: 1943.

Lüttmann, H., P. Zwitserlood, A. Böhl, and J. Bölte. 2011a. Evidence for morphological composition at the form level in speech production. *Journal of Cognitive Psychology* 23: 818–833.

Lüttmann, H., P. Zwitserlood, and J. Bölte. 2011b. Sharing morphemes without sharing meaning: Production and comprehension of German verbs in the context of morphological relatives. *Canadian Journal of Experimental Psychology* 65 (3): 173–191.

Manelis, L., and D.A. Tharp. 1977. The processing of affixed words. *Memory & Cognition* 5 (6): 690–695.

Marslen-Wilson, W. 1999. Abstractness and combination: The morphemic lexicon. In *Language processing*, ed. S. Garrod and M.J. Pickering, 101–119. Hove: Psychology Press.

Marslen-Wilson, W. D. 2007. Processes in language comprehension. In M.G. Gaskell (Ed.),*The Oxford handbook of psycholinguistics*, 11(175), 495–524 Oxford: Oxford University Press

Marslen-Wilson, W., L.K. Tyler, R. Waksler, and L. Older. 1994. Morphology and meaning in the English mental lexicon. *Psychological Review* 101 (1): 3–33.

Marslen-Wilson, W., M. Bozic, and L.K. Tyler. 2014. Morphological systems in their neurobiological contexts. In *The cognitive neurosciences*, ed. M.S. Gazzaniga and G.R. Mangun, 5th ed. Cambridge, MA: MIT Press.

Meunier, F., and W. Marslen-Wilson. 2004. Regularity and irregularity in French verbal inflection. *Language and Cognitive Processes* 19: 561–580.

Napps, S.E. 1989. Morphemic relationships in the lexicon: Are they distinct from semantic and formal relationships? *Memory and Cognition* 17: 729–739.

New, B., M. Brysbaert, J. Segui, L. Ferrand, and K. Rastle. 2004. The processing of singular and plural nouns in French and English. *Journal of Memory and Language* 51: 568–585.

Orsolini, M., and W. Marslen-Wilson. 1997. Universals in morphological representation: Evidence from Italian. *Language and Cognitive Processes* 12: 1–47.

Osgood, C.E., and R. Hoosain. 1974. Salience of the word as a unit in the perception of language. *Attention, Perception, & Psychophysics* 15 (1): 168–192.

Pinker, S. 1999. *Words and rules: The ingredients of language*. New York: Harper Collins.

Pinker, S., and M.T. Ullman. 2002. The past and future of the past tense. *Trends in Cognitive Sciences* 6: 456–463.

Plaut, D.C. 2011. Connectionist perspectives on lexical representation. In *Lexical representation: A multidisciplinary approach*, ed. G. Gaskell and P. Zwitserlood, 149–169. Berlin: De Gruyter.

Prasada, S., and S. Pinker. 1993. Generalisation of regular and irregular morphological patterns. *Language and Cognitive Processes* 8: 1–56.

Rastle, K., and M.H. Davis. 2008. Morphological decomposition based on the analysis of orthography. *Language and Cognitive Processes* 23 (7–8): 942–971.

Rastle, K., M.H. Davis, W.D. Marslen-Wilson, and L.K. Tyler. 2000. Morphological and semantic effects in visual word recognition: A time-course study. *Language and Cognitive Processes* 15 (4–5): 507–537.

Raveh, M., and J.G. Rueckl. 2000. Equivalent effects of inflected and derived primes: Long-term morphological priming in fragment completion and lexical decision. *Journal of Memory and Language* 42 (1): 103–119.

Reid, A.A., and W.D. Marslen-Wilson. 2003. Lexical representation of morphologically complex words: Evidence from polish. In *Morphological structure in language processing*, ed. R.H. Baayen and R. Schreuder, 287–336. Berlin: Mouton de Gruyter.

Reifegerste, J., A.S. Meyer, and P. Zwitserlood. 2017. Inflectional complexity and experience affect plural processing in younger and older readers of Dutch and German. *Language, Cognition and Neuroscience* 32 (4): 471–487.

Roelofs, A., and R.H. Baayen. 2002. Morphology by itself in planning the production of spoken words. *Psychonomic Bulletin & Review* 9 (1): 132–138.

Rueckl, J.G., M. Mikolinski, M. Raveh, C.S. Miner, and F. Mars. 1997. Morphological priming, fragment completion, and connectionist networks. *Journal of Memory and Language* 36 (3): 382–405.

Schreuder, R., and R.H. Baayen. 1995. Modeling morphological processing. In *Morphological aspects of language processing*, ed. L.B. Feldman, 131–154. Hove: Erlbaum.

Schriefers, H., P. Zwitserlood, and A. Roelofs. 1991. The identification of morphologically complex spoken words: Continuous processing or decomposition? *Journal of Memory and Language* 30 (1): 26–47.

Smolka, E., P. Zwitserlood, and F. Rösler. 2007. Stem access in regular and irregular inflection: Evidence from German participles. *Journal of Memory and Language* 57 (3): 325–347.

Smolka, E., P.H. Khader, R. Wiese, P. Zwitserlood, and F. Rösler. 2013. Electrophysiological evidence for the continuous processing of linguistic categories of regular and irregular verb inflection in German. *Journal of Cognitive Neuroscience* 25 (8): 1284–1304.

Smolka, E., K.H. Preller, and C. Eulitz. 2014. 'Verstehen'('understand') primes 'stehen'('stand'): Morphological structure overrides semantic compositionality in the lexical representation of German complex verbs. *Journal of Memory and Language* 72: 16–36.

Sonnenstuhl, I., S. Eisenbeiss, and H. Clahsen. 1999. Morphological priming in the German mental lexicon. *Cognition* 72: 203–236.

Soveri, A., M. Lehtonen, and M. Laine. 2007. Word frequency and morphological processing in Finnish revisited. *Mental Lexicon* 2 (3): 359–385.

Stanners, R.F., J.J. Neiser, W.P. Hernon, and R. Hall. 1979. Memory representation for morphologically related words. *Journal of Verbal Learning and Verbal Behavior* 18: 399–412.

Stemberger, J.P., and B. MacWhinney. 1986. Frequency and the lexical storage of regularly inflected forms. *Memory and Cognition* 14: 17–26.

Taft, M. 1979. Recognition of affixed words and the word frequency effect. *Memory & Cognition* 7 (4): 263–272.

———. 1994. Interactive-activation as a framework for understanding morphological processing. *Language and cognitive Processes* 9 (3): 271–294.

———. 2004. Morphological decomposition and the reverse base frequency effect. *Quarterly Journal of Experimental Psychology Section A* 57 (4): 745–765.

Taft, M., and K.I. Forster. 1975. Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning & Verbal Behavior* 14 (6): 638–647.

———. 1976. Lexical storage and retrieval of polymorphemic and polysyllabic words. *Journal of Verbal Learning & Verbal Behavior* 15 (6): 607–620.

Tyler, L.K., W. Marslen-Wilson, J. Rentoul, and P. Hanney. 1988. Continuous and discontinuous access in spoken word-recognition: The role of derivational prefixes. *Journal of Memory and Language* 27 (4): 368–381.

Ullman, M.T. 2001. The declarative/procedural model of lexicon and grammar. *Journal of Psycholinguistic Research* 30: 37–69.

Verdonschot, R.G., R. Middelburg, S.E. Lensink, and N.O. Schiller. 2012. Morphological priming survives a language switch. *Cognition* 124 (3): 343–349.

Veríssimo, J., and H. Clahsen. 2009. Morphological priming by itself: A study of Portuguese conjugations. *Cognition* 112: 187–194.

Westermann, G., and N. Ruh. 2012. A neuroconstructivist model of past tense development and processing. *Psychological Review* 119 (3): 649.

Wurm, L.H. 1997. Auditory processing of prefixed English words is both continuous and decompositional. *Journal of Memory and Language* 37 (3): 438–461.

Zwitserlood, P. 1994. Processing and representation of Dutch compounds: Effects of semantic transparency. *Language and Cognitive Processes* 9 (3): 341–368.

———. 1996. Form priming. *Language and Cognitive Processes* 11 (6): 589–596.

———. 2003. The internal structure of words: Consequences for listening and speaking. In *Phonetics and phonology in language comprehension and production. Differences and similarities*, ed. N.O. Schiller and A.S. Meyer, 79–114. Berlin: Mouton de Gruyter.

———. 2004. Sublexical and morphological information in speech processing. *Brain and Language* 90: 368–377.

Zwitserlood, P., E. Drews, A. Bolwiender, and E. Neuwinger. 1996. Kann man Geschenke umbringen? Assoziative Bahnungsexperimente zur Bedeutungsheterogenität von Verben. In *Perspektiven der kognitiven Linguistik*, ed. C. Habel, S. Kanngießer, and G. Rickheit. Opladen: Westdeutscher Verlag.

Zwitserlood, P., J. Bölte, and P. Dohmes. 2000. Morphological processing and speech production: Evidence from picture naming. *Language and Cognitive Processes* 15: 563–591.

———. 2002. Where and how morphologically complex words interplay with naming pictures. *Brain and Language* 81: 358–367.

Zwitserlood, P., A. Bolwiender, and E. Drews. 2005. Priming morphologically complex verbs by sentence contexts: Effects of semantic transparency and ambiguity. *Language and Cognitive Processes* 20: 395–415.

Towards a Constructional Approach of L2 Morphological Processing

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Abstract Following Silva & Clahsen seminal work, psycholinguistic research on L2 morphological processing has mainly adopted a morpheme-based, decompositional dual route approach suggesting that L2 learners have a limited access to morphological representation during processing and consequently rely more on lexical storage (Clahsen H, Felser C, Neubauer K, Sato M, Silva R, Lang Learn 60:21–43, 2010; Clahsen and Felser, 2017). Therefore, experimental research, which largely used the masked priming paradigm, mainly focused on the distinction between storage and computation as two alternative, mutually exclusive and competing mechanisms. In this paper, we claim that a word-based approach, which considers morphology in terms of constructional schemas, allows us to overcome the rule *vs.* list fallacy and therefore reshapes the dichotomy between L1 and L2 processing mechanisms. Although a consistent proposal is still out of reach, given that data on L2 processing are limited, we will discuss the advantages of a model which jointly considers formal and semantic similarities, as well as paradigmatic proprieties.

Keywords Second language acquisition · L1-L2 morphological processing · Masked priming

1 Introduction

The first psycholinguistic studies on second language acquisition (SLA) claimed that the processing of morphologically complex words operates differently in native (L1) and non-native speakers (L2) (see for a review Clahsen et al. 2010). According to this view, adult second language learners, even at the highest levels of L2

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proficiency, because of their limited access to the procedural memory system, would be less efficient in parsing complex words in their morphological constituents and consequently in computing the morphological structure of complex words. On the contrary, they would rely more than native speakers on lexical storage during word recognition. As we will discuss, such an interpretation is deeply rooted in a dual route 'decompositional' psycholinguistic model of processing and lexical access and clearly refers to morpheme-based approaches to morphology. A growing body of results, however, cannot be accounted for within this model and suggests an alternative picture of L2 processing (Feldman et al. 2010; Voga et al. 2014; Dal Maso and Giraudo 2014; Coughlin and Tremblay 2015) which strongly calls into question the proposed strict opposition between native and non-native processing and, more generally, the decompositional perspective on which it is based. In the present contribution, we will review highly debated issues in this still relatively young domain (i.e., the dichotomy between inflection and derivation, the dichotomy between regularly and irregularly inflected forms, frequency and series effects), and we will suggest that a word-based approach which considers morphology in terms of constructional schemas, as in Construction Morphology (CxM), is better suited to account for L2 processing mechanisms. Although a consistent proposal is still out of reach, given that data on L2 processing are limited, we aim at discussing the advantages of a model which jointly considers formal and semantic similarities, as well as paradigmatic proprieties.

2 Masked Priming Research on Morphological Processing

In the last 20 years of psycholinguistic research, the nature of connections among morphologically connected word in the mental lexicon has been investigated mostly by means of the masked priming technique, generally associated with a lexical decision task (LDT). Basically, in masked priming (Forster and Davis 1984), a prime word, which is virtually invisible to the participants because of its brief presentation times (<60 ms), precedes the presentation of a target word on which participants are asked to perform a lexical decision (i.e., decide as quickly and accurately as possible if the item is a word or not) while their recognition latencies are recorded. The masked priming experimental technique has been considered as particularly suited to explore the automatic and unconscious processes occurring in the speakers' minds during word processing because, since participants are not aware of the presentation of the first stimulus, they cannot develop any predictive response strategy. Therefore, any facilitation observed in masked priming experiments cannot be considered to derive from a conscious appreciation of the relation between the prime and the target and a consequent metalinguistic reasoning (Forster 1998). As for the processing mechanisms, this technique provides the possibility to explore the automatic transfer of facilitation or inhibition from the prime to the target in different priming conditions. Morphological effects are usually examined by comparing the facilitation induced by a prime on the recognition of a morphologically related target word

(e.g., *singer/SING*) with the effect of an unrelated prime on the recognition of the same target (e.g., *banker/SING*). Recently, morphological effects have been more frequently observed in relation to an orthographic condition (e.g. sinner*/SING*) in order to exclude the existence of any facilitation induced by the formal/orthographic overlap within the prime-target pair.

From the seminal repetition priming study conducted by Stanners et al. (1979) to the most recent investigations combining masked priming with techniques which observe brain activity (e.g., Morris et al. 2013), morphological priming effects have been extensively studied and have systematically revealed strong facilitation effects in a large number of languages with different morphological features; German and Dutch: Drews and Zwitserlood (1995); French: Grainger and Dal Maso (2016a, b); Arabic: Boudelaa and Marslen-Wilson (2011); Chinese: Ding et al. (2004); Japanese: Clahsen and Ikemoto (2012); Korean: Kim et al. (2015). The fact that experimental results exhibiting morphological effects (where a morphologically related prime facilitates the recognition latency of its base presented as the target) differ significantly from formal and semantic relationships (where a mere formal and/or a mere semantically related prime is actually used as a base of comparison), led the authors to conclude that independent morphological representations were coded within the mental lexicon in a similar way as orthographic, phonological, and semantic representations. In the present paper, therefore, we will mainly refer to results obtained within this experimental paradigm, in order to deal with comparable data, although we may occasionally mention outcomes obtained using other techniques (namely, overt or cross-modal priming).

Although the role of morphology is quite unanimously acknowledged, a lively debate has developed on its interpretation in terms of models of lexical access and processing. Specifically, theoretical positions crucially differ as for the *locus* of morphological representations within the lexicon (i.e., pre-lexical or lexical) and therefore its functioning mechanisms (parsing vs lexical organization). The pre-lexical, decompositional, morpheme-based account, claims that in processing morphologically complex stimuli (e.g., *singer*), an obligatory morphemic parsing takes place and word representations are accessed through their morphemic components (e.g., *sing* and *-er*) (Taft and Forster 1975; Taft 1994; Marslen-Wilson and Tyler 1997; Rastle and Davis 2008). The supra-lexical approach, on the other hand, proposes a crucially different perspective (Giraudo and Grainger 2000, 2001; Giraudo and Voga 2007, 2014): morphologically structured stimuli are accessed through their whole-word forms (i.e., lexical representations), which in turn contact the morphological units they are made up of. In this model, these supra-lexical units are supposed to be abstract nodes that stand at the interface between whole-word forms (coded at the lexical level) and meaning representations (coded at the semantic level) and organize words in paradigms i.e., morphological families and

series[1] (Giraudo and Grainger 2000, 2001; Pastizzo and Feldman 2002; Giraudo and Voga 2007, 2014).

In SLA, the domain of empirical investigations of morphological processing is relatively young and although experimental research that focuses on the cognitive on-line processes using the masked priming paradigm has been developing only recently, and the available results are still quantitatively limited.[2] Moreover, because of inherent difficulties of experimentation with non-native speakers, and because of methodological discrepancies, the studies so far conducted have resulted in rather controversial evidences as to the efficiency and nature of morphological processing mechanisms in L2 (compared to L1), so that the question whether morphology plays a role at all is still an open one. In SLA research, the discussion aims at determining whether L1 and L2 morphological processing mechanisms are substantially different or that the observed differences can be accounted for in terms of different proficiencies in the two linguistic systems. Ultimately, the question is to verify whether L1 and L2 morphological processing are qualitatively or quantitatively different. Thus, research on morphological processing contributes to a more general debate on L2 online functioning, in which two main positions are confronted. On the one hand, some researchers maintain that L1 and L2 have the same processing system and that any difference emerged in empirical studies can be accounted in terms of slower, i.e. more memory-demanding cognitive processes (Ellis 2005; Perani and Abutalebi 2005; McDonald 2006; Abutalebi and Green 2008; MacWhinney 2011) and possibly affected by L1 transfer (Sabourin and Haverkort 2003; Portin et al. 2007; Chen et al. 2007). On the other hand, a different position claims that the mechanisms underlying native and non-native processing are substantially different (Silva and Clahsen 2008; Neubauer and Clahsen 2009; Kirkici and Clahsen 2013; Jacob et al. 2013; Heyer and Clahsen 2015; Bosch and Clahsen 2016). This latter view is mainly based on the declarative/procedural model (DP) proposed by Ullman (2004), which distinguishes between a computational system involved in the processing of the combinatorial rules of language (i.e., computation) and a memory system which is responsible for the storage of memorized words.[3] On the basis of the DP model, some researchers have interpreted the differences between native and non-native performances as an evidence of the fact that L2 learners rely considerably more on the declarative system as their

[1]There also exists 'hybrid', dual-route models (i.e., the AAM, Augmented Addressed Morphology developed by Burani and Caramazza (1987) and Caramazza et al. (1988), and the Morphological Race Model proposed by Schreuder and Baayen (1995) which posits two different ways of processing complex words, the choice of which crucially depends on their surface frequency: highly frequent words will be accessed directly through their whole form, while less frequent ones will be parsed and accessed via their constituents.

[2]In SLA, the cross-language priming is also used, mainly in order to investigate the lexical rather than the morphological processing (Potter et al. 1984; Kroll and Stewart 1994). On cross-language priming in morphological research, see Voga (2005), Basnight-Brown et al. (2007), on auditory priming Gor and Cook (2010); Gor and Jackson (2013).

[3]However, see Ullman (2006) on Clahsen's interpretation of the DP model.

procedural system is 'impaired' or not (completely) available. As far as morphology is concerned, this would imply that morphological information is not encoded in the L2 mental lexicon or that its functioning is not as efficient as for native speakers. Such a claim is a coherent extension of the 'shallow-structure hypothesis (SSH)' formulated for L2 processing of syntax and morphosyntax (Clahsen and Felser (2006); see Clahsen and Felser (2017) for an up-to-date account and revision of SSH). Such a hypothesis suggests that in L2 learners, syntactic parsing is not supported to the extent it is in L1 speakers and that consequently, L2 sentence processing is based on lexical semantic cues rather than on syntactic cues.

So, as the storage vs computation opposition seems to be a crucial point in order to grasp the L1 and L2 differences, in what follows, we will discuss the domains traditionally exploited to disentangle the two mechanisms in native processing, i.e., inflection and derivation, regular and irregular inflection, and frequency effects. We will suggest that assuming a 'constructional' perspective on L2 processing allows us to overcome the traditional storage *vs* computational dichotomy and consequently the well-known 'rule/list fallacy' (Langacker 1987), according to which linguistic constructs are either created by rules or listed in the lexicon. We claim that the fact that a complex word might be 'listed', i.e., memorized in the mental lexicon, does not necessarily exclude that it is at the same time linked to a 'rule', i.e., a regular pattern, such as a morphological schema. Morphological schemas have the function of encoding the predictable properties of existing complex words and by doing so, to give structure to the lexicon as they group complex words in families (i.e., words with the same base) and series (i.e., words with the same affix) (Booij 2010: 4). Morphological schemas also indicate how new words can be coined but, as psycholinguistic research has not considered speakers 'creative competence', this specific function of morphological schemas will not be discussed here.

3 Inflection *vs* Derivation

3.1 Storage and Computation

The opposition between inflection and derivation is one of the most debated issues in the research on L2 processing, and has been considered by some scholars as a critical domain to capture the specificity of non-native processing mechanisms. Starting from the observation that the facilitation effect typically obtained with inflected primes in L1 does not systematically emerge with L2 learners, a specific 'impairment' of the computational component (compared to the storage component) has been hypothesized for L2 processing. However, as detailed below, both the results obtained so far and the interpretations proposed are not completely consistent, especially as far as inflection is concerned, so that implications in terms of theoretical models of L2 processing are still tentative. The lack of consensus on the efficiency of both inflected and derived primes is due to both theoretical

and pragmatic factors. As for the latter, in the still relatively young domain of L2 processing research, only a limited number of studies have systematically considered both inflection and derivation (e.g., Diependaele et al. 2011; Dal Maso and Giraudo 2014 only focus on derivation) and even when both systems have been investigated, they have been rarely directly compared (at least until recent experiments by Jacob et al. (2017) and Dal Maso and Giraudo (submitted)). On the other hand, divergent interpretations of results reflect the different theoretical positions taken with respect to the demarcation between inflection and derivation, which is a classical issue for morphological theories. A strong and relatively clear-cut dichotomy between the two kinds of processes is advocated by the 'split morphology' hypothesis (Anderson 1982; Perlmutter 1988). This view claims two separated components of the grammar: derivation, located in a pre-syntactic morphological component, which functions to enrich the lexicon, and inflection, located in a post-syntactic component, which only spells out the correct inflectional form of the word depending on its position in the syntactic structure. An alternative view posits only one morphological component and a sort of inflection – derivation *continuum*, articulated according to the mapping of relationships between different word forms through associatively linked orthographic, phonological and semantic codes. This view, thus, implies a gradient, rather than a simple inflection *vs* derivation dichotomy (Bybee 1985; Dressler 1989; Plank 1994; Booij 1996).

Crucially, in CM both inflection and derivation are represented as constructions, which exhibit holistic properties (both formal and semantic ones) that do not derive only from word- internal constituents, but rather from their paradigmatic organization. Taking such a word-based network perspective, CM is thus less concerned with the internal 'building blocks' of morphologically complex forms, but rather in their organizations in morphological families (words that share the same base) and morphological series (words that share the same affixation patterns, see Booij 2010: 32). CM has been proven to be particularly effective to account for a certain number of relatively common phenomena in inflectional systems, which are highly problematic for morpheme-based approaches and derive from the fact that in no language there is a one-to-one correspondence between the building blocks of inflected words and their morpho-semantic properties. Morpheme-based approaches described such cases of morpho-syntactic and morpho-semantic opacity in terms of notions like cumulative exponence, extended exponence, stem allomorphy, inflectional classes, thematic vowels, syncretism, suppletion, etc. From a constructionist point of view, on the other hand, it is the schema as whole, which evokes a specific set of morpho-syntactic and morpho-semantic properties, and thus the set of properties is a holistic property of the inflectional construction. That is, inflectional phenomena provide direct evidence for the idea that morphologically complex words should be seen as constructions with holistic properties (Booij 2010: 22).

Experimental research on native speakers has investigated the psychological reality of linguistic distinctions between inflected and derived words, without solving

the theoretical diverging positions, which are replicated in essentially two families of psycholinguistic models (see Diependaele et al. 2012 for a detailed discussion of these psycholinguistic models). Basically, morpheme-based approaches gave rise to dual mechanism accounts which mainly argue that the linguistic distinction between inflection and derivation is reflected in the manner in which morphologically complex words are represented and processed (Stanners et al. 1979; Taft 1985, 1994; Henderson 1985; Pinker 1991; Pinker and Prince 1988; Clahsen et al. 2003). Stanners et al. (1979), for instance, hold that derivational forms are explicitly stored in the mental lexicon, but regularly inflected forms are not. Inflected forms, by virtue of their paradigmatic nature and semantic predictability are processed by applying rule-governed computations to the representations of their constituent morphemes. In contrast, given the semantic unpredictability of derived forms, rule-governed computation would be exceptionally costly and error-prone; consequently, the processing of derived words would rely on stored whole word representations. According to this view, the processing of inflected and derived forms relies on two qualitatively distinct mechanisms: rule-governed computation for inflected forms and lexical look-up for derived words. Stanners et al. (1979) seem to provide empirical results supporting the view according to which inflection and derivation are represented and processed differently. They found that lexical decisions were facilitated when base-form targets were preceded by inflected primes (e.g., *pours/POUR*) and that this effect was equal in magnitude to identity priming (e.g., *pour/POUR*). In contrast, the priming effect from suffixed derived words (e.g., *appearance/APPEAR*) although statistically significant, was smaller than the identity priming effect.

Network and connectionists models, and of course CxM, on the other hand, are generally compatible with associative single-mechanism models which claim that all inflected words are stored and processed within a single associative system using distributed representations (Fowler et al. 1985; Sereno and Jongman 1997; Gonnerman et al. 2007). Under this perspective, connections across words would not be determined by the nature of the process at their origin, but would rather be a function of the degree of semantic and phonological /orthographic overlapping, the frequency of the whole form, the size, salience and consistency of morphological families and series they belong to, etc. Results of direct comparisons between priming effects induced by inflected and derived forms seem to confirm this line of interpretation as no substantial difference emerged in the two conditions. Raveh and Rueckl (2000) manipulated inflected and derived primes paired with the same target word (e.g., *believed*/*BELIEVE* and *believer*/*BELIEVE*); moreover, both kinds of primes equated in terms of their orthographic similarity to the targets. With this experimental design, equivalent effects for inflected and derived primes were obtained across these experiments. Thus, for Raveh and Rueckl (2000) there is no support for the claim that different classes of morphologically complex words are processed in different ways: "our results indicate that the syntactic and semantic differences between inflections and derivations are not *sufficient* to produce a

difference in the manner in which these classes of words are processed. At least in the case of visual word recognition, lexical processes do not appear to be organized around morphological categories *per se*. If further research shows that in some circumstances (e.g., with high frequency primes) inflections and derivations do give rise to priming effects of different magnitudes, the account of those results cannot be in terms of linguistic categories. Instead, a more fine-graded analysis couched in terms of the interaction of a variety of statistical and structural variables will be required" (Raveh and Rueckl 2000: 116).

Before turning to results of studies on L2 processing, an important point need to be discussed, namely the 'parsing' mechanism which is generally associated with the morphological effect, and the 'affix stripping mechanism' which is advocated to be at the base of all morphological effects. In fact, although both dual models and holistic ones acknowledge a role for morphology during word processing and access, they crucially differ with respect to the *locus* of morphological representation within the lexicon (i.e., pre- or post-lexical) and therefore its functioning mechanisms (parsing vs lexical organization). According to morpheme-based accounts, the processing of a morphologically complex stimulus (e.g., *walked, walker*) implies a pre-lexical obligatory morphemic parsing, and word representations are accessed through their morphemic components (e.g., *walk* and *–ed/ -er*) (Taft and Forster 1975; Taft 1994; Marslen-Wilson and Tyler 1997; Rastle and Davis 2008). The so-called 'full priming'[4] effect found with regular inflected forms would indicate that these forms are recognized by first decomposing the whole-word into its morphological constituents and then accessing the representation of the base. Hence, identical and inflected primes give rise to equivalent magnitudes of priming because in both cases, the same access unit is activated by the prime and the target. In contrast, the 'partial priming' or 'reduced priming' (relative to the identity condition) found for irregular inflections would indicate that these forms are not parsed into their constituent morphemes and are instead recognized by directly accessing their whole-word representations in the lexicon. Holistic models (i.e., the supra-lexical approach) propose a crucially different perspective: because all morphologically structured stimuli are accessed through their whole-word forms, no difference is expected between inflections and derivations or between regulars and irregulars. Two morphologically related words prime each other thanks to the fact that their lexical representations are indirectly linked via supralexical representations that cluster together words from the same morphological family and from the same series. Masked priming effects obtained with pseudo-derived words like *corner-corn* (see Rastle and Davis 2008 who reviewed the systematic positive priming effects found for this type of prime-target pairs) are explained in this model in terms of surface formal effects (see Giraudo and Dal Maso 2016b for a discussion).

[4]Morphological and identity primes produce the same amount of priming on target recognition.

3.2 L1 Vs L2: Different Patterns of Morphological Facilitation?

Starting from the seminal work by Silva and Clahsen (2008) on L2 English, priming effects with derived primes emerged regularly in L2 Turkish (Kirkici and Clahsen 2013), in L2 Italian (Dal Maso and Giraudo 2014) and in L2 English (Heyer and Clahsen 2015). In all these studies, a derived prime triggers facilitation in the recognition of the target relative to an unrelated condition and, in some cases, relative to an orthographic/formal condition as well. In fact, the only study which failed to observe a morphological facilitation with derived primes is the one conducted by Clahsen and Neubauer (2010), in which nominalizations in *–ung* in L2 German were considered (e.g., *Bezahlung* 'payment' did not prime *BEZAHLEN* 'pay').

A more complex experimental design has been used by Diependaele et al. (2011) who manipulated three types of prime-target pairs with different degrees of formal overlapping and semantic transparency: transparent suffixed primes (e.g., *viewer /VIEW)*, opaque or pseudo-suffixed primes (e.g., *corner/CORN*), and form control primes (e.g., *freeze/FREE*). This experimental design aimed at assessing on the one hand, the effect of semantic transparency between prime and target and, on the other, the role of formal, orthographic factors. The goal thus was to verify the hypothesis of a stronger reliance on orthographic representations and on word forms in non-native speakers' processing (as proposed by Feldman et al. 2010, but on this point see § 4). The masked priming experiment conducted with two groups of late bilinguals (i.e., Spanish-English and Dutch-English) revealed a graded pattern of facilitation across conditions, i.e., priming effects were largest in the transparent condition, smallest in the control formal condition and intermediate in the opaque condition. Taken together, these results indicate that the priming effects induced by transparent derived primes are stable (at least relative to the unrelated condition) and quite univocally observed.

A quite different and more complex picture emerges, on the contrary, for inflection. Basically, Clahsen and collaborators failed to obtain morphological effects induced by inflected primes (Silva and Clahsen 2008 in L2 English; Neubauer and Clahsen (2009) in L2 German; Kirkici and Clahsen (2013) in L2 Turkish), whereas Feldman et al. (2010), Voga et al. (2014) and Coughlin and Tremblay (2015) consistently found significant priming effects triggered by inflected forms in L2 English.

The most striking L1 – L2 difference has been found with regularly inflected past tense forms: both Silva and Clahsen (2008) for L2 English (e.g., *walked/WALK*) and Neubauer and Clahsen (2009) for L2 German (e.g., *geordnet – ORDNE* 'arrange-(I) arrange') obtained no significant priming effect for L2 speakers, as opposed to L1 speakers, whose reaction times were significantly faster in the morphological condition with respect to the control baseline. Starting from these initial findings, and considering the 'partial' or even absent priming effect with derived forms, it was proposed that L2 morphological processing is overall 'impaired' (and regular

inflection more clearly) or not operative during the early stages of word recognition. It should be kept in mind that in Clahsen and colleagues' works, morphological priming implies the decomposition of complex forms in morphological constituents and lexical access through the isolated stem. Accordingly, what is impaired in L2 learners is the ability to decompose the words into stem and inflectional suffix because of a L2 learners' limitation of the procedural memory system and an overreliance on lexical storage.

This initial hypothesis was later confirmed by Kirkici and Clahsen (2013) who focused on regularly inflected forms (e.g., the Aorist verb form) and on deadjectival nominalizations in L2 Turkish. Again, no significant morphological effects were yielded by inflected primes, whereas significant priming effects were induced by derivationally related primes.[5] Kirkici and Clahsen (2013) explained the diverging patterns of results for inflection and derivation by suggesting that priming for derived words would arise via the lexical route, whereas a 'lexically mediated' priming would not be possible for inflected forms. "Since regularly inflected forms do not have their own lexeme entries, morphological decomposition is the only source of masked priming effects for regular inflection. This means that during early visual word recognition in an L2, a lexeme such as [walk] is not activated by the prime/walked/because *walked* is not morphologically decomposed, and hence there is no priming in such cases" (Kirkici and Clahsen 2013: 786).[6]

Thus, the crucial difference between L1 and L2 processing would consist in the efficiency of the decomposition mechanism, as without a successful process of affix stripping there can be no access to the stem shared by inflected words and their base. The conclusion therefore is that: "advanced L2 learners' lexical representations of morphologically complex words are identical to those of L1 speakers, but (unlike in the L1) L2 processing does not make use of morphological decomposition. Consequently, masked priming effects in the L2 can only arise in cases in which prime and target words share lexical entries" (Kirkici and Clahsen 2013: 787). Therefore, in the interpretation proposed by the authors the contrast between inflection and derivation would be even more visible in L2 than in L1 data.

Such an explanation raises, however, some concerns regarding its psychological plausibility because it claims that in L2, representations of inflected forms are neither lexically nor morphologically connected, which would turn out to be the less efficient (and most costly) choice for the learners. Even if we assumed that

[5]Similar results were obtained by Jacob et al. (2013) with Russian learners of L2 German processing past participle forms (-t participle *gestoppt-stoppe* 'stopped-(I) stop; -n participles with no stem change *gesalzen-salze* 'salted-(I) salt'; -n participle with stem change *gestohlen-stehle* 'stolen-(I) steal') using, though, a cross-modal priming (e.g. auditory primes and visual targets).

[6]"Here we suggest that morphological decomposition is not operative during early L2 word recognition and that this causes the unusual morphological priming patterns reported for L2 learners (Kirkici and Clahsen 2013: 786)."The L2 data provided clear psycholinguistic evidence for a contrast between inflection and derivation, which was not visible from L1 data. This contrast is consistent with that posit precisely the kind of split observed in the L2 data" (Kirkici and Clahsen 2013: 787).

morphological decomposition is not operative in L2 and that consequently no computation takes place, the reason why L2 learners should not lexically 'store' inflected forms (as they seem to do with derived or irregularly inflected forms) is far from being clear. Should they rely more on a declarative system rather than on a procedural one, similar effects for inflected and derived primes should be expected. At a more general level, this kind of interpretation confronts us with the extremely difficult task to disentangle morphological from lexical connections (the first one involved in inflection, the second one in derivation), on the basis of the difference between full *vs* partial priming effects (i.e., purely quantitative/RT differences). Finally, such an interpretation does not take into account the fact that even the formal effect, which usually emerges in priming experiments (see the *corner/CORN* effect in Diependaele et al. 2011), fails to emerge with inflected forms.

Lack of satisfaction with this kind of interpretation led to the elaboration of alternative accounts even in a strongly decompositional approach. This is for example the case for Jacob et al. (2017), who observed the inflection-derivation opposition in L2 German, comparing the respective effects of a derived prime (e.g., *Lösung* 'solution') and an inflected prime (e.g., *gelöst* 'solved') for the same target word (e.g., *lösen* 'to solve'). The advantage of the experimental design used in this experiment is twofold. First, it provides the possibility to directly compare the effects yielded by inflected and derived forms, instead of comparing effects on two different sets and on different targets. Secondly, it also allows a within-group comparison, instead of a comparison of priming effects across different participant groups (one for derived and another for inflected forms), which could possibly differ in their L2 proficiency levels, age of acquisition of the L2, or other specific learning characteristics. Jacob et al. (2017) found that the L2 group showed a significant priming effect only for derived, but not for inflected primes. Moreover, this result was independent from the proficiency of the L2 speakers and from the years of experience with the L2 (number of years since the onset of German acquisition).

As for the theoretical interpretation, although Jacob et al. (2017) remain within a strictly decompositional framework, they do not explain the inflectional *vs* derivational opposition in 'split morphology' terms (as Kirkici and Clahsen 2013 do), i.e., by claiming that L2 learners cannot parse and compute inflected forms and that priming effects with derived forms arise through lexical mediation. They rather explain the inflected *vs* derived opposition by considering their different semantic salience: "L2 speakers can, in principle, strip off affixes from morphologically complex words, but struggle to do so for inflected forms due to the particular properties of inflectional versus derivational affixes. One such property is that derivational affixes, unlike inflectional ones, contain semantic information. [...] the fact that derivational affixes contain meaning might allow the L2 processor to decompose a derived word in similar way as a compound. Inflectional affixes, in contrast, can be considered less salient, which potentially constitutes a problem for L2 decomposition mechanisms" (Jacob et al. 2017: 14). To our mind, this is an interesting development as the authors recognize that decomposition is not a compulsory mechanism that applies to all forms (true complex words or pseudo-suffixed words, complex nonwords as stated by Rastle and Davis 2008), but that

decomposition probability crucially depends on semantic factors (such as salience and consistency).

To sum up: in the line of reasoning developed in the first phase of the research on L2 processing, a clear-cut opposition between inflection and derivation has been advocated and interpreted as the result of learners' inability to segment inflected forms and therefore to access the stem of inflected forms. Further experiments, however, could not confirm such a strict opposition and the lack of priming effects with inflected primes.

A first challenge to Clahsen and colleagues' position comes from Voga, Anastassiadis-Symeonidis and Giraudo's (2014) replication of the Silva and Clahsen (2008) experiment with Greek learners of L2 English, which did not confirm the inflectional *vs* derivational opposition. This study, using the same critical items as Silva and Clahsen (2008), obtained equally robust priming effects with derived (e.g., *acidity/ACID*; *dullness/DULL*) and inflected primes (e.g., *walked/WALK*) in L2 processing. More specifically: "Both derivational and inflectional priming were statistically equivalent to identity priming, as it is usually the case with data for native speakers (e.g. Drews and Zwitserlood 1995)" (Voga et al. 2014: 344). To which degree this discrepancy is due to methodological choices or captures a reliable effect, is a question which needs to be verified in future research. It is in fact undeniable that Silva and Clahsen's (2008) results and Voga et al.'s (2014) results are not directly comparable because of methodological differences and both present potential limitations. As acknowledged by Voga et al. (2014), while the two studies did use the same critical items, the proportion between critical items (i.e., real words) and distractors (i.e., non-words and fillers words) differs significantly: 21 critical items *vs* 303 filler items for Silva and Clahsen (2008), but the same number of critical items and distractors for Voga et al. (2014). Such a proportion is likely to have an impact on participants' discrimination choices (between words vs non-words) and, possibly, on the developing of participants' expectations about prime-target relations. Moreover, Voga et al. (2014) replicated the original experiment only for the L2 group. Although the priming effect emerges consistently throughout the rich literature on L1 English and can therefore be expected in Silva and Clahsen's (2008) replication, technically, Voga et al. (2014) does not provide any direct between-group comparison. Finally, as none of the studies used an orthographic control condition, the observed effects cannot be distinguished from purely formal ones. Consequently, we cannot be completely sure that such effects are not simply due to the orthographic overlap between the prime and the target. Although for all of the reasons discussed, Voga et al.'s (2014) results need to be considered with caution, they do seem to cast some doubts on the dichotomist view of inflection *vs* derivation.

A further confirmation of the efficiency of L2 processing mechanisms seems to come from the study conducted by Coughlin and Tremblay (2015) on L2 French (L1 English) which used inflected (e.g., *aimons*) and orthographic (e.g., *aide*) primes on the same target (e.g., *aime*), although in a quite unusual experimental

design, which combines masked-priming with a naming task.[7] Their results revealed "full morphological priming in L2 learners, with size of this priming effect increasing with French proficiency. Recall that full priming is defined as the morphological condition being significantly different from the unrelated condition but not significantly different from the identity condition" (Coughlin and Tremblay 2015: 11). Similarly, Foote (2015) found significant priming effects in L2 Spanish with morphologically related prime-target pairs not only with respect the unrelated control condition, but crucially also with respect to the orthographic and semantic conditions. More specifically, Foote investigated both verbal inflection (indicative and subjunctive forms, e.g., *cante/CANTA*) and nominal inflection (masculine and feminine form: e.g., *tonto/TONTA*).

Recent results, therefore, seem to indicate that the inflection *vs* derivation dichotomy posited by some models of morphology is not always confirmed, and that there is no compelling evidence in favor of the postulated impairment in the parsing/decompositional mechanism. On the contrary, more recent results would better fit into models like CxM, which do not advocate a strong and substantial dichotomy between inflection and derivation, but rather abstract schemas which display different properties according to both formal and semantic factors, and which are modulated by quantitative (extra-linguistic) features.

4 Regular *vs* Irregular Inflection

Another critical dimension that has typically been explored in order to verify the relative reliance on computation *vs* storage in L1 and L2 processing, is the opposition between regular and irregular inflection. We will show that, similarly to what emerged with the dichotomy between inflection and derivation in L2 research, although both results and interpretations are not consistent, the initially suggested strong opposition does not seem to be confirmed substantially. First data come from Neubauer and Clahsen (2009), who contrasted the effect of regular past participles primes to the effect of irregular past participle primes in L2 German (e.g., *geordnet/ORDNE* 'arrange-(I) arrange' vs. *gefahren/FAHRE* 'drive-(I)' respectively), in a design where both kind of primes had the same formal and semantic overlap with their targets. The patterns of the obtained effects with non-native speakers indicated partial priming induced by irregular participles, and no priming yielded by regular participles. Therefore, the main L1-L2 differences are found in regular inflection rather than in irregular inflection (or derivation), as is

[7] "Participants sat in front of a computer screen wearing a head-mounted microphone connected to a digital recorder which audiorecorded them during the entirety of the experiment. Participants were told that they would first see a row of hash signs (#######), followed by a French word. They were instructed to read the French word aloud as soon as they saw it on the screen and as rapidly as possible. They were told not to correct themselves if they made mistakes" (Coughlin and Tremblay 2015: 9–10).

expected if L2 speakers do not computationally process regularly inflected forms through their morphological structure. On the other hand, partial masked priming effects for irregularly inflected forms and for derived words, would be due to lexical connections. Of course, this kind of interpretation is prone to all the criticisms that we mentioned for the derivation *vs* inflection opposition.

Clahsen and colleagues' conclusions are brought into question by subsequent results for L2 English obtained by Feldman et al. (2010), who compared the morphological effects produced by regularly inflected past forms (e.g., *billed–bill*) to the effects of two types of irregular past tense forms (e.g., *fell–fall* and *taught–teach*). Interestingly, Feldman and colleagues' study gave the first evidence of a robust facilitation triggered by regularly inflected words in advanced L2 learners, thus falsifying the L2 impairment suggested by Silva and Clahsen (2008) and following studies (such an effect will be confirmed by Voga et al. 2014 and Coughlin and Tremblay 2015). Furthermore, the morphological effects with inflected primes were significant relative not only to the unrelated condition but also relative to the orthographic condition, confirming that what emerges is not a formal side effect but rather a genuinely morphological one. More interesting, no fully reliable difference could be observed between regular and irregular verb types, which clearly suggests that the effects induced by regular and irregular primes cannot be conceived as an all-or-none question, but rather as the result of a complex interplay of different factors (mainly, semantic and formal overlap). In other terms, the similar effects of regular and irregularly inflected primes call into doubt the obligatoriness of the decomposition process in morphological processing. In fact, if only regularly inflected forms are decomposed, and irregular are accessed through lexical connections, different patterns of priming effects should emerge with regular and irregular forms, which is evidently not the case here. The conclusion, thus, is that: "the failure to detect reliable differences in magnitudes of facilitation across regular and irregular verb types poses challenges to the explanatory adequacy of a decompositional vs non–combinatorial association processing dichotomy based on inflectional regularity in either native or non-native speakers of English [...] Collectively, results fail to provide compelling evidence that L1 speakers process regular and irregular verbs by distinct mechanisms, or that L1 and L2 speakers differently engage decompositional and non compositional associative processes" (Feldman et al. 2010: 15).

These first and provisional data coming from L2 research confirm what was found for L1, and has been widely discussed as being problematic for decompositional approaches. However, the implication for L2 processing is quite straightforward: if no reliable difference between regular and irregular emerges with non-native speakers, there is no evidence of a L1/L2 difference rooted in the computation vs storage opposition as claimed in the first studies. These results are definitely more compatible with holistic single mechanism approaches, which, as is the case with CxM, jointly considers formal and semantic overlapping (i.e., shared form and meaning between the prime and the target) and the patterns of similarity among complex words.

5 Frequency and Series Effects

Frequency effects have been traditionally exploited to investigate the storage vs. computation mechanisms with native speakers. Generally, their effects have been observed by means of lexical decision tasks (Burani and Caramazza 1987; Colé et al. 1989; Schreuder et al. 2002; Burani and Thornton 2003) but recently, masked priming experiments have also been conducted that manipulated different prime/target frequency ratios (Voga and Giraudo 2009; Giraudo et al. 2016; Orihuela and Giraudo submitted). As for the L2 learners, only Dal Maso and Giraudo (2014) observed the role of frequency and series size during the processing of derived words, but their outcomes suggest that this domain asks for of further investigation. Specifically, they focused on (semantically transparent) deadjectival nouns ending in *–ità* and *–ezza* in L2 Italian, and compared the effects of high frequency primes (e.g., *velocità /VELOCE*; *bellezza/BELLO*) and low frequency primes (e.g., *brevità/BREVE*; *contentezza/CONTENTO*) in the recognition of their stems, whose frequency was held constant. Results indicated that learners with middle or high proficiency in the L2 are sensitive to both dimensions, as a significant effect was observed only with frequent primes and with the larger series. Interestingly, the fact that only high frequency primes induced a significant effect suggests that the derived prime was accessed as a whole form, whose availability in the mental lexicon was a function of its frequency. In fact, if the prime were parsed and accessed through its stem, we would have observed the same magnitude of effect with both kinds of primes because their stems had comparable frequency. Morphological families are thus not necessarily accessed through their stems, while words belonging to the same family might be connected and activated. The connections within a family would be modulated by usage.

Moreover, primes ending with *–ità* induced stronger effects than primes ending with *–ezza* (which showed only a tendency to significance), indicating that words belonging to larger series (here *–ità*) are represented according to morphological parameters in the earliest phases of second language acquisition. Series effects of this kind indicate that suffixed words are mentally organized according to abstract schemas, whose strength of representation and activation threshold depends on availability in the input.

6 Conclusions

L2 processing is a quite young but lively domain of scientific research, where the still limited results available cannot be easily fitted into a uniform model. Therefore, the aim of the present contribution was not to provide an ultimate model for L2 processing, but rather to suggest alternative views for the most critical aspects emerging from recent research. We tried to show that the initial hypothesis of a substantial difference between native and non-native speakers processing, based on

a clear-cut separation between storage and computational mechanisms, is not really confirmed by subsequent studies. We discussed psycholinguistic research focusing on morphological processing which are typically exploited in order to disentangle storage *vs* computation and whole-form *vs* morpheme-based representation in the mental lexicon, i.e. inflection vs. derivation, regular vs. irregular inflection, and frequency and series effects. Recent L2 results do not support a strong opposition between the processing of inflection and derivation or between the processing of regular and irregular inflected forms. Instead, they suggest that a model which captures the formal and semantic similarity among complex words and represents them in terms of abstract constructions is better suited to account for the results obtained so far. Moreover, the observed family and series effects seem to indicate that the processing of complex words crucially depends on the strength of their paradigmatic relationships, i.e., their connections with words belonging to the same family (stem and derived forms) or to the same series (forms constructed with the same affix). In such a model, morphological processing does not necessarily imply the parsing of complex words into its morphological constituents but can be conceived as the reciprocal activation of connected forms.

References

Abutalebi, J., and D.W. Green. 2008. Control mechanisms in bilingual language production: Neural evidence from language switching studies. *Language and Cognitive Processes* 23: 557–582.

Anderson, S.R. 1982. Where's morphology? *Linguistic Inquiry* 13: 571–612.

Basnight-Brown, D., H. Chen, H. Shu, A. Kostić, and L.B. Feldman. 2007. Monolingual and bilingual recognition of regular and irregular English verbs: Does sensitivity to word form vary with language experience? *Journal of Memory and Language* 57: 65–80.

Boudelaa, S., and W.D. Marslen-Wilson. 2011. Productivity and priming: Morphemic decomposition in Arabic. *Language & Cognitive Processes* 26: 624–652.

———. 1996. Inherent versus contextual inflection and the split morphology hypothesis. In *Yearbook of morphology 1995*, ed. G. Booij and J. van Marle, 1–16. Dordrecht: Kluwer.

———. 2010. *Construction morphology*. Oxford: Oxford University Press.

Bosch, S., and H. Clahsen. 2016. Accessing morphosyntax in L1 and L2 word recognition: A priming study of inflected German adjectives. *The Mental Lexicon* 11: 26–54.

Burani, C., and A. Caramazza. 1987. Representation and processing of derived words. *Language and Cognitive Processes* 2: 217–227.

Burani, C., and A.M. Thornton. 2003. The interplay of root, suffix and whole-word frequency in processing derived words. In *Morphological structure in language processing*, ed. R.H. Baayen and R. Schreuder, 157–208. Berlin: Mouton de Gruyter.

Bybee, J.L. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam: John Benjamins.

Caramazza, A., A. Laudanna, and C. Romani. 1988. Lexical access and inflectional morphology. *Cognition* 28: 297–332.

Chen, L., H. Shu, J. Liu Zhao, and P. Li. 2007. ERP signatures of subject–verb agreement in L2 learning. *Bilingualism: Language and Cognition* 10: 161–174.

Clahsen, H., and C. Felser. 2006. How native-like is non-native language processing? *Trends in Cognitive Science* 10: 564–570.

Clahsen, H., and C. Felser. 2017. Some notes on the shallow structure hypothesis. *Studies in Second Language Acquisition*. Advance online publication. https://doi.org/10.1017/S0272263117000250.

Clahsen, H., and Y. Ikemoto. 2012. The mental representation of derived words: An experimental study of *–sa* and *–mi* nominals in Japanese. *The Mental Lexicon* 7: 147–182.

Clahsen, H., and K. Neubauer. 2010. Morphology, frequency, and the processing of derived words in native and non-native speakers. *Lingua* 120: 2627–2637.

Clahsen, H., I. Sonnensthul, and J.P. Blevins. 2003. Derivational morphology in the mental lexicon: A dual mechanism account. In *Morphological structure in language processing*, ed. R.H. Baayen and R. Schreuder, 125–155. Berlin/New York: Mouton-De Gruyter.

Clahsen, H., C. Felser, K. Neubauer, M. Sato, and R. Silva. 2010. Morphological structure in native and non-native language processing. *Language Learning* 60: 21–43.

Colé, P., C. Beauvillain, and J. Segui. 1989. On the representation and processing of prefixed and suffixed derived words: A differential frequency effect. *Journal of Memory and Language* 28: 1–13.

Coughlin, C., and A. Tremblay. 2015. Morphological decomposition in native and non-native French speakers. *Bilingualism: Language and Cognition* 18: 1–19.

Dal Maso, S., and H. Giraudo. 2014. Masked morphological priming in Italian L2: Evidence from masked priming. *Lingvisticae Investigationes* 37: 322–337.

Dal Maso, S., and H. Giraudo. submitted. On the interplay of family and series effects in visual word recognition. *Morphology,* Special Issue: Paradigms in Word-formation.

Diependaele, K., J.A. Duñabeitia, J. Morris, and E. Keuleers. 2011. Fast morphological effects in first and second language word recognition. *Journal of Memory and Language* 64: 344–358.

Diependaele, K., J. Grainger, and D. Sandra. 2012. Derivational morphology and skilled reading: An empirical overview. In *The Cambridge handbook of psycholinguistics*, ed. M. Spivey, K. McRae, and M. Joanisse, 311–332. Cambridge: Cambridge University Press.

Ding, G., D. Peng, and M. Taft. 2004. The nature of the mental representation of radicals in Chinese: A priming study. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 30: 530–539.

Domínguez, A., J. Segui, and F. Cuetos. 2002. The time-course of inflectional morphological priming. *Linguistics* 40: 235–259.

———. 1989. Prototypical differences between inflection and derivation. *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 42: 3–10.

Drews, E., and P. Zwitserlood. 1995. Morphological and orthographic similarity in visual word recognition. *Journal of Experimental Psychology: Human Perception and Performance* 21: 1098–1116.

Ellis, N.C. 2005. At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in Second Language Acquisition* 27: 305–352.

Feldman, L.B. 2000. Are morphological effects distinguishable from the effects of shared meaning and shared form? *Journal of Experimental Psychology: Learning, Memory, and Cognition* 26: 1431–1444.

Feldman L.B., D. Barac-Cikoja, and A. Kostić. 2000. *Semantic aspects of morphological processing: Transparency effects in Serbian*. Paper presented at the Psychonomic Society, November, New Orleans, LA.

Feldman, L.B., A. Kostić, D.M. Basnight-Brown, D.F. Đurđević, and M.J. Pastizzo. 2010. Morphological facilitation for regular and irregular verb formations in native and non-native speakers: Little evidence for two distinct mechanisms. *Journal of Bilingualism: Language and Cognition* 13: 119–135.

Foote, R. 2015. The storage and processing of morphologically complex words in L2 Spanish. *Studies in Second Language Acquisition* 37: 1–33.

Forster, K.I. 1998. The pros and cons of masked priming. *Journal of Psycholinguistic Research* 27: 203–233.

Forster, K.I., and C. Davis. 1984. Repetition priming and frequency attenuation in lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 10: 680–698.

Fowler, C.A., S.E. Napps, and L.B. Feldman. 1985. Relations among regular and irregular morphologically related words in the lexicon as revealed by repetition priming. *Memory and Cognition* 13: 241–255.

Giraudo, H., and S. Dal Maso. 2016a. Suffix perceptual salience in masked morphological priming. *Lingue e Linguaggio* 15: 85–103.

———. 2016b. The salience of complex words and their parts: Which comes first? *Frontiers in Psychology* 7: 1–8.

Giraudo, H., and J. Grainger. 2000. Effects of prime word frequency and cumulative root frequency in masked morphological priming. *Language and Cognitive Processes* 15: 421–444.

———. 2001. Priming complex words: Evidence for supralexical representation of morphology. *Psychonomic Bulletin & Review* 8: 127–131.

Giraudo, H., and M. Voga. 2007. Lexeme-based model vs. morpheme-based model from psycholinguistic perspectives. In *Selected Proceedings of the 5th Décembrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 108–114. Somerville: Cascadilla Proceedings Project.

———. 2014. Measuring morphology: The tip of the iceberg? A retrospective on 10 years of morphological processing. *Carnets de Grammaire* 22: 136–167.

Giraudo, H., S. Dal Maso, and S. Piccinin. 2016. The role of stem frequency in morphological processing. In *On-line proceedings of the 10th Mediterranean Morphology Meeting (MMM10), Quo vadis morphology? Grammar, Cognition and Computation*, 64–72.

Gonnerman, L.M., M.S. Seidenberg, and E.S. Andersen. 2007. Graded semantic and phonological similarity effects in priming: Evidence for a distributed connectionist approach to morphology. *Journal of Experimental Psychology: General* 136: 323–345.

Gor, K., and S. Cook. 2010. Non-native processing of verbal morphology: In search of regularity. *Language Learning* 60 (1): 88–126.

Gor, K., and S. Jackson. 2013. Morphological decomposition and lexical access in a native and second language: A nesting doll effect. *Language and Cognitive Processes* 28: 1065–1091.

Henderson, L. 1985. Towards a psychology of morphemes. In *Progress in the psychology of language*, ed. A.W. Ellis, vol. I, 15–68. London: Lawrence Erlbaum.

Heyer, V., and H. Clahsen. 2015. Late bilinguals see a *scan* in *scanner* AND in *scandal*: Dissecting formal overlap from morphological priming in the processing of derived words. *Bilingualism: Language and Cognition* 18: 543–550.

Jacob, G., E. Fleischhauer, and H. Clahsen. 2013. Allomorphy and affixation in morphological processing: A cross-modal priming study with late bilinguals. *Bilingualism: Language and Cognition* 16: 924–933.

Jacob, G., V. Heyer, and J. Veríssimo. 2017. Aiming at the same target: A masked priming study directly comparing derivation and inflection in the second language. *International Journal of Bilingualism*. https://doi.org/10.1177/1367006916688333.

Kim, S.Y., M. Wang, and M. Taft. 2015. Morphological decomposition in the recognition of prefixed and suffixed words: Evidence from Korean. *Scientific Studies of Reading* 19: 183–203.

Kirkici, B., and H. Clahsen. 2013. Inflection and derivation in native and non-native language processing: Masked priming experiments on Turkish. *Bilingualism: Language and Cognition* 16: 776–794.

Kroll, J., and E. Stewart. 1994. Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language* 33: 149–174.

Langacker, R.W. 1987. *Foundations of cognitive grammar: Vol. 1. Theoretical prerequisites*. Stanford: Stanford University Press.

MacWhinney, B. 2011. Language development. In *Developmental science: An advanced textbook*, ed. M. Bornstein and M. Lamb, 389–424. New York: Psychology Press.

Marslen-Wilson, W.D., and L.K. Tyler. 1997. Dissociating types of mental computation. *Nature* 387: 592–594.

McDonald, J.L. 2006. Beyond the critical period: Processing-based explanations for poor grammaticality judgment performance by late second language learners. *Journal of Memory and Language* 55: 381–401.

Morris, J., J. Grainger, and P.J. Holcomb. 2013. Tracking the consequences of morpho-orthographic decomposition using ERPs. *Brain Research* 1529: 92–104.

Neubauer, K., and H. Clahsen. 2009. Decomposition of inflected words in a second language: An experimental study of German participles. *Studies in Second Language Acquisition* 31: 403–435.

Nikolova, R., and G. Jarema. 2002. Interaction of morphological structure and prefix transparency in the processing of Bulgarian aspectual verb forms. *Brain and Language* 81: 649–665.

Orihuela, K., and H. Giraudo. submitted. *Reversing the surface frequencies of prime-target morphologically related pairs: Implications for the decompositional and holistic approaches of lexical access*.

Pastizzo, M.J., and L.B. Feldman. 2002. Discrepancies between orthographic and unrelated baselines in masked priming undermine a decompositional account of morphological facilitation. *Journal of Experimental Psychology: Learning, Memory and Cognition* 28: 244–249.

Perani, D., and J. Abutalebi. 2005. The neural basis of first and second language processing. *Current Opinion in Neurobiology* 15: 202–206.

Perlmutter, D.M. 1988. The split morphology hypothesis: Evidence from Yiddish. In *Theoretical morphology*, ed. M. Hammond and M. Noonan, 79–100. San Diego: Academic.

Pinker, S. 1991. Rules of language. *Science* 253: 530–535.

Pinker, S., and A. Prince. 1988. On language and connectionism: Analysis of a parallel distributed model of language acquisition. *Cognition* 28: 73–193.

Plank, F. 1994. Inflection and derivation. In *Encyclopedia of language and linguistics*, ed. R.E. Asher, vol. 3, 1671–1678. Oxford: Pergamon Press.

Portin, M., M. Lehtonen, and M. Laine. 2007. Processing of inflected nouns in late bilinguals. *Applied Psycholinguistics* 28: 135–156.

Rastle, K., and M.H. Davis. 2008. Morphological decomposition based on the analysis of orthography. *Language and Cognitive Processes* 23: 942–971.

Raveh, M., and J. Rueckl. 2000. Equivalent effects of inflected and derived primes: Long-term morphological priming in fragment completion and lexical decision. *Journal or Memory and Language* 42: 103–119.

Sabourin, L., and M. Haverkort. 2003. Neural substrates of representation and processing of a second language. In *The lexicon-syntax interface in second language acquisition*, ed. R. van Hout, A. Hulk, F. Kuiken, and R. Towell, 175–195. Amsterdam: Benjamins.

Schreuder, R., and R.H. Baayen. 1995. Modeling morphological processing. In *Morphological aspects of language processing*, ed. L.B. Feldman, 131–154. Hove: Erlbaum.

Sereno, J., and A. Jongman. 1997. Processing of English inflectional morphology. *Memory and Cognition* 25: 425–437.

Silva, R., and H. Clahsen. 2008. Morphologically complex words in L1 and L2 processing: Evidence from masked priming experiments in English. *Bilingualism: Language and Cognition* 11: 245–260.

Stanners, R.F., J.J. Neiser, W.P. Hernon, and R. Hall. 1979. Memory representation for morphologically related words. *Journal of Verbal Learning and Verbal Behavior* 8: 399–412.

———. 1985. The lexical account of word naming considered further. *Behavioral and Brain Sciences* 8: 689–740.

———. 1994. Interactive activation as a framework for understanding morphological processing. *Language and Cognitive Processes* 9: 271–294.

Taft, M., and K.I. Forster. 1975. Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning and Verbal Behavior* 14: 638–647.

Ullman, M. 2004. Contributions of memory circuits to language: The declarative/procedural model. *Cognition* 92: 231–270.

———. 2006. The declarative/procedural model and the shallow-structure hypothesis. *Journal of Applied Psycholinguistics* 27: 97–105.

Voga, M., and J. Grainger. 2004. Masked morphological priming with varying levels of form overlap: Evidence from Greek verbs. *Current Psychology Letters: Behaviour, Brain & Cognition* 13 (2): 1–10.

Voga, M. 2005. Amorçage masqué cognate inter-alphabet: rôle des facteurs morphologique et phonologique. *Revue d'Intelligence Artificielle* 19: 407–426.

Voga, M., A. Anastassiadis-Syméonidis, and H. Giraudo. 2014. Does morphology play a role in L2 processing? Two masked priming experiments with Greek speakers of ESL. *Lingvisticae Investigationes* 37: 338–352.