Chapter 10
A Frame Approach to Metonymical Processes in Some Common Types of German Word Formation

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Abstract Langacker (1987, 2008) defines metonymies as conceptual shifts within a domain or domain matrix. However, there are several cases in which metonymical shifts between conceptual entities that belong to the same domain are not possible. Thus, in this paper a more restrictive definition of metonymy is developed on the basis of frames, understood as recursive attribute-value structures. It is claimed that metonymies can be explained by a simple frame transformation requiring a necessary condition that I refer to as bidirectional functionality. This assumption is confirmed by an analysis of metonymical processes in various common types of word formation in German, including possessive compounds, *-er* nominalizations, and synthetic compounds. Furthermore, bidirectional functionality seems to underlie a sub-class of nominal compounds I suggest calling "frame compounds".

Keywords Frames • Concept types • Metonymy • Word formation

10.1 Introduction

In word formation, metonymies are mainly associated with the so-called possessive compounds (*bahuvrīhi*) that do not refer to the possible referents of their head nouns, but rather to something that is metonymically linked to what can be described as their "literal" reference (cf. Knobloch (1997)). The meaning of the German compound *Schlaukopf* (lit. 'clever head'), for instance, can be paraphrased as "someone with a clever head", where *head* is metonymically linked to the person referred to. Accordingly, the compound *Schlaukopf* does not refer to an entity

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characterized as being a head, but to the possessor of such an entity. Nevertheless, metonymies are not confined to this type of word formation. Hence, it will be argued that several phenomena in nominalization and compounding are also based on metonymical processes. These metonymical processes will be captured by frames in the sense of Barsalou (1992). In his view, frames are recursive attribute-value structures that constitute the general format of concept representation. In order to represent frames I will use the notation developed in Petersen (2007).[1]

Starting from Langacker's (1987, 2008) definition of metonymy, it will be shown that his approach is deficient in so far that it lacks the potential to exclude several cases in which metonymical shifts are not possible. Frames, on the other hand, provide an opportunity to formulate an explicit constraint for this kind of meaning shift to which I refer to as bidirectional functionality that is defined in terms of frames. Thus, this paper has two aims: firstly, to develop a restrictive and therefore more adequate definition of metonymy in general; and secondly, to demonstrate that metonymical processes are general patterns of word formation.

The paper is structured as follows: first, the definition of domains given by Langacker will be discussed, focusing particularly on the inability of explaining the capacity of metonymical shifts (Sect. 10.2). Subsequently, I will comment on some general aspects of meaning representation by frames. On this foundation, a frame-based explanation of metonymy will be given (Sect. 10.3). And finally, a frame-based analysis of metonymical processes in word formation will be developed by exemplifying it on some compounds and deverbal nouns (Sect. 10.4). Note that this paper merely deals with word formation in German. However, most of the examples are transferable into English.

10.2 Metonymies and Domains

10.2.1 State of the Art

Metonymy is a specific kind of meaning shift whose effect can be described as follows: the reference of a lexeme is shifted from the potential referents of the lexeme to something that is in the broadest sense part of, or thematically linked to, these potential referents. Metonymical shifts can be context-triggered (examples (1a) to (1d)) or lexicalized (example (1e)).

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[1]The works represented in Petersen (2007) as well as the works represented in this paper were developed in the research program "Functional Concepts and Frames" (FOR 600) at the Heinrich Heine University Düsseldorf. The research program is supported by the German Research Foundation (DFG).

(1)   a.   The locality refers to the institution.
           Washington passes a new law.
      b.   The institution refers to the people working there.
           The department of linguistics in Düsseldorf organises the conference.
      c.   The producer refers to the produced.
           This painting is a real Picasso.
      d.   The container refers to the contained.
           Jimmy drank a glass in one gulp.
      e.   The event refers to its participants.
           to vote "event of voting" vs. vote "someone who votes"[2]

Lakoff and Johnson (1980) state that metonymy is a cognitive process based on a relationship between two conceptual entities, namely between the conceptual entity whose reference is metonymically shifted and the conceptual entity the reference is shifted to. As seen in (1), the relationships between the involved conceptual entities are grounded on general knowledge, including political, cultural, and historical awareness as well as knowledge about the common usage of an object. The diversity of these relationships is what causes the difficulty of formulating a rigid definition to cover all different cases of metonymies.

The most common solution is to define metonymy in respect of what is called a domain, understood as a network of contiguously related conceptual entities. The term *contiguity*, in this regard, is based on the idea that the conceptual representation of an element A is always associated with the conceptual representation of an element B if A is frequently perceived with B. First, Lakoff and Johnson (1980) point out the way in which contiguously related concepts constitute a *domain*. This approach is more precisely worked out by Langacker (1987, 2008), who explicates some assumptions that are merely implicit in the works of Lakoff and Johnson (cf. Croft (2002, p. 165)).

According to Langacker (1987, p. 147), "Most concepts presuppose other concepts and cannot be adequately defined except by reference to them, be it implicit or explicit."He illustrates his remarks by the example of a knuckle that cannot be understood without having knowledge about a finger, and hence, the concept 'knuckle' presupposes the concept 'finger'. Langacker calls the presupposed concept a *base*, whereas the concept requiring the presupposed base is called a *profile*. Bases and profiles are interdependent because, on the one hand, a profile cannot be understood without background knowledge provided by a base, and, on the other hand, a profile refers only to an obligatory part of a base so that a profile is always a constitutive entity for the base itself. Furthermore, a concept can simultaneously be both, a profile for a certain concept and a base for another concept; e.g., 'finger' is a base for the concept 'knuckle', and 'knuckle' is a profile for the base 'hand' which

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[2]Here, an example is not given deliberately, due to the fact that the metonymical shift is not a matter of context-dependency, but rather a metonymically based polysemy.

is, in turn, a profile for the base 'arm'. In addition, a base can be a base for more than one concept; e.g., the concept 'circle' is a base for the concept 'arc' as well as for the concept 'radius' and 'diameter'. Moreover, a concept often presupposes more than one base; e.g., the concept 'wind' and the concept 'water' are both bases of the concept 'surfing'.

Langacker (1987, pp. 147–148) defines a domain as a concept that functions as a base for at least one profile. This profile is part of the domain established by the base. As mentioned above, in many cases a concept presupposes more than one base and therefore more than one domain. Such a union of domains is called a *domain matrix*. In addition, Langacker (1987, p. 148) distinguishes between domains that are basic and those that are nonbasic. The underlying idea is that: "Although it is typical for one concept (or conceptual complex) to serve as domain for the characterization of another, there must be a point beyond which no further reduction is possible." Domains which do not presuppose further concepts, and are therefore cognitively irreducible, are *basic* in terms of Langacker (1987, p. 148; 2008, p. 44). Examples are abstract concepts like conceptualizations of 'shape' or 'time'. Domains that presuppose further concepts, on the contrary, are *nonbasic*.

Moreover, he sees metonymies as referential shifts within merely one domain or a domain matrix, not across domains. However, Langacker (2008, p. 44) points out that it depends on our particular purpose and it is also to some extent arbitrary, how many and which domains we recognize. Therefore, the term *domain* is rather general, and the question arises how it can be ascertained if reference is shifted within a domain or across domains. Neither Langacker nor Lakoff and Johnson make an explicit remark on this aspect. However, Croft (2002, p. 162) argues that the domain is determined by the context. He states that "all of the elements in a syntactic unit must be interpreted in a single domain." Assuming Croft's statement, Langacker's definition of metonymy offers a criterion to verify whether the reference of a lexeme is shifted within a domain or not: metonymical shifts from a conceptual entity A to a conceptual entity B should be possible if A and B presuppose the same concept, functioning as a domain, within which a given sentence is interpreted.

In (1a), for instance, the domain is 'political activity'. Washington, in its function as capital of the United States, presupposes the existence of political activity, as well as the concept 'congress'. Thus, the concepts 'capital' and 'congress' are profiles of the base 'political activity' and hence part of the same domain. Therefore, the meaning shift in (1a) is a metonymical, and not a metaphorical one.

10.2.2 Missing Restrictions

The crux of defining metonymies on the basis of domains is that there are some cases in which two conceptual entities A and B are entities of the same domain; yet a metonymical shift from A to B is impossible. Sentence (2a), for instance, can be considered as "the campus of the university is situated in the centre of the city,"

while (2b) cannot be considered in the sense "a student gave a miserable term paper to me." Hence, the reference of the lexeme *university* can be metonymically shifted in (2a), but it cannot be shifted in (2b).

(2) a. The university is situated in the centre of the city.
    b. #The university gave a bad term paper to me.

The concepts 'student' and 'campus' as well as the concept 'university' pre-suppose the domain 'academic activity'. Thus, the concepts are profiles of the base 'academic activity' in the sense of Langacker and therefore entities of the same domain. Nevertheless, a metonymical shift is only possible from the concept 'university' to the concept 'campus', while a metonymical shift from the concept 'university' to the concept 'student' is impossible. The examples show that there are not only restrictions for metonymical shifts across domains but also within domains. However, Langacker's definition of metonymy is unable to exclude such shifts as it is not possible to create a plausible domain that includes 'university' and 'campus' but not 'student'.

The frame model as developed in the following chapter is not in contradiction to Langacker's domain approach: both are able to capture the same conceptual information. Yet, the frame model highlights the relationships between concepts that will be used to formulate explicit constraints to exclude shifts like those in (2b).

10.3 Metonymies and Frames

10.3.1 The Representation of Concepts as Frames

The frame model, as it is developed in Petersen (2007), is based on Barsalou (1992). The central assumption of Barsalou's approach is that all concepts are structured as recursive attribute-value structures[3] called frames. This conception applies to verbalized concepts as well as to concepts that cannot be expressed by words. Regarding the architecture of frames, attributes describe general properties or dimensions of the object or category represented in a frame, while values are concrete specifications of the attributes. According to Petersen (2007), frames are represented as directed graphs; e.g., Fig. 10.1 shows the frame of the concept 'car'.[4] Although the graph itself is not a frame (understood as a cognitive structure), but a representation of it, I shall refer to these directed graphs as "frames," too, in order to

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[3]Apart from attribute-value sets, Barsalou (1992) states that structural invariants and constraints are further ingredients of frames. However, I will not comment on constraints and structural invariants as they are not relevant for the analysis proposed in this paper.

[4]The representation of frames that is proposed in this paper differs from the notation used by Barsalou (1992). Regarding these differences, see Petersen (2007).
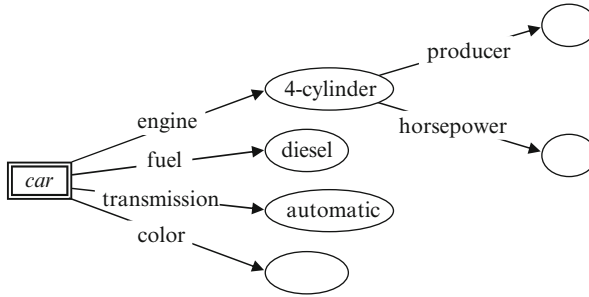
Fig. 10.1 *Car* frame

make the explications more straightforward. Additionally, names of attributes will be written in capital letters and names of values in small bound letters.

In directed graphs, the central node of a frame stands for the concept represented by the frame. It is highlighted by a double border. Values are depicted as nodes, while attributes are represented as arcs; e.g., in Fig. 10.1 the attribute ENGINE is specified by the value **4-cylinder**. The attributes are functions in the mathematical sense. That is, an attribute is specified by exactly one value and there cannot be more than one arc labelled with the same attribute. In this regard, the direction of the arcs is constitutive since the node that is source of the arc is the preimage of a function, and the node the arc goes to is its image. Furthermore, frames are recursive since values can be represented by additional frames. For instance, the value **4-cylinder** is represented by a frame containing the attributes PRODUCER or HORSEPOWER. If a value is nonspecific, it is represented by an empty node; e.g., the attribute COLOR in Fig. 10.1. An empty node has to be understood in the way of existential quantification, i.e., with respect to the example that a color of the car exists, but it is not known which color the car is. Also, two kinds of nodes have to be distinguished: angular nodes are used to mark open arguments concerning the syntax-semantics interface and hence have to be satisfied in a given context, whereas round nodes are used to represent satisfied argument nodes or values specifying conceptually relevant properties.

A central question concerns the attributes that frames contain. Barsalou's explications are not clear regarding this point; yet our analysis of frames constructed in the research program "Functional Nouns and Frames" has indicated that four different types occur frequently: potential attributes describe parts (EYES, HEAD, HANDLE), dimensions (COLOR, SIZE, AGE), correlates (MOTHER, ADDRESS), and specific functions (USAGE) of objects.

There is another point that has to be mentioned: assuming that frames are recursive and contain the entire knowledge about the object or category that is represented, it is almost impossible to reconstruct a "complete" frame. Therefore, I will consistently apply to partial frames in the following, i.e., only those attributes will be pointed out that are currently relevant.

Table 10.1 Löbner's (1985) classification of concepts

	Nonunique reference	Unique reference
Nonrelational	Sortal concepts	Individual concepts
	Dog, *table*, *car*, *house*	*Pope*, *semantics*, *sun*
Relational	Proper relational concepts	Functional concepts
	Brother, *sister*, *entrance*	*Mother*, *nose*, *name*

10.3.2   Frames of Different Concept Types and Verbs

Barsalou develops a theory for sortal concepts, i.e., concepts that classify their potential referents. Sortal concepts, e.g., *table*, *desk*, *dog* or *car*, are often understood as prototypical nouns. What these nouns have in common is that they are one-place predicates in the logical sense, i.e., their semantic effect can be described as classifying the denoted object to be a member of a certain class of objects, for instance the class of dogs. Löbner (1985), however, points out that there are nouns that are of the sortal type. He distinguishes four classes of nouns on the basis of two binary features, referential uniqueness and relationality. Sortal and individual nouns are nonrelational, and thus, they are typically used without a possessor argument. Sortal nouns denote categories. Since they are able to denote different representatives of a category, their reference is (usually) not unique. Individual nouns, on the other hand, refer uniquely. They denote entities like *pope* that are always determined definitely. Sortal and individual nouns differ from proper relational and functional nouns insofar as the latter are relational and are therefore typically used with a possessor argument. Examples for proper relational nouns are *brother* or *entrance* because a brother is always a brother of someone and an entrance is always an entrance of a location. Functional nouns are a specific subgroup of proper relational nouns: compared to other proper relational nouns, they refer uniquely as they establish a right-unique[5] mapping from their possessors to their referents. Examples are nouns like *mother* because everybody has exactly one mother. Table 10.1 outlines the four noun classes and their distinctive features.

The four classes of nouns correspond to four logical types on the one hand and to four different types of concepts on the other. A concept type can be shifted as seen in (3):

(3)   a.   Tom's mother is 42 years old.
       b.   A mother has to be patient.

In (3a) *mother* is used as a functional concept, while in (3b) it is used as a sortal one. Such type shifts are always context-triggered (cf. Petersen 2007, p. 153).

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[5]The term is used in the mathematical sense as (pontial) n-to-one mapping.

Fig. 10.2 *Mother* frame
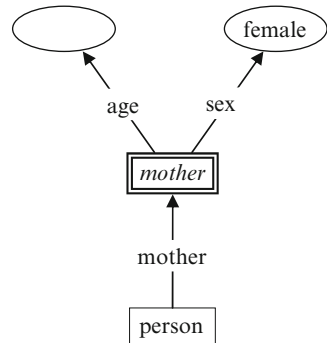
Fig. 10.3 *Handle* frame
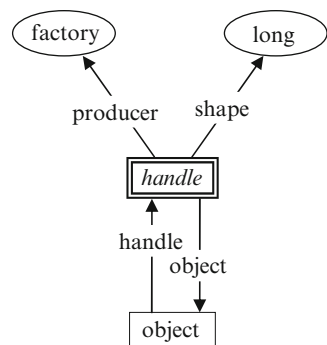
With respect to the analysis that is proposed in this paper, only functional concepts are of relevance. Therefore, I will comment merely on the frame-based representation of this special concept type. Frame-based representations of proper relational and individual concepts are submitted in Petersen (2007).

Figure 10.2 shows the frame of the functional concept *mother*. Since a mother is always a mother of someone, the frame contains a node which represents this person. Thus, in contrast to the frames of sortal concepts, the frames of functional concepts contain a possessor node that is linked to the central node by a so-called *determining arc*: the value of the possessor node determines the value of the central node. The determining arc is an outgoing arc for the possessor node and an ingoing arc for the central node. Since attributes are always functions in the mathematical sense, the direction of the arc guarantees that the mapping of the possessor node to the central node is right-unique. The possessor is a further argument of the concept, and hence, it is represented by an angular node.

It is also possible that the possessor node and the central node are linked by a second arc that heads for the opposite direction, as Fig. 10.3 shows. Here,

Fig. 10.4 *Hit* frame
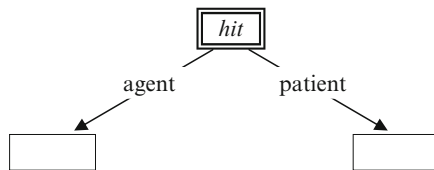
the possessor node and the central node are linked by inverse arcs. Such links between the central node and the possessor node can be observed in some frames of functional concepts, but this is not obligatory for this concept type. In fact, the characteristic feature of frames of functional concepts is simply that the possessor node and the central node are linked by a determining arc.

Verbs can also be captured by frames. Figure 10.4 shows the frame of the verb *to hit*. Since the participants of the event of hitting are arguments of this event, the participants are represented by angular nodes.

The meaning of verbs, however, is surely not completely captured by representing their argument structure. Nevertheless, for the analysis proposed here, only the arguments of verbs are relevant, and therefore only those nodes will be illustrated.

10.3.3 Attributes, Functional Concepts, and Type Hierarchies

In the directed graphs depicted above, attributes are always titled with functional nouns.[6] Hence, the question arises, as to which manner functional concepts are connected to attributes in frames. This connection can be explained by the fact that functional concepts behave like mathematical functions. Given, for instance, a set P of persons, the referential properties of the nominal phrases (NP) in (4) can be translated into a function

$$f_{mot} : P \rightarrow P, f_{mot} = \left\{ (p_i, p_j) \,\middle|\, p_j \text{ is mother of } p_i \right\}.$$

The function f_{mot} is well-defined since it fulfils the existential condition and the condition of right-uniqueness: the first one is fulfilled since every person has a mother, and the latter is fulfilled as every person has exactly one mother. (These conditions are not fulfilled for proper relational nouns; e.g., someone can have no brother (violation of the existential condition), and on the other hand, someone can have more than one brother (violation of the condition of right-uniqueness).)

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[6]I speak of nouns here because I am referring to a lexical-morphological level and not to a conceptual level.

(4)   a.   *Bart Simpson's mother*
           f_{mot} *(bart simpson)* $=$ *marge simpson*
      b.   *Kate Hudson's mother*
           f_{mot} *(kate hudson)* $=$ *goldie hawn*

The referents of the NPs in (4) correspond to the value of the function f_{mot} that is configured by the input for the independent variable, specified in form of a possessive construction. Hence, the referent of the NP in (4a) differs from the referent of the NP in (4b). Attributes in frames behave in a similar way as they define a right-unique relationship between two concepts. Indeed, frame attributes differ from functional concepts in the way that they are nonreferential.

The difference between functional concepts and attributes is fundamental for the frame model developed in Petersen (2007) and it can be rendered more precisely: Guarino (1992) distinguishes between the denotational and the relational interpretation of relational concepts. The first applies to the reference of such concepts, while the latter refers to the relation expressed by them. With respect to the NPs in (4), the denotational interpretation of the functional concept *mother* corresponds to the value of the function f_{mot}, whereas the relational interpretation corresponds exclusively to the relation between the independent variable and the value of the function; e.g., for (4) this relation can be paraphrased as "being-mother-of." Therefore, conceptual concepts have a denotational interpretation on the one hand, and a relational interpretation on the other. According to Petersen (2007, p. 163), "These considerations allow us to clarify the ontological status of attributes in frames: Attributes in frames are relationally interpreted functional concepts." In other words: assuming that concepts are organized in attribute-value structures, functional nouns are verbalizations of structuralizing components of mental concepts, and frames can be decomposed as relationally interpreted functional nouns (cf. Löbner 2005, p. 468).

So far, the question as to which values attributes can be specified has not been raised. According to Barsalou (1992, p. 43), values are subconcepts of attributes. However, he does not consider the differentiation between the denotational and the referential interpretation of relational concepts. Regarding Guarino's distinction, it is now possible to render Barsalou's statement more precisely and to explain by which values a given attribute can be specified: the possible values of an attribute are sub-concepts of the denotational interpretation of the functional concept the attribute is based on (cf. Petersen 2007, p. 164). For instance, *blue*, *yellow* and *red* are subconcepts of the concept *color*, and therefore **blue**, **yellow** and **red** are possible values of the attribute COLOR. In addition, possible values of an attribute are often structured with respect to their degree of specification; e.g., the value **red** is less specific than the value **rosso corsa**. From that point of view, possible values form a taxonomy composed of subconcepts of a given functional concept. In Petersen's frame model, this taxonomy is captured by a type hierarchy capturing possible values of attributes and the degree of specification of these values.
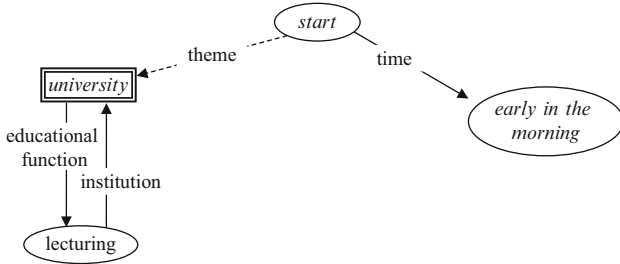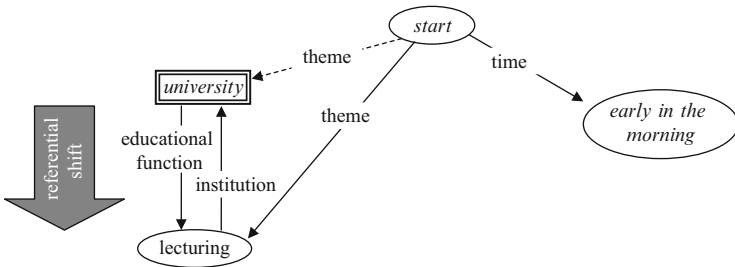
Fig. 10.5 *University* frame

Fig. 10.6 Metonymical shift in the *university* frame

10.3.4   A Frame-Based Explanation for Metonymies

The effect of metonymical shifts can be explained by a simple frame transformation resulting in the fact that the central node is shifted.

(5) The university starts early in the morning.

In (5) the noun *university* is considered as "the lecturing at university." Figure 10.5 shows the frame-based representation of the sentence. Note that the representation of the phrase *early in the morning* is a simplification since it has to be represented as a complex frame. However, with regard to the example, the phrase is less important, and therefore, it is just represented by a single node to make the illustration more transparent.

The frame transformation mentioned at the outset is reflected in a conceptual shift from the central node to another node it is linked to. Since the lecturing starts early in the morning but not the other "parts" of the university, the central node is shifted to the *lecturing* node (Fig. 10.6). Furthermore, the metonymical shift results in a change of the conceptual properties of the involved nodes so that the *lecturing*
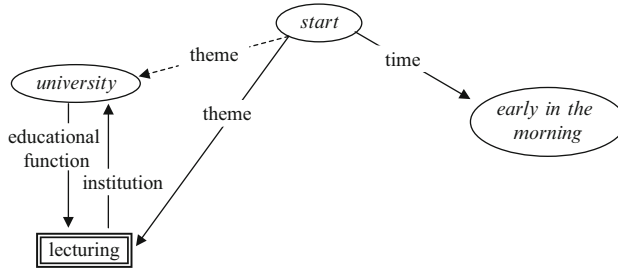
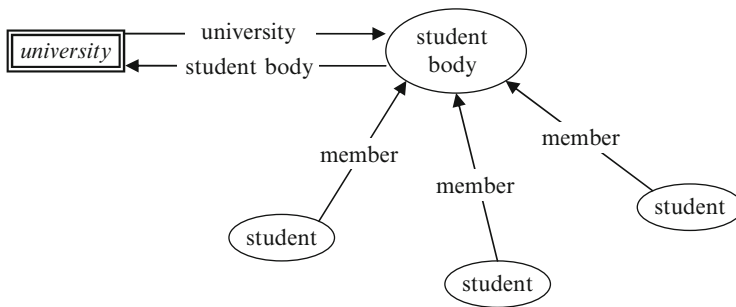**Fig. 10.7** Conceptually shifted *university* frame

Fig. 10.8 *University* frame

node is transformed into an angular node, and the university node is transformed into a round node because *university* is not an argument of *lecturing* (Fig. 10.7).

As can be seen in Figs. 10.5, 10.6, and 10.7, the *lecturing* node is linked to the *university* node by a second arc. Due to the fact that attributes are always functional in the mathematical sense, the mapping between the *university* and the *lecturing* node is one-to-one. In the following, I refer to those arcs as *bidirectionally linked* and to this relation as *bidirectional functionality*. With regard to metonymies, bidirectional functionality is important, given that it guarantees the unique reference of metonymical shifts. This aspect can be illustrated by the example of the *university* frame in Fig. 10.8: the *university* and the *lecturing* node are linked by bidirectional arcs but there is no such link between the *university* node and the several *student* nodes. In fact, the mapping between the *university* node and the several *student* nodes is one-to-many. Hence, in case of a metonymical shift it would not be clear onto which of the student nodes the reference would be shifted to. On the other hand, the set of students is mapped one-to-one to the university node (see Fig. 10.8). For this reason, in (6a) a metonymical shift is possible, while in (6b) it is not. The *university* and the *lecturing* node, on the other hand, are bidirectionally linked, and therefore, in the case of a metonymy, the reference can be shifted uniquely.

(6)   a.   The university demonstrates against tuition fees.
      b.   #The university gave a bad term paper to me.[7]

Bidirectional functionality can be established by the context. So it may be possible that the expression *university* can be used to refer to a certain student, if specific conditions allow the unique identification of that student. For instance, if the student is a sprinter in the sporting team of a certain university, (7) can be used to refer to that student – other students of the same university are context-dependently excluded.

(7)   The university won the race.

The assumption of the one-to-one mapping between the involved conceptual entities is confirmed by the examples mentioned in Sect. 10.2.1, in the following repeated as (8).[8]

(8)   a.   Washington passes a new law.
      b.   The department of linguistics in Düsseldorf organises the conference.
      c.   This painting is a real Picasso.
      d.   Jimmy drank a glass in one gulp.

The one-to-one mapping between the involved conceptual entities can easily be explained in (8a), (8b), and (8d): there is exactly one Congress in Washington passing laws, in Düsseldorf there is exactly one specific group of people working at the department of linguistics, and a glass contains exactly one content. With respect to (8c), it could be argued that Picasso painted more than one picture, and hence, the relationship between Picasso and his paintings is one-to-many. However, the statement made in (8c) does not refer to identifying a specific one of Picasso's paintings. Instead, (8c) predicates that the painting referred to is a painting produced by Picasso, i.e., the statement made in (8c) involves classifying the painting referred to as belonging to Picasso's oeuvre, and the relationship between Picasso and his oeuvre is one-to-one. The one-to-one mapping also explains why it is possible to refer metonymically to Picasso's oeuvre (*The exhibition does not show the whole Picasso*).

It can be concluded that, with respect to frames, metonymical shifts are possible, if the underlying nodes are bidirectionally linked. This necessary precondition restricts the capacity of metonymical shifts and has to be understood as an addendum to the domain-based definition of this type of meaning shift in the sense of Langacker (1987, 2008).

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[7]The example was discussed in our talk Kimm et al. (2010).

[8]The example (1e) is not repeated here but the one-to-one mapping between the agent of an action and the action itself can easily be motivated; see Sect. 10.4.2.

10.4 Metonymical Processes in Some Common Types of German Word Formation

10.4.1 Possessive Compounds

Several compounds, typically categorized as possessive compounds, can be used in a nonmetonymical manner as well as in a metonymical one. In sentence (9a) the compound *Lockenkopf* lit. 'curly head' is used in a nonmetonymical way, whereas in sentence (9b) it is used metonymically.

(9) a. *Peter hat einen Lockenkopf.*
         'Peter has curly hair.'
     b. *Der Lockenkopf ist laut und nervig.*
         'The curly-haired person is loud and obnoxious.'

The nonmetonymical reading of the compound is the result of a unification of frames, while "unification" has to be understood as the fusion of two frames containing compatible information. In a technical sense, a unification is defined as follows: let the graphs A (seen in Fig. 10.9) an B (seen in Fig. 10.10) be frames, and let **f** be a concept that is more specific than the concept **c**. The unification of the two frames designates the process of integrating frame B into frame A. Figure 10.11 shows the result of the unification.

The interpretation of the compound *Lockenkopf* 'curly head' is the result of a similar process. First, the compound's head *Kopf* 'head' as well as the modifier *Locken* 'curls' activate separate frames. The frame *Kopf* 'head' contains an attribute
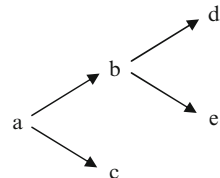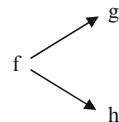

Fig. 10.9 Frame A

Fig. 10.10 Frame B
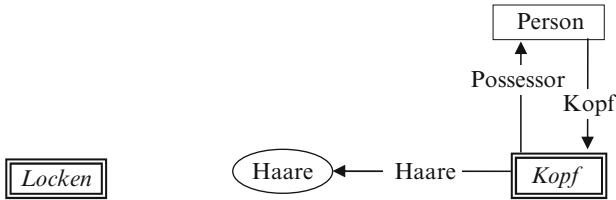
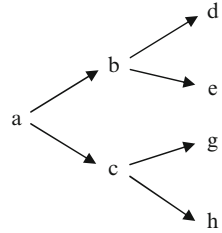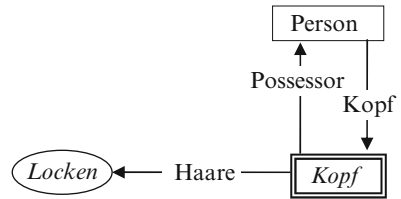**Fig. 10.11** Unification of A and B

Fig. 10.12 *Locken* 'curls' and *Kopf* 'head' frame

Fig. 10.13 Frame unification

HAARE 'hair'. Since *Kopf* 'head' is a functional concept as every human being has just one head, the frame contains a possessor node (Fig. 10.12). The value of the attribute HAARE 'hair' is specified by an empty node because the value is nonspecific. On the contrary, the concept *Locken* 'curls' is a hyponym of the concept *Haare* 'hair', and hence, **locken** 'curls' is a potential value of the attribute HAARE 'hair'. Since the value **locken** 'curls' is a subconcept of the concept *Haare* 'hair' in that curls refer to hair having a certain physical structure, the value **locken** 'curls' is a more specific value than the one expressed by the empty node. Thus, the two frames contain compatible information so that the *Locken* 'curls' frame can be integrated into the *Kopf* 'head' frame (Fig. 10.13). Since curls are not an argument of the concept *head*, the angular node transforms into a round node, i.e., the conceptual properties of the node activated by *Locken* 'curls' change as a result of the unification of the frames.

Fig. 10.14 Metonymical shift (Translations: Locken 'curls', Kopf 'head', Haare 'hair', Possessor 'possessor', Person 'person')
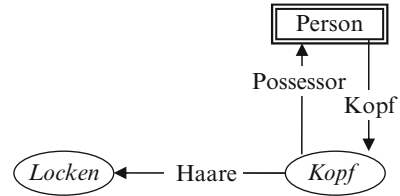
The metonymical reading of the compound *Lockenkopf* is the result of a metonymical shift. In the course of this process, the central node shifts to the possessor node (Fig. 10.14). Since the mapping between the two nodes involved in the metonymical shift is one-to-one, the same principle as mentioned in Sect. 10.3.4 can be noticed here. Additionally, the conceptual properties of the central node change, in that the central node of the frame *Kopf* 'head' transforms into a round node, because *head* is not an argument of the concept *person*. As can be seen in Fig. 10.14, every node in the frame can be reached from the central node, and the frame contains exactly one angular node. Both features are characteristic for sortal concepts, and thus, the metonymical interpretation of the compound *Lockenkopf* 'curly head' results not only in a referential shift but also in a conceptual shift: the metonymical interpretation of the compound evokes a sortal concept, while the nonmetonymical interpretation of the compound is a functional one.

10.4.2 Deverbal Nouns and Synthetic Compounds

The nominalization of verbs by the suffix *-er* also triggers a metonymical shift that can be captured by frames. Explaining nominalization on the basis of metonymies was also carried out by Panther and Thornburg (2002). In this Section, I will demonstrate that nominalization by the suffix *-er* confirms the assumption that a one-to-one mapping between the involved nodes is an obligatory precondition for metonymical shifts.

The frame of the verb *spielen* 'to play' contains the argument structure of the verb. The nominalization by the suffix *-er* results in a conceptual shift from the central node of the verbal frame to the node specifying the agent of the event of playing (Figs. 10.15 and 10.16). Löbner (1985, p. 316) points out that, given sufficient temporal (and contextual) restriction of the situation, the mapping between the agent of an action verb and the event, the action that the verb refers to, is one-to-one. Therefore, the nodes involved in the metonymical shift are, again, bidirectionally linked. From this point of view, the suffix *-er* is a morphological reflex, revealing a metonymical shift.

In contrast to bare metonymies, the metonymical shift is not triggered by the context but rather by a grammatical marker. In this regard, the *-er* suffix seems
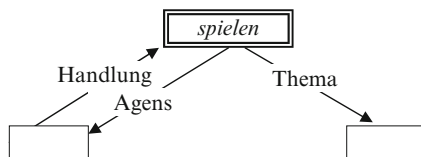
Fig. 10.15 *Play* frame

Fig. 10.16 *er* nominalization
(Translations: Agens 'agent',
Handlung 'action', Thema
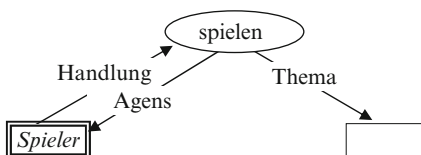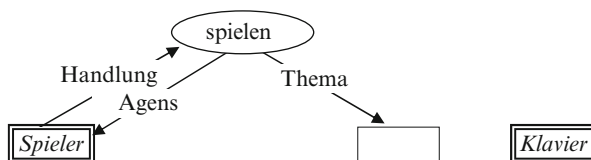'theme', spielen 'to play',
Spieler 'player')

Fig. 10.17 *Klavierspieler*
'piano player' frame

to have two effects: it triggers the metonymical shift and "freezes" the new frame
so that the frame cannot be shifted metonymically anymore. The last aspect is
illustrated in (10) where the nominalization *Spieler* cannot be used to refer to an
event of playing.

(10)   a.   *Der Spieler begann um 20 Uhr.*
            'The player started at 8 p.m.'
       b.   *#Der Spieler dauerte zwei Stunden.*[9]
            #'The player lasted two hours.'

However, the *Spieler* frame maintains the original frame of *spielen*. This is
reflected in the fact that the theme argument of the *spielen* frame can be saturated
within the so-called synthetic compounds whose interpretation is, therefore, based
on metonymical relations. The German compound *Klavierspieler* 'piano player' can
be explained as follows: the constituents of the compound activate separate frames,
and subsequently, the frame activated by *Spieler* 'player' is linked to a node of
playing that activates a frame containing attributes for the argument structure of such
an event (Fig. 10.17). Finally, the interpretation of the compound *Klavierspieler*
'piano player' in the sense of "someone who plays the piano" is the result of a
unification of frames (Fig. 10.18).

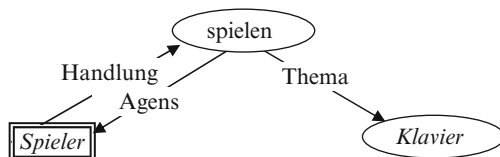[9]One of the anonymous reviewers of this paper pointed me to the example.

Fig. 10.18 *Klavierspieler* 'piano player' frame (Translations: Agens 'agent', Handlung 'action', Thema 'theme', spielen 'to play', Spieler 'player', Klavier 'piano', Zweck 'purpose')

To sum up, the meaning of deverbal nouns is the result of a metonymical shift. The interpretation of synthetic compounds is based on this metonymical process in that the verb frame derived from the compound's head is reconstructed on the basis of bidirectionally linked nodes.

10.4.3 Excursus: "Frame Compounds"

Bidirectionality is not only a constraint of metonymies but also occurs as a general interpretational pattern of ordinary compounds like *Suppenlöffel* 'soup spoon'. I speak of interpretational patterns since the interpretation of German compounds is a question of patterns rather than rules due to their ambiguity, (cf. Kanngießer (1987)). The interpretational pattern, that is subject of this section, corresponds to the Onomasiological Type III in the sense of Stekauer (2005). Such compounds underlie the semantic structure THEME–action–INSTRUMENT, where the theme and the instrument are represented on the linguistic surface, while the linking action has to be reconstructed. The meaning of the compound *Suppenlöffel* can be explained in the following steps: the constituents, *Suppe* 'soup' and *Löffel* 'spoon', activate separate frames. Then, the *Suppe* 'soup' frame as well as the *Löffel* 'spoon' frame is linked to a disposition of an eating action by a purpose attribute that is similar to the telic roles in Pustejovsky's qualia theory. According to Pustejovsky (1991), concepts of artifacts contain knowledge about the potential actions the referent of the concept can be used for. With regard to the nouns *Suppe* 'soup' and *Löffel* 'spoon', their concepts contain knowledge that a soup is something that can be eaten and a spoon is an instrument for this action. In terms of cognitive psychology, the purpose attributes correspond to some sort of conventionalized affordances, i.e., the referents of the concepts are artifacts made for a uniquely determined purpose. In the example, the purpose attributes link the frames of the compound constituents to a frame of eating. Both nodes of eating, in turn, activate frames in which the *soup* frame on the one hand and the *spoon* frame on the other hand are integrated (Fig. 10.19).

The *soup* node and the *eating* node as well as the *spoon* node and the *eating* node are bidirectionally linked. The one-to-one mapping can be accounted for similarly to the argumentation given in Sect. 10.4.2 regarding the uniqueness of the relation
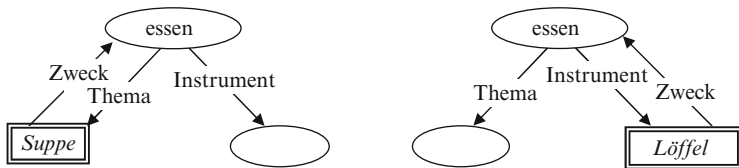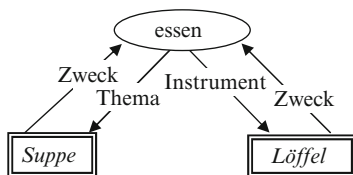
Fig. 10.19 *Suppenlöffel* 'soup spoon' frame

Fig. 10.20 *Suppenlöffel* 'soup spoon' frame (Translations: Agens 'agent', Handlung 'action', Thema 'theme', essen 'to eat', Suppe 'soup', Löffel 'spoon', Zweck 'purpose')

between an event expressed by an action verb and its participants. Therefore, the principle of activating the frames of eating is exactly the same principle that underlies the metonymies mentioned before. The meaning of the compound in the sense of "a spoon for eating soup" results from the unification of frames (Fig. 10.20). The bidirectional link between the frames of the compound constituents and the action frame is a precondition for the unification in that it is necessary that (a) the purpose attributes link the frame of the compound constituents to an action frame of an identical type, and (b) the frames of the compound constituents are integrated in the action frame by different attributes. Otherwise the unification would fail.

I suggest calling such compounds *frame compounds*. Frame compounds combine the meanings of their constituents by integrating them into an action frame which is re-constructed from the frames activated by the compound constituents. The reconstruction itself is based on a purpose attribute that is similar to the telic roles in Pustejovsky's qualia theory. The relation between the frames of the constituents and the mentioned action frame is bidirectional, although no metonymical shift is involved.

10.5   Conclusion

On the basis of frames as recursive attribute-value structures, metonymical shifts can be explained by a simple frame transformation in that the central node is shifted to another node it is linked to. This process is compatible with the current definitions of metonymy. Beyond that, I have postulated that the involved nodes in frames have to be bidirectionally linked, and hence, the mapping between the involved conceptual

entities has to be one-to-one. This one-to-one mapping is a constraint which excludes metonymical shifts that are impossible within a given domain. Such a constraint is still missing in Langacker's (1987, 2008), Langacker's 1993 definition of metonymy in which metonymical shifts are only excluded across domains.

Furthermore, it was shown that metonymical processes can be observed in several kinds of word formation, in this paper illustrated for the German language. Above all, metonymies are not confined to the so-called possessive compounds, where the literal reference of the compound is metonymically shifted. Nominalizations by the suffix *-er* and synthetic compounds are also based on metonymies as in case of *-er* nominalization where the reference is shifted to an argument of the base verb. This metonymical relation between the base verb and the argument of the verb the reference is shifted to establishes a foundation for the interpretation of the synthetic compounds. Beyond that, bidirectional functionality explains the interpretational pattern of what I call frame compounds whose interpretation is based on an action frame that is reconstructed from the frames evoked by the compound constituents. This process underlies bidirectional functionality, although no metonymical shift is involved.

All examples discussed in this paper confirm the assumption that a one-to-one mapping between the involved nodes is an obligatory precondition for metonymical shifts. Furthermore, there are several examples whose meaning can be explained analogously to the examples discussed in Sect. 10.4 (see Appendix). Thus, we have rich evidence that metonymical processes are general patterns of word formation.

There are at least two questions that are not fully answered. First, the range of metonymies is still unknown. In this paper only metonymical shifts from the central node to another node it is linked to, were accounted. Therefore, the question arises as to whether a metonymical shift is possible across more than one node. Second, it has been argued that bidirectional functionality is a necessary condition for metonymical shifts. However, it may not be a sufficient condition; e.g., (11), where the concept of the expression *university* cannot be metonymically shifted to the concept 'students of the university', although there is a one-to-one correspondence between the mentioned concepts.

(11) #In the 1970s, the university had long hair and used to smoke and knit during the lectures.[10]

Thus, there must be further conditions beyond bidirectional functionality that have to be evaluated in later works.

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[10]We were advised of the example by Anja Latrouite. It was discussed in our talk Kimm et al. (2010).

Appendix

The following examples can be explained correspondingly to the examples in Sect. 10.4.

Possessive compounds:	
Hängebauch	hänge(n) 'to hang' Bauch 'belly'
Großmaul	mouth 'big' Maul 'mouth'
Dickwanst	dick 'fat' Wanst (colloq.) 'paunch'
Milchgesicht	Milch 'milk' Gesicht 'face'
Blauhelm	blau 'blue' Helm 'helmet'
Hinkebein	hinke(n) 'to limp' Bein 'leg'
Dickschädel	fathead (lit. dick 'here: massive' Schädel 'bonce')
Kahlkopf	kahl 'bald' Kopf 'head'
Trotzkopf	Trotz 'defiance' Kopf 'head'
Schreihals	schrei(en) 'to scream' Hals 'neck'
Kleinhirn	klein 'small' Hirn 'brain'
Synthetic compounds:	
Zeitungsleser	Zeitung 'newspaper' Leser 'reader'
Autofahrer	Auto 'car' Fahrer 'driver'
Geschichtenerzähler	Geschichte 'story' Erzähler 'teller'
Deutschlerner	Deutsch 'German' Lerner 'learner'
Turnschuhwerfer	Turnschuh 'sneaker' Werfer 'thrower'
Frame compounds:	
Betonmaschine	Beton 'concrete' Maschine 'machine'
	"machine producing concrete"
Zeitungsbote	Zeitung 'newspaper' Bote 'envoy'
	"newspaper delivery boy"
Märchenonkel	Märchen 'fairy story' Onkel 'uncle'
	"'uncle' who tells tall stories"
Billardtisch	Billard 'billiard' Tisch 'table'
	"table on which billiards can be played"
Zeitungsbericht	Zeitung 'newspaper' Bericht 'report'
	"report published in a newspaper"
Fassbier	Fass 'barrel' Bier 'beer'
	"beer that has been drawn from a barrel"
Getränkemarkt	Getränke 'drinks' Markt 'market'
	"market where drinks can be bought"
Prosaschriftsteller	Prosa 'prose' Schriftsteller 'writer'
	"writer of prose"
Bienenhonig	Biene(n) 'bee(s)' Honig 'honey'
	"honey that has been made by bees"
Regenschirm	Regen 'rain' Schirm 'screen'
	"screen [i.e., umbrella] that protects you from the rain"
Stahlwerk	Stahl 'steel' Werk 'factory'
	"factory where steel is made"

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