

The Biosemiotic Glossary Project: Umwelt

Morten Tønnessen^{1,2} · Riin Magnus³ ·
Carlo Brentari⁴

Received: 26 November 2015 / Accepted: 18 February 2016 / Published online: 15 March 2016

© Springer Science+Business Media Dordrecht 2016

Abstract This is the second article in a series of review articles addressing biosemiotic terminology. The biosemiotic glossary project is designed to integrate views of members within the biosemiotic community based on a standard survey and related publications. The methodology section describes the format of the survey conducted July–August 2014 in preparation of the current review and targeted on Jakob von Uexküll’s term ‘Umwelt’. Next, we summarize denotation, synonyms and antonyms, with special emphasis on the denotation of this term in current biosemiotic usage. The survey findings include ratings of eight citations defining or making use of the term Umwelt. We provide a summary of respondents’ own definitions and suggested term usage. Further sections address etymology, relevant contexts of use, and related terms in English and other languages. A section on the notion’s Uexküllian meaning and later biosemiotic meaning is followed by attempt at synthesis and conclusion. We conclude that the Umwelt is *a centerpiece phenomenon*, a phenomenon that other phenomena in the living realm are organized *around*. To sum up Uexküll’s view, we can characterize an Umwelt as *the subjective world of an organism, enveloping a perceptual world and an effector world, which is always part of the organism itself and a key component of nature, which is held together by functional cycles connecting different Umwelten*. In order to pay respect to Uexküll’s work, we must move from notion to model, from mention of Uexküll’s Umwelt term to actual application of it.

Electronic supplementary material The online version of this article (doi:10.1007/s12304-016-9255-6) contains supplementary material, which is available to authorized users.

✉ Morten Tønnessen
morten.tonnessen@uis.no

¹ Department of Health Studies, University of Stavanger, Stavanger, Norway

² Department of Social Studies, University of Stavanger, Stavanger, Norway

³ Department of Semiotics, University of Tartu, Tartu, Estonia

⁴ Department of Humanities, University of Trento, Trento, Italy

Keywords Biosemiotic glossary · Survey · Terminology · Von Uexküll · Umwelt · Ethology · Theoretical biology

Introduction

This review article is the second in the Biosemiotic Glossary Project (cf. Tønnessen 2015 and the editorial Sharov et al. 2015: 4), an enterprise that aims both to document existing biosemiotic term usage and to contribute innovatively to theoretical discourse. Each review is prepared on the basis of a term-specific survey in the biosemiotic community and follows a similar structure, including an Appendix published as electronic supplementary material which presents survey findings in more detail.

The introduction of the term ‘Umwelt’ by Jakob von Uexküll opened new vistas for the understanding of the particularities of the animal world, while also providing conceptual tools for its analysis. On the one hand, the reluctance of Uexküll¹ to provide an encyclopedic definition of the term and hence its relative ambiguity, might make it receptive to critique as well as misinterpretation (see also Mildenerger and Herrmann 2014: 263). On the other hand, its open character and the diversity of possible meanings it can generate, has also kept the term alive and dynamic (for a systematic review, see Brentari 2015, for an analysis of political use and abuse of the term see Stella and Kleisner 2010). Each scientific field that has incorporated the Uexküllian meaning to its conceptual toolbox, has stressed those aspects of the term which bring along some novelty for the discipline and yet allow it to be connected with the existing terminological corpus of the discipline.

Although in its Uexküllian meaning, the term was employed by a variety of disciplines throughout the 20th century (for overviews see Kull 2001a; Brentari 2015: 175–231), it has always been in a marginal position.² Highlighting of the term has taken place together with some interdisciplinary breakthroughs, which have aimed at crossing the borders between the humanities and natural sciences. The introduction of the zoosemiotic research agenda by Thomas A. Sebeok in the 1960s and 1970s encompassed the discovery of Jakob von Uexküll and his Umwelt theory as the theoretical cornerstones of the new field (Sebeok 1979; see also Deely 2004). Another milestone of the term is related to the beginning of the 21st century expansion of many disciplines of humanities to encompass also non-human animals as their research subjects. The so-called ‘animal turn’ encompasses fields such as more-than-human geographies (Whatmore 2002), multispecies ethnography (Tsing 2012; Kohn 2013), posthumanities (Wolfe 2010),³ and animal studies (Waldau 2013). These share an agenda of rehabilitating other species as members of a community which operates with meanings and values. Uexküll’s methodical attempt to describe the world of each species as it might appear to them, has proven to be a helpful tool.

¹ From here on, “Uexküll” (without any initial) refers to Jakob von Uexküll, whereas “T. von Uexküll” refers to his son, Thure von Uexküll.

² Some novel research fields of the 20th century, such as cognitive ethology, which work with topics similar to Uexküll, have occasionally integrated the term Umwelt into their vocabulary (see e.g. Burghardt 2008; Bekoff et al. 2002: xi; Allen 2014). However, the term does not hold a central role in the cognitive ethological literature.

³ Coincidentally, the latest translation of von Uexküll’s work into English, von Uexküll 2010a, 2010b, appeared in the Posthumanities book series. As Paul Cobley remarks in comments to a draft of this article, “the posthumanists and their fellow travellers principally got excited about Umwelt because it was cited and used by Deleuze and then Agamben”.

Even though, in the scope of this article, we refer to various other fields, we would like to stress that our main endeavor in this review article is to map term usage in the biosemiotic community. Our aim is *not* to cover all usages of the term in different disciplines, and we make no claim of providing a comprehensive description of use of the term Umwelt *in general*.

Material and Methods

This review article of the notion of ‘Umwelt’⁴ builds on a survey conducted in the biosemiotic community, and on a literature review. The survey was conducted July–August 2014. The questionnaire was sent as email attachment to the members of the editorial board and advisory board of *Biosemiotics*,⁵ the board members of the International Society for Biosemiotic Studies (ISBS) and of the International Society of Code Biology (ISCB), and via the biosemiotics email list (biosemiotics@lists.ut.ee⁶). It was furthermore made available online (on Academia.edu)⁷, and the same message as had been sent by email was posted in the Biosemiosis blog (<http://biosemiosis.blogspot.com>). There were 77 individual email recipients⁸ in addition to the roughly 120 subscribers to the biosemiotics email list at the time of distribution (likely with considerable overlap). 14 scholars returned questionnaires that were fully or partially filled-in. Of the 14 respondents, 12 were men and two women. One respondent opted for anonymity, the other 13 agreed to be mentioned by name. All 14 gave permission to be cited.

In the questionnaire distributed in preparation of the first review article (Tønnessen 2015), the respondents were asked to state their specialization(s) in an open-ended manner (ibid, 128). In this second questionnaire, respondents were asked to indicate one or more specializations⁹: Biology; Semiotics; Philosophy; Other field(s). Six respondents indicated “Biology”, nine indicated “Semiotics”¹⁰ and nine “Philosophy”. Furthermore, nine respondents indicated “Other field(s)” either by naming them (e.g. physics, media studies, anthropology, cognitive sciences) or by marking with a cross. Altogether, just three of the 14 respondents reported having just one specialty – a clear majority, 11 respondents, indicated they had at least two specialties.¹¹ This reflects the interdisciplinary nature of the biosemiotic enterprise.

⁴ In contemporary academic literature, some authors use the term “Umwelt” (as in the German original, with a capital U), others “umwelt” (arguing that the word has become naturalized as an English word). It also varies whether the word is italicized – as foreign terms tend to be – or not. In order to be consistent, in this review article we refer to “Umwelt”, unless we cite authors who follow other practices.

⁵ The composition of the editorial board was revised, and the advisory board of *Biosemiotics* was discontinued in the autumn of 2014. At the time of the survey, however, the old structure was still in place.

⁶ See <http://lists.ut.ee/wws/info/biosemiotics>

⁷ URL: https://www.academia.edu/7731910/Questionnaire_Biosemiotic_glossary_project_2nd_review_article_Umwelt.

⁸ Including all registered participants at the 14th Gathering in Biosemiotics (London June 30th to July 4th 2014), and members of the editorial and advisory board of *Biosemiotics*.

⁹ “Specialization(s) (by training/scientific activities): Please mark one or more boxes with a cross (X).”

¹⁰ One of which with the input “somewhat”.

¹¹ For example, six respondents reported having both semiotics and philosophy as specialties, and four respondents indicated having both semiotics and biology as specialties, with two respondents reporting having all three fields as specialties.

Due to the low number of respondents to the survey, no statistical analysis of quantitative survey findings has been carried out in this article, as this is not meaningful with such a small sample.

In the first review article in the biosemiotic glossary project, Tønnessen 2015, it was stressed (p. 126) that "the survey presented in this review article should primarily be considered as a qualitative study, not a quantitative study." The same holds true for this second article in the series – "[t]he actual interpretation and application of terms – and differences in views – is ultimately what is of interest" (ibid). In Tønnessen 2015 it was stated (p. 125) that the project "is [...] designed to integrate views of a *representative group* of members within the biosemiotic community based on a standard survey and related publications" (emphasis added). Based on valuable feedback from a peer-reviewer, in this second review article we have modified this claim so as to read: "The biosemiotic glossary project is designed to integrate views of members within the biosemiotic community based on a standard survey and related publications" (cf. abstract). This is because it is misleading, in terms of statistical methodology, to claim that the surveys related to these review articles are representative, given their low number of respondents. But even so it may in a wider sense of representativity, as we claim, be the case that "the survey findings [...] are arguably quite representative for current biosemiotic thought, given that they bring several typical disagreements to the fore." In social sciences, representativity is not only understood in terms of the size of the sample, but also, and equally importantly, in terms of the variability of the total population studied. The biosemiotic community constitutes a small population with significant variability in opinions and perspectives. On this point, it is our explicit aim to map and describe differences of opinion as thoroughly as possible, and thus to map and describe variability in views within the biosemiotic community. We would also like to stress that a central feature of the methodology of these review articles is that validation of findings is systematically pursued by distributing a draft of each article to the editorial board of *Biosemiotics* and to cited survey respondents, and inviting criticism. Scholars invited to comment on draft articles are asked to provide feedback on "the accuracy of citations and how they have been contextualized", "any misrepresentation of views, theories, etc.", and "any serious omission". This validation procedure enhances the accuracy and, to some extent, representativity of the review articles.

One way forward could be to try to generate a truly representative dataset in statistical terms. A higher response rate is of course desirable, but this alone would not suffice to produce a numerically representative dataset. The operational "population of biosemioticians" would have to be expanded, e.g. by including (if technically feasible) all scholars registered at Academia.edu¹² who follow "Biosemiotics" as a topic. At the time of writing,¹³ this amounts to 3.473 people. However, even though expanding the operational population of biosemioticians would likely result in a higher number of respondents (i.e. a *bigger* sample), it is not given that it would result in a more *representative* sample. This is because many of the 3.473 people who show interest in biosemiotics on Academia.edu are only moderately engaged in biosemiotics – as readers, rather than writers, of biosemiotic literature, and so on. Nevertheless, authors of future review articles in the biosemiotic glossary project can consider expanding the

¹² <https://www.academia.edu/>, a social media website for academics.

¹³ January 28th 2016.

operational population of biosemioticians in this or other ways. They should also consider targeting central biosemioticians personally, with an aim to increase the involvement of central thinkers. In principle these two different “ways forward” can be combined. Authors of future review articles in the project should also consider making use of diagram types that do not rely on quantification, e.g. scatter diagrams, as replacement for the bar graphs used so far.

Denotation, Synonyms and Antonyms

Denotation In his introduction to the special issue on Jakob von Uexküll of the journal *Semiotica*, Kalevi Kull writes: “The word ‘Umwelt’ has by now become a term in the English-language scientific literature of many areas, including psychology, anthropology, ethology, etc.” (Kull 2001a: 11) That the term has taken root in modern English language, is partially confirmed by the entries of major English language online dictionaries. Although *Merriam-Webster* and *Chambers* dictionaries 2015 do not have an entry for the term ‘Umwelt’, *Encyclopedia Britannica* (2015) translates Umwelt as ‘perceptual environment’,¹⁴ and according to *Oxford English Dictionary* Umwelt (2015) is “The outer world, or reality, as it affects the organisms inhabiting it.”

Major English language handbooks and dictionaries of semiotics all contain explanations of the term ‘Umwelt’, either in the entry *Jakob von Uexküll* (see e.g. von Uexküll 1994: 1131–1132, von Uexküll 1982a, b: 1146–1150; Nöth 1995: 158–159) or as an entry on its own (see Danesi 2000: 236; Hoffmeyer 1998: 623–624; Kull 2009a: 348–349, Kull 2001b: 281). However, the definitions of Umwelt in these publications diverge in several aspects. First, the variation is evident in how the terms ‘environment’ and ‘Umwelt’ are related to one another. In some cases Umwelt is understood as synonymous with environment, but provided with an Uexküllian meaning (Nöth 1995: 158), sometimes the environment is understood as an aspect of Umwelt (Martinelli 2010: 279), and in yet other cases the two terms are contrasted with one another (Kull 2009a: 348; von Uexküll 2010a, b: 1146). Some of the definitions equate Umwelt with the sensory or perceptual world of the animal (Hoffmeyer 1998: 623), whereas others include non-perceptual activity in the explanation (von Uexküll 2010a, b: 1146; Kull 2009a: 348). Besides the semiotic character of Umwelt the specifically biosemiotic glossaries also stress its origin from brain and modelling activity (Barbieri et al. 2014), its non-tangible character (Martinelli 2010: 280), its reliance on an interpretation of the surrounding world (Sedov and Chebanov 2009: 24), and its dependence on the needs of an organism (von Uexküll 1982a, b: 87).

Besides the dictionaries of semiotics, there are also other specialised encyclopedic dictionaries that have included the term ‘Umwelt’. For instance, *Online Stanford Encyclopedia of Philosophy* features the term under the entry “Edmund Husserl”, translated into environment and defined as “a world of entities that are “meaningful” to us in that they exercise “motivating” force on us and present themselves to us under egocentric aspects” (Beyer 2015). In the *Encyclopedia of Philosophy* Jakob von

¹⁴ In response to a draft of this article, Tim Ireland notes that the authors “do not offer a definition/explanation of the word ‘environment’.” We have not found room for a comprehensive description of that term within the scope of this article.

Uexküll's works are discussed under the entry *Philosophical anthropology*, under *Biological philosophical anthropology*, where the term Umwelt is introduced as well (Pappé 2006: 320). *The Encyclopedia of applied animal behavior and welfare* does not give the term as a separate record, but includes it under the entries of *perception* and *cognition* and refers to it as a perceived or sensory world (Wei 2010: 112; Burn 2010: 459). Following Edward O. Wilson's definition (Wilson 1975: 597) *Animal Behavior Desk Reference* refers to Umwelt as "[t]he total sensory input of an animal" (Barrows 2011: 681). Instead of a reference to the concept of Umwelt, the *International Encyclopedia of Systems and Cybernetics* (Charles 2004) includes an entry for the study of Umwelt, Umwelt Lehre [Umwelt theory], although in the definition of the concept, the object of study and the research field get confounded: "'Umwelt Lehre' leads to specific 'window perception', different for each living system" (ibid, p. 642). The selection of definitions above indicates the variety of fields into which the term 'Umwelt' has been incorporated. Although the encyclopedic renditions are given in fields ranging from ethology to cybernetics and philosophy, they still incorporate in their definitions an Uexküllian understanding of the term. In several cases, however, the Uexküllian meaning is referred to via other canonical authors of the discipline in question (e.g. via Edward O. Wilson and Niko Tinbergen (Tinbergen 1951: 16) in *Animal Behavior Desk Reference* (Barrows 2011: 681), and via Ludwig van Bertalanffy (von Bertalanffy 1962: 73) in *International Encyclopedia of Systems and Cybernetics* (Charles 2004: 642).

Jakob von Uexküll, the author who coined the meaning of the word Umwelt for semiotics, has himself explained it in different ways and from different angles: 1) in terms of its components: "All that a subject perceives becomes his perceptual world and all that he does, his effector world. Perceptual and effector worlds together form a closed unit, the Umwelt" (von Uexküll 1992: 320); 2) in relation to the observer: "Each Umwelt of an animal forms a spatially, temporally as well as with regards to content delimited part of the phenomenal world of the observer"¹⁵ (translation by R. Magnus) (von Uexküll 1980: 281); 3) in relation to the organism: "Umwelt is always this part of the surrounding, which impinges on the irritable substance of the animal body"¹⁶ (von Uexküll 1909: 249, translation by R. Magnus); and 4) presented via a metaphor: "we must first blow, in fancy, a soap bubble around each creature to represent its own world, filled with the perceptions which it alone knows" (von Uexküll 1992: 319).

As part of the abovementioned survey, respondents were asked to state whether each of eight citations involving the term 'Umwelt' were (A) perfectly suitable, (B) generally suitable, (C) somewhat suitable, or (D) not at all suitable. With labels added, these were:

- UMWELT 1: "Die **Umwelt**, wie sie sich in der Gegenwelt des Tieres spiegelt, ist immer ein Teil des Tieres selbst, durch seine Organisation aufgebaut und verarbeitet zu einem unauflöslchen Ganzen mit dem Tiere selbst." = "The **Umwelt**, as it is reflected in the Gegenwelt [counterworld, mirror world] of the animal, is always a

¹⁵ "Jede Umwelt eines Tieres bildet einen sowohl räumlich wie zeitlich, wie inhaltlich abgegrenzten Teil aus der Erscheinungswelt des Beobachters" (von Uexküll 1980: 281).

¹⁶ "Die Umwelt ist immer nur jener Teil der Umgebung, der auf die erregbare Substanz des Tierkörpers wirkt" (249).

part of the animal itself, constructed based on its organization, and made into an indissoluble whole with the animal itself.” (von Uexküll 1909: 196, translation by M. Tønnessen)

- UMWELT 2: “Das gesamte Universum, das aus lauter **Umwelten** besteht, wird durch die Funktionskreise zusammengehalten und nach einem Gesamtplan zu einer Einheit verbunden, die wir Natur nennen.” = “The whole universe, which consists of nothing but **Umwelten**, is held together by the functional cycles/circles, and unified according to a total plan to a single unit which we call nature.” (von Uexküll 1928: 221, translation by M. Tønnessen)
- UMWELT 3: “[A]ll that a subject perceives becomes his *perceptual world* and all that he does, his *effector world*. Perceptual and effector worlds together form a closed unit, the **Umwelt**.” (von Uexküll 1992 [1934]: 320)
- UMWELT 4: “It is clear that Jakob von Uexküll’s **Umwelt**, a qualitative and meaningful model of a species’ significant surrounding, and his *Innenwelt*, the individual’s actualized version of that surround orchestrated by its nervous system, both integrate consummate environments, exterior and interior.” (Sebeok 1986: 23)
- UMWELT 5: “The way Uexküll saw it, animals spend their lives locked up, so to speak, inside their own subjective worlds, each in its own **umwelt**. Modern biology employs the objective term ‘ecological niche’, that is to say the set of conditions – in the form of living space, food, temperature, etc. – under which a given species lives. One might say that the **umwelt** is the *ecological niche as the animal itself apprehends it*.” (Hoffmeyer 1996: 54)
- UMWELT 6: “**Umwelt** marks the difference between the world such as it exists in itself, and the world as the world of a living being. It is an intermediary reality between the world such as it exists for an absolute observer and a purely subjective domain. It is the aspect of the world in itself to which the animal addresses itself, which exists for the behavior of the animal, but not necessarily for its consciousness.” (Merleau-Ponty 2003: 166)
- UMWELT 7: “[W]e define **umwelt** as a *set of relations an organism has in an ecosystem* (as in a semiosphere). The formation of an **umwelt** is dependent on the *Innenwelt* as the primary modeling system of the organism.” (Kull 2010: 353)
- UMWELT 8: “**Umwelt**: The model of the external world built by the brain of an animal. It is a subjective model, and any animal lives therefore in an environment whose sounds, images, smells and tastes are manufactured by its own brain.” (Barbieri et al. 2014)

Of these eight citations, UMWELT 3 (von Uexküll 1992 [1934]: 320) was considered to be “perfectly suitable” by 10 of the respondents, or 71 %. UMWELT 5 (Hoffmeyer 1996: 54), UMWELT 6 (Merleau-Ponty 2003: 166) and UMWELT 7 (Kull 2010: 353) were also evaluated as “perfectly suitable” by at least half of the

respondents. Out of the eight citations, only one was considered to be only “somewhat suitable” by a majority of the respondents. Noteworthy, this is one of the three von Uexküll citations, UMWELT 2 (von Uexküll 1928: 221). This citation simultaneously has the lowest rating for “perfectly suitable”, with only four respondents, or 29 %, indicating it as being “perfectly suitable”. All but two of the citations surveyed were evaluated as “not at all suitable” by some respondents. The exceptions, which all 14 respondents found to be somewhat, generally or perfectly suitable, are UMWELT 3 (von Uexküll 1992 [1934]: 320), the single most well received citation, and UMWELT 4 (Sebeok 1986: 23) (Fig. 1).

Figure 2 shows how respondents indicating the specialties biology, semiotics and philosophy respectively rated the eight citations. Several citations are evaluated quite similarly by the three (admittedly overlapping) groups – for instance, UMWELT 3 (von Uexküll 1992 [1934]: 320) is evaluated as “perfectly suitable” by 63 % or more in all three groups. There are, however, a few striking differences: Both the other von Uexküll citations, UMWELT 1 and UMWELT 2, are considered as “perfectly suitable” by half of the philosophers and at least 44 % of the semioticians, but only by one (14 %) of the biologists. What we observe here is that the biologists that partook in the survey are more skeptical of von Uexküll’s definitions of Umwelt than semioticians and philosophers are. None of the other citations elicited similarly polarized response. Furthermore, among the philosophers, all but one of the citations were rated as “perfectly suitable” by half or more of the respondents (vs. five citations among semioticians, and three Citations among biologists). It thus seems like the philosophers that responded to the survey were in general to a larger extent willing to go along with the definitions of the cited scholars than were semioticians and, in particular, biologists,

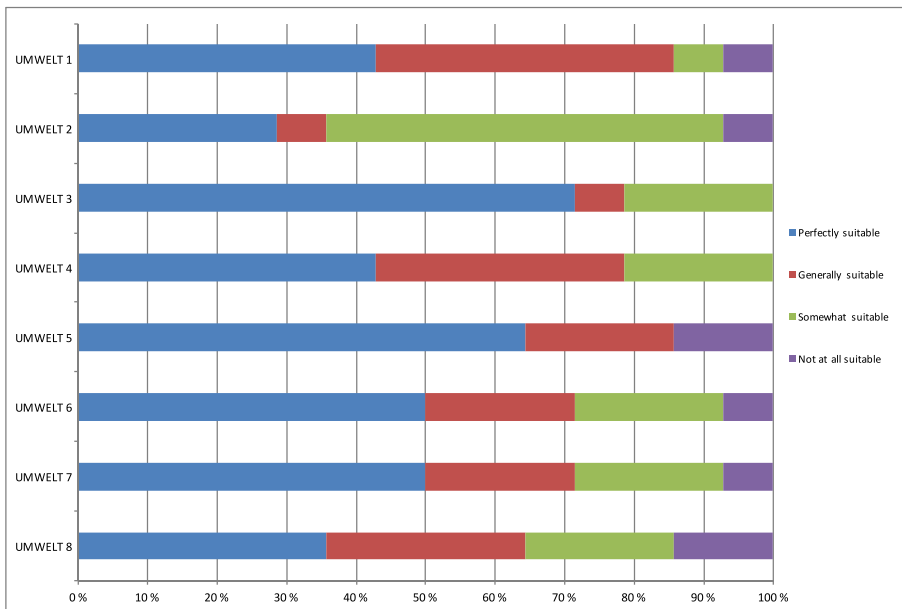


Fig. 1 Percentage of respondents who regarded eight selected citations as perfectly suitable, generally suitable, somewhat suitable and not at all suitable

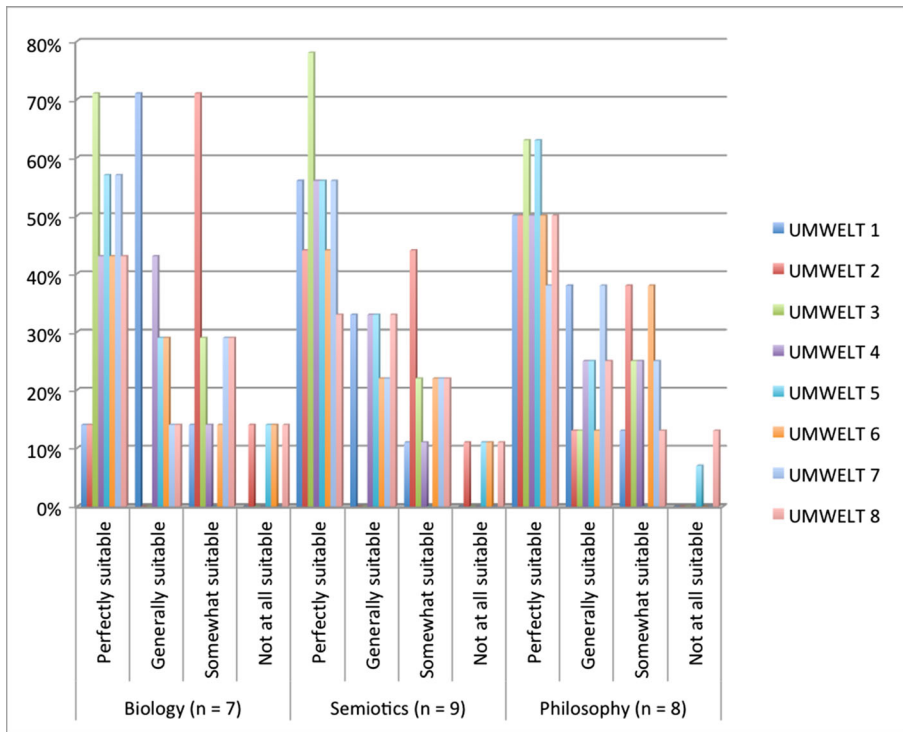


Fig. 2 Percentage of respondents associated with each specialty (biology, semiotics, philosophy) that regarded eight selected citations as perfectly suitable, generally suitable, somewhat suitable and not at all suitable

whether the citation was of a philosopher (such as with UMWELT 6, Merleau-Ponty), the biologist von Uexküll (UMWELT 1, 2 and 3), or recent or contemporary biosemioticians.

Tønnessen 2015 found that in the evaluation of some citations involving the terms ‘agent’ or ‘agency’, biosemioticians appeared to differ in their judgement depending on what specialties they indicated (ibid, 131). In some cases semioticians stood out from the rest, in others philosophers. The current article with its associated survey confirms that specialty-specific differences in opinion occur. Remarkably, while the philosophers who responded to this survey had an on average-evaluation of the surveyed philosophical citation (UMWELT 6), the biologist respondents were much more than average critical to two of the three biological citations. The biologists were especially negative to UMWELT 2 (von Uexküll 1928: 221), a citation from the second edition of *Theoretische Biologie*, von Uexküll’s main work in theoretical biology, which in translation states that “[t]he whole universe [...] consists of nothing but Umwelten”. This programmatic statement of Uexküll’s subjective biology, and subjective ontology, was in contrast evaluated as “perfectly suitable” by every second philosopher and four out of nine semioticians. The consensus citation, UMWELT 3 (von Uexküll 1992 [1934]: 320), which is overall very positively evaluated no matter what specialty the respondents indicate, is from the popularized work *Streifzüge durch die Umwelten von Tieren und Menschen* (von Uexküll 1934), translated to English as “A stroll through the

worlds of animals and men” (von Uexküll 1992). Its message is that perception and action “together form a closed unit, the Umwelt”.

Additional data from the survey is presented in the Appendix (Online Resource). This includes respondents’ comments on the surveyed citations, and the respondents’ own definitions of ‘Umwelt’. Respondents defined ‘Umwelt’ by way of terms such as ‘relation’, ‘world’, ‘environment’ and ‘niche’. The Appendix furthermore presents response regarding examples of the respondents’ own usage of this terms, and examples of other scholars’ recommendable usage of ‘Umwelt’. These sections make reference to Castro 2009; Markoš et al. 2010; von Uexküll 1956 [1934, 1940]; Barbieri 2003; Sharov 2010; Kull 2009a, 2010; Heidegger 1996 [1927]; von Uexküll 1992 [1934]; Hoffmeyer 1996; and Deacon 2012.

Synonyms A number of synonyms have been proposed as carrying the same meaning as ‘Umwelt’. The widest variety is offered by Thomas Sebeok, who provides a whole list of words that overlap with the term: “*ecological niche, experienced world, psychological or subjective or significant environment, behavioral life space, ambient extension, ipsefact*, or, expressions that I prefer, *cognitive map, scheme or even mind set*” (Sebeok 1989: 194). Also Jesper Hoffmeyer, when referring to the meanings of the term in modern scientific literature, mentions the experienced world, phenomenal world, subjective universe, cognitive map and mind-set as equivalents of Umwelt (Hoffmeyer 1998: 623). One of the most frequent synonyms used in the translations of Umwelt appears to be ‘subjective world’ (Kull 2001b: 281; von Uexküll 1994: 1146; Nöth 1995: 158; von Uexküll and Wesiack 1997: 39; Hoffmeyer 1996: 54; Kull 2001a, b: 7; Rütting 2004: 50; Krampen et al. 1987: 256; Emmeche et al. 2002: 30). Jakob von Uexküll himself avoided the use of synonyms for the term ‘Umwelt’ and preferred to provide explanations and illustrations/examples (see the paragraph *Denotations*).

Data from the survey is presented in the Appendix (Online Resource). Further synonyms might be found among the terms mentioned in the Appendix’ “Supplement to Section 6. Related terms in English and other languages”.

Antonyms No antonyms were explicitly mentioned by respondents.

Etymology

The German term ‘Umwelt’ is a comparatively young word. It appears for the first time in the year 1800, in the ode *Napoleon* by the Danish poet J-I. Baggesen (1764–1826). It is uncertain whether Baggesen, who wrote both in Danish and in German, constructed it following the Danish ‘omverden’, but it is most probable that the original word was the German one (Dahlerup 1934: 675–676; Grimm and Grimm 1956: 1259; Albertsen 1965: 115; Sutrop 2001: 454). The term is made by the preposition ‘um’, ‘around’, and the substantive ‘Welt’, ‘world’. It refers, consequently, to the ‘world around’; and the center around which the Umwelt displays itself is the experiencing subject.

In the poetical setting of Baggesen’s poem *Napoleon*, Umwelt is the (prevalingly hostile) natural context that surrounds the poet: “And the flood mutates into fire, the fog into northern light, /the rain into an effusion of rays, so that from the distance the fate-hell of the poet appears to the Umwelt as an etheric castle” (translation by Carlo

Brentari) [“Und es verwandelt die Fluth in Feuer sich, Nebel im Nordlicht, /Regen in Strahlenerguß, dass von fern erscheint der Umwelt /Ein’ etherische Feste die Schicksalshölle des Dichters” (Baggesen 1836: 102)]. Many interpreters have read these verses as if the Umwelt were the totality of the external conditions that are transformed in light and fire by a sort of poetical vision. According to Sutrop, for instance, this passage suggests the equivalence: “surroundings: hostile world around (Umgebung: feindliche Welt ringsum)”; so states Sutrop: “Here the Umwelt appears from a distance as an etheric castle, as the fate-hell of a poet” (Sutrop 2001: 454). At any rate, this interpretation is only partial. In the quotation above, the grammatical case of Umwelt is the German dative “der”, and not the nominative “die”; consequently, the meaning of the verses is: “the fate-hell of the poet appears *to the Umwelt* [erscheint *der Umwelt*] as an etheric castle”. That is to say that, in its first appearance the Umwelt is personified: it is poetically seen as a subject *to which* something can appear in a certain way. This thesis is reinforced by another poem by Baggesen, *Parthenais*, where we read: “for now you rest a little while/here on the flowery grass and, all around you, you’re sheltered by the arch/of precipitous mountain heights, far from the meeting glances of the Umwelt” (translation by Carlo Brentari) [“Derweil ihr allein ein wenig ausruht/Hier auf dem blumigen Grase, wo rings euch schirmet die Wölbung/Schroffer Gebirghöhn, fern von begegnenden Blicken der Umwelt” (Baggesen 1819: 158)]. In this passage, the personification is strengthened by the metaphor of the ‘eyes of the Umwelt’, from which the mountains offer shelter and rest. Close to this interpretation is Gerahld Schnedl’s view, according to which in Baggesen’s ode the term “means the reading environment [die lesende Umwelt] of the poet. ‘Umwelt’ was for Baggesen the Other, the ‘outside-here’ [‘Da-draußen’] opposed to the experiencing Self” (Schnedl 2007: 513).

To sum up, at its first appearance, the term ‘Umwelt’ has two main connotations: hostility, a trait that was recognized by all interpreters (Albertsen 1965: 117; Sutrop 2001: 454), and subjectivity, a characteristic we would highlight with great determination. In Baggesen’s poetry, the Umwelt seems to be an external and hostile world that observes and judges the poet; as Albertsen states, the relationship between the I and the Umwelt/Other is a sort of “lacking communication [fehlende Kommunikation]” (Albertsen 1965: 117).

In the first half of the 19th Century, the term is also used by Goethe – in a decidedly more positive, but also more conventional manner: “The day is so long, my reflections are undisturbed, and the splendid sights in the world around me [Umwelt] by no means inhibit the poetic sense. Rather, along with movement and open air, they evoke it all the more quickly” (von Goethe 2016: 760). [“Der Tag ist so lang, das Nachdenken ungestört, und die herrlichen Bilder der Umwelt verdrängen keineswegs den poetischen Sinn, sie rufen ihn vielmehr, von Bewegung und freier Luft begleitet, nur desto schneller hervor” (von Goethe 1869: 18)]. The features of hostility and personification disappear, what prevails here is the idea of the Umwelt as the whole of the images coming from the natural landscape. This neutrality makes it similar to another term used by Goethe, namely ‘Umgebung’ (cf. the subsection *Antonyms* above), a word that was translated by Thomas Carlyle with the English locution “environment of circumstances” (Carlyle 1928). The custom of translating both ‘Umgebung’ and the related term ‘Umwelt’ with the English word ‘environment’ can be traced back to this moment. Anyway, up to this point the term Umwelt was prevalently used in a poetical

and imprecise way, as an occasional substitute of ‘external world’, ‘surroundings’, ‘environment’, etc.; this thesis is reinforced by Leo Spitzer’s sober remark that the neologism *Umwelt* was firstly created “in order to meet the requirements of German metrics” (Spitzer 1942: 208).

The conceptual use of the term begins in the second half of the 19th Century, when its history intertwines with that of the world ‘milieu’. The meaning of the French term ‘milieu’ oscillates between ‘geometrical center’ (as in ‘to be in the middle of’ [‘être au milieu de’]) and ‘mechanical medium’ (i.e. the context, element or field in which a process can take place: the air as the milieu of a flying bird, etc.) (Trésor de la Langue Française 1985: 815–817). In the second meaning, the term is abundantly used in the works of the French Encyclopedists, Newton and, later on, French Positivists. In its recent history, it has found ample usage in sociology and realistic novels, as well as in biology and environmental sciences; and it is in the last two field that it met the German ‘Umwelt’. As Georges Canguilhem (2008: 99) synthetically reconstructs,

in the second half of the 18th century the notion and the word *milieu* were imported into biology from mechanics. The mechanical notion, but not the word, appeared with Newton, and the word *milieu*, with its mechanical meaning, is present in the article “Milieu” in d’Alembert’s and Diderot’s *Encyclopedie* [Diderot and d’Alembert 1765: 509–510]. It was introduced into biology by Lamarck [...]. Etienne Geoffroy Saint-Hilaire in 1831, and Comte in 1838, both use the word in the singular as an abstract term. Balzac gives it currency in literature in 1842, in the preface to the Human Comedy [de Balzac 1842: 72], and Taine establishes it as one of the three analytical principles of historical explanation, the other two being race and the moment (*le moment*). The neo-Lamarckian French biologists after 1870 [...] take the word from Taine rather than from Lamarck.

If, in its mechanical meaning, the term ‘milieu’ referred to the medium in which a natural process takes place, in its sociological and biological sense it begins to indicate the whole of the forces that influence an object (an organism, a person, or a group) and its behaviour. In sociology and social psychology, the term now refers to the familiar and social context in which a person grows up, and by which she/he is influenced or even shaped.

This process of reinterpretation – through which a mechanical notion comes to be focused on a living subject, thus overcoming the sociological phase and becoming “authentically biological” (Canguilhem 2008: 102) – made possible the convergence of ‘milieu’ with the term ‘Umwelt’. In this regard, a notable point is marked by August Comte, who is responsible for two important intuitions: the holistic character of the environment (seen as the dynamic whole of the external factors), and the idea that between environment and organism there is a reciprocity of influences, so that the environmental system cannot modify the organism without, in turn, being modified by it (Canguilhem 2008: 101–102). Moreover, without completely abandoning the mechanical meaning of the word, Comte begins to ascribe to the organism a greater spontaneity in its relationship with the environment. This tendency continues with Darwin and his theory of the spontaneous mutations of the organism – a sort of ‘proposals’ that the organism addresses to the environment and that are approved or refused according to their adaptive value. If we think back to the starting point of our etymological observation, it can be affirmed that “under the influence of the biológico-sociological ‘milieu’

Umwelt was deflected from its course; [...] it came to be invested with the sharply circumscribed task of translating a technical term of science” (Spitzer 1942: 209).

At a first glance, the term seems to have lost the personified character it had in its poetical use and to be fully available for objective and scientific goals; according to Spitzer, however, “Umwelt was never swept completely within the orbit of milieu; even today its original subjective nuance has not been lost for it refers to the milieu not simply as to objective environment, but in so far as this is seen from the point of view of individual” (Spitzer 1942: 209–210). In other terms, the notion of Umwelt is particularly valuable when it comes to describing the interrelationship between an active, spontaneous subject and the world around him/her. It should be noted, however, that in the analysis of this interaction the contribution of the subject is often neglected in favor of that of external influences. In the *Oxford English Dictionary*, for instance, ‘Umwelt’ is defined as “the outer world, or reality, as it affects the organism inhabiting it” (Simpson 1989: 2677); this objectivistic definition would rather suit the concept of ‘milieu’ and, moreover, is weakened by the choice of authors meant to support the same dictionary entry, such as Uexküll, Heidegger and Lacan.

In short, the adoption of the living subject’s point of view is a common feature of the different usages of the term ‘Umwelt’ by contemporary authors and tendencies: the Uexküllian and biosemiotic meaning (see the rest of this article); its usage by the continental philosophy of the XXth Century, and in particular by the German philosophical anthropology (see Brentari 2015: 176–194); its bioethical and ecologic meaning, today prevailing and focused in particular on the individual responsibility towards the environment (see among others Teutsch 1985; Chien 2007).

Relevant Contexts of Use

Data from the survey regarding what the relevant contexts of use are for ‘Umwelt’, according to the respondents, is presented in the Appendix (Online Resource). While some respondents appear to think of the term as applicable within biosemiotics, or biology, others mention additional fields as well, including social sciences and phenomenology.

Related Terms and Translations in English and Other Languages

‘Umwelt’ is originally a German term (though the word’s relation to the similar Danish term “omverden” is debated, cf. 4. *Etymology*). The most closely related term in English is *environment*, in French *environnement*, *milieu*, in Italian *ambiente*. In German, *Welt* (world) is of course a related term, although several authors would hold *Welt* to be distinctively different from *Umwelt* (e.g. by implying consciousness about the objective ontological status of “the world”).¹⁷ Data from the survey regarding terms related to ‘Umwelt’ is presented in the Appendix (Online Resource). This section makes reference to Deely 2011 and Merriam-Webster 2015. In the survey, ‘niche’ and ‘environment’ were mentioned as terms related to ‘Umwelt’ by several respondents.

¹⁷ At the same time, the subject is conceptually placed in the centre of the Um-Welt (environment) which surrounds the subject.

A number of translations of Uexküll's work have appeared, in various languages. One of the latest major translations is Kliková and Kleisner (2006), which includes a Czech translation of *Streifzüge durch die Umwelten von Tieren und Menschen* (von Uexküll 1934). In this Czech version, the term 'Umwelt' is retained.¹⁸ In translations to several other languages, the term is translated. For instance, in Estonian, Umwelt has been translated as "omailm" (litterally: "self-world") (see von Uexküll 2012). In Chinese, as Hongbing Yu writes in response to the survey, '主体世界', which can be directly translated to English as 'subject [主体] world [世界]', is "the most appropriate translation of Umwelt".

Umwelt has sometimes been opposed to the terms 'environment' and 'physical environment' (Kull 2010: 348; von Uexküll 1994: 1146), but it is generally done for the sake of distinguishing and specifying the meaning of Umwelt in respect to the established term of environment. Uexküll made a distinction between *Umgebung* and *Umwelt* (von Uexküll 1909, 1921). These are antithetical terms as far as an organism's reaction to external stimuli are concerned. In this perspective, the *Umgebung* is the part of the environment that remains untouched by the neural activity of the animal, whereas the involvement of the perceptual and motoric apparatus of the organism is constitutive for the *Umwelt*. From another perspective, the *Umgebung* is the physical environment at large, whereas the *Umwelt* is that part of the *Umgebung* that an organism engages with. Thus, what is *Umwelt* for one organism, might be mere *Umgebung* for another – and when we conduct *Umwelt* research, we must in effect distinguish between another organism's *Umwelt* and *Umgebung*, within our own *Umwelt*.

A further antithetical term in Uexküll's work is *Wohnhülle*, which can be directly translated as "dwelling-shell", and more accurately translated as "dwelling-world". This is the plant equivalent of an animal *Umwelt*. According to von Uexküll (1956) [1940]: 111) plants (and fungi) relate to external stimuli via their "living cell layer" ("einer lebenden Zellenschicht") in stead of via specific organs for perception and action, as animals do. *Innenwelt* is a concept that is more intimately connected to that of *Umwelt*, and is by many understood simply as the *Umwelt*'s (in a wider sense) somatic, or endosemiotic, aspect. See von Uexküll 1909, 1921, the surveyed citations UMWELT 4 and UMWELT 7, and discussion in the next section.

Uexküllian Meaning and later Biosemiotic Meaning

When used these days in standard English, the term 'Umwelt' is often endowed with meanings that are close to the ones given by Jakob von Uexküll (see the subsection *Denotations*). In modern biosemiotics, the concept has been adapted to the current biosemiotic theoretical framework and with that the Uexküllian sense of the word has been shifted towards a more explicitly semiotic meaning. The following (bio)semiotic quotations explaining the concept might illustrate the point: "The basis for the existence of an *Umwelt* is **semiosis**" (Cobley (ed.) 2009: 348); "Jakob von Uexküll's *Umwelt*, a qualitative and meaningful model of a species' significant surrounding" (Sebeok 1986: 23); "we define *umwelt* as *a set of relations an organism has in an ecosystem* (as in a

¹⁸ However, some Czechoslovakian philosophers have used the translation 'osvětí' (meaning something akin to 'awareness', consciousness) for *Umwelt*.

semiosphere)” (Kull 2010: 353); “Umwelt is not a set of objects in the environment but rather a system of signs interpreted by an organism” (Sharov 2001: 211).

Although the biosemiotic definitions of Umwelt rely on the works of Uexküll and refer to his use of the term, the ‘biosemiotic switch’ has also brought along some transformations of the initial meaning of the concept:

- 1 In the modern definitions, more emphasis is placed on the phenomenal aspect of Umwelt, which implies the presence of qualia. Also the mediatory aspect of Umwelt is highlighted in cases where Umwelt is explained as a model of the world (see e.g. Sebeok 1986: 23; Kull 2009b). In the early definitions of Umwelt by Uexküll, the (neuro)physiological processes as such appeared to be more important for defining both *Innenwelt* (inner world) and *Umwelt* (surrounding world) (see von Uexküll 1909: 59, 249), although the meaning of Umwelt as the appearance of the world for different species becomes more important in his later works.
- 2 The highlighting of the subjective and phenomenal character of Umwelt has at the same time given the term a more individualistic sonance. However, for Jakob von Uexküll, the term was applicable also for a species, whose Umwelt consists of the functional cycles of all individuals belonging to that species. According to Uexküll, the more the individuals of the same species differ from one another, the bigger is the difference between the Umwelt of the species and that of any individual organism of that species (von Uexküll 1928: 181). In some cases the species and the individual are merged in the later biosemiotic definitions of an Umwelt. It is rather common to include the adjective ‘species-specific’ to the rendition of the concept, e.g. Umwelt as “a subjective species-specific world created by an organism” (Augustyn 2013: 96) or as “[t]he part of the environment of a subject that it selects with its species-specific sense organs according to its organization and its biological needs” (von Uexküll 1982a, b: 87). The question about the role of species and individual is raised also in connection with the accessibility of Umwelten (e.g. “Each Umwelt, thus, in its totality is accessible only to conspecifics” (Deely 1991: 535)). Still, the issue of the Umwelt of a species vs. the Umwelt of the individual has so far received little explicit attention in the modern biosemiotic works (but see Tønnessen 2011: 19–20, Mildenerger and Herrmann 2014: 262).
- 3 Uexküll claims that the organism–Umwelt bond is built according to a plan (*Planmässigkeit*) and not on causality (von Uexküll 1928: 62). Due to its disputable connotations, the term *Planmässigkeit* has caused a certain unease in the later scientific community and different modern scientific frameworks, ranging from theory of categorical perception to non-deterministic models of development and evolution, have been suggested to clarify its content (e.g. Hoffmeyer 2004; Stjernfelt 2007: 236; see also Magnus and Kull 2012: 657–658).¹⁹

¹⁹ Peter Harries-Jones asks: “What if Uexküll’s intention in using “Planmässigkeit” was to refer to a “propositional order” or, more simply, “family (species?) of rules (habits?)” in the same manner as Wittgenstein and/or Gregory Bateson used in their discussions of subjectivity? He further notes that “Bateson takes recursive feedback to be the means by which organisms learn and act. Is this not the case with Uexküll as well?” If Harries-Jones’ interpretation of von Uexküll is correct, there would likely be less reason for discontent with this term. He furthermore remarks that “[t]he possibility that Uexküll acknowledged circularity or recursiveness in levels of response (functional circles) as a key aspect of sentience seems almost absent in the whole discussion of Umwelt presented above.”

- 4 The definitions that explain Umwelt only in perceptual or sensory terms have omitted the motoric counterpart of perception. In the initial definition by Uexküll, the two are inextricably linked: “Perceptual and effector worlds together form a closed unit, the Umwelt” (von Uexküll 1992 [1934]: 320). A mere mechanical response to the external stimuli, without an act of perception involved, does not contribute to the formation of an effector world in Uexküll’s sense. Hence, an organism does not have to be involved in its totality in the Umwelt formation process. For example, Uexküll claims that the large non-irritable parts of the bodies of species of the phylum Cnidaria function as non-living entities (von Uexküll 1909: 249).
- 5 Although the evolutionary hierarchisation of species was to be rejected by Uexküll via the introduction of research on the Umwelten of different species, a certain hierarchical relation between the Umwelten of different complexity is still preserved: “The Umwelt of the higher always encompasses the Umwelt of the lower” (von Uexküll 1909: 253, translation by R. Magnus).

The use of the Umwelt concept and its aspects undergo change even in Uexküll’s own writings. This can be observed when reading the three landmark works by Uexküll, which simultaneously characterize slightly different periods in Uexküll’s career (cf. also Brentari 2015). In *Umwelt und Innenwelt der Tiere* (first edition 1909, 2nd edition 1921) different Umwelten are discussed taxa by taxa, with a stronger emphasis on the physiological processes. In *Theoretische Biologie* (1st edition 1920, 2nd edition 1928) the ultimate a priori categories of time and space are presented as the major organisers of all Umwelten, while other structural and functional principles underlying the constitution of Umwelten are sought for as well. In *Bedeutungslehre* (von Uexküll 1940) (translated into English as *The Theory of Meaning* (1982)) the connections between different Umwelten are brought into focus, and ‘meaning’/‘significance’ [Bedeutung] as the major organising principle of the composition of different Umwelten is emphasized. Hence the Umwelten are here, in this last major work of Uexküll, described in an explicitly ecological and semiotic framework. The later biosemiotic interpretations of ‘Umwelt’ appear to combine Uexküll’s earlier focus on the Umwelten of individual (species) and the meaning-related explanations of Umwelt formation which is more explicit in Uexküll’s later works.

In the survey, respondents were asked: “How, in your opinion, does the usage of ‘Umwelt’ in biosemiotics differ from other usage of Uexküll’s ‘Umwelt’ notion?”²⁰ Response is presented in the Appendix (Online Resource). As we see in the survey response, respondents did not quite agree as to in what extent current term usage differs from Uexküll’s term usage.

²⁰ This contrasts with the comparable formulation in the first survey, where respondents were prompted to state how the usage of the terms ‘agent’ and ‘agency’ in biosemiotics differs from *mainstream usage* (cf. Tønnessen 2015: 138). This question needed rephrasing, since there is in the case of the term ‘Umwelt’ no sharp distinction between biosemiotic term usage on one hand and mainstream term usage on the other, given that biosemioticians are in contemporary times some of the most prominent term users.

Attempt at Synthesis

A logical starting point for this section aiming at synthesis of term usage, is the one surveyed citation that was most positively evaluated by respondents. This was UMWELT 3 (von Uexküll 1992 [1934]: 320), which reads: “[A]ll that a subject perceives becomes his perceptual world and all that he does, his effector world. Perceptual and effector worlds together form a closed unit, the Umwelt.” While the content of this definition should perhaps be part of a “definitive” definition of Umwelt, it arguably does not make reference to all “intrinsic” elements of an Umwelt. For instance, UMWELT 1 (von Uexküll 1909: 196) stresses that the Umwelt “is always a part of the animal itself”. This idea was central to Uexküll, who held that his “subjective biology” was the way forward for biology at large, and it is telling of his worldview or ontological outlook. What Uexküll claims here, is that the Umwelt is no accidental feature of the organism, but an integral part of what it means to be an organism. Similarly, UMWELT 2 (von Uexküll 1928: 221) states that the universe “consists of nothing but Umwelten, [and] is held together by the functional cycles/circles”. While UMWELT 3 was the single best received citation, UMWELT 2 was arguably the least well received of the eight surveyed citations, with a majority of respondents ranking it as only “somewhat suitable”. Nevertheless, for Uexküll a key component of the Umwelt idea was that just as the Umwelt is no accidental feature of the organism, nor is it an accidental feature of the universe, the world at large. Subjective experience, in Uexküll’s perspective, is not simply one phenomenon among many, on equal footing with other phenomena in the living realm – it is *a centerpiece phenomenon*, a phenomenon that other phenomena in the living realm are organized *around*. This is why Uexküll thought that biology should be organized around notions of meaning and significance – because the life processes themselves are organized around meaning and significance, as manifested in cycles of perception and action.

To sum up Uexküll’s view, we can characterize an Umwelt as *the subjective world of an organism, enveloping a perceptual world and an effector world, which is always part of the organism itself and a key component of nature, which is held together by functional cycles connecting different Umwelten*. As it stands, this formulation is correct up to a certain point. Note that in the phrase taken from UMWELT 1, where Umwelt “is always a part of the animal itself”, ‘animal’ is here replaced with ‘organism’. As Kalevi Kull points out (see Appendix, “Supplement to Section 7. Uexküllian Meaning and Later Biosemiotic Meaning”), Uexküll does not use the term ‘Umwelt’ unless there is “an interconnected web of sign processes”, such as in an individual animal. In other cases, such as biosemiosis in plants and fungi, he refers not to Umwelten, but to ‘Wohnhüllen’ (dwelling-worlds). In Uexküll’s outlook, there are thus two fundamental types of phenomenal worlds, as it were, in nature: Umwelten, and Wohnhüllen, and of these the Umwelt stand out as particularly well organized in terms of functional characteristics. Wohnhüllen, too, are “subjective worlds” of a sort – but in a sense they are worlds without any clear *subject*. This is why we can state, with Uexküll, that the functional cycles that hold nature together, as it were, occur among Umwelt creatures, and not among Wohnhülle dwellers – for only Umwelt creatures uphold these relations to others *subjectively*, i.e. in capacity of being unitary organisms. In Uexküll’s perspective, all living organisms dwell in meaning and significance, but only Umwelt creatures *act* based directly on what they *perceive*.

Conclusion

Drawing on a survey and study of literature, this second review article in the biosemiotic glossary project has aimed to map and analyse term usage in the biosemiotic community with reference to ‘Umwelt’. This is a key term in Jakob von Uexküll’s work as well as for biosemiotics as such.

Uexküll’s reluctance to provide an encyclopedic definition of the term has given the term an open, dynamic character. Typically, each scientific field that has incorporated the Uexküllian meaning to its conceptual toolbox has stressed some (discipline-specific) novel aspects of the term while connecting it with the existing terminological corpus of the discipline. In order to be truly useful in a discipline, however, the Umwelt idea must be introduced not merely as a *notion* (concept), but furthermore as a *model*. After all, what Uexküll set out to do, was not simply to find a *word* for, say, subjective experience. Rather, his life’s work was devoted to working out models of the life worlds of various animals, in order to advance our scientific understanding. In order to pay respect to Uexküll’s work, and try to achieve something similar in our own day – but aiming at even better accuracy – we must move from notion to model, from *mention* of Uexküll’s Umwelt term to actual *application* of it.

We believe that it is in many cases possible to develop discipline-specific Umwelt models – for instance in ethology, ethnography, and in various disciplines studying human–animal interaction. Ethology, the study of animal behavior, is the core discipline for Umwelt research. Here we need up-to-date, state of the art knowledge in combination with classical Uexküllian thinking, resulting in modern Umwelt models. Biosemiotics can connect the dots. While zoosemiotic Umwelt models will be focused on animal semiosis (including animal–animal relations), ecosemiotic Umwelt models will be focused on environmental semiosis involving ecosystemic relations and typically several species. Biosemiotics potentially has a lot to offer animal studies, or Human-Animal Studies as this broad, interdisciplinary field is sometimes called. Ecosemiotic thinking is particularly suited to inform development of Umwelt models of human–animal interaction. Since a given Umwelt is always *someone in particular*’s life world, such models must be multifaceted and involve at least two ‘centers’, one for each creature with an Umwelt. It is furthermore conceivable that discipline-specific Umwelt models may be developed in specialized fields such as conservation biology and human ecology, and in general disciplines devoted to studying human behavior such as sociology, history, and psychology.

Acknowledgments Tønnessen’s and Magnus’ work in this project has been supported by the research project “Animals in Changing Environments: Cultural Mediation and Semiotic Analysis” (EEA Norway Grants/Norway Financial Mechanism 2009–2014 under project contract no. EMP151). We would like to thank the peer-reviewers for their comments, an to thank members of the editorial board (specifically Paul Cobley, Peter Dittrich, Peter Harries-Jones, Tim Ireland) and a respondent to the survey (Anton Markoš) for providing useful feedback on a draft of this paper.

References

- Albertsen, L. A. (1965). Umwelt. *Zeitschrift für Deutsche Sprache*, 21, 111–118.
- Allen, C. (2014). Umwelt or umwelten? how should shared representation be understood given such diversity? *Semiotica*, 198, 137–158.

- Augustyn, P. (2013). What connects biolinguistics and biosemiotics? *Biolinguistics*, 7, 96–111.
- Baggesen, J. (1819). *Parthenäis*. Leipzig: Brockhaus.
- Baggesen, J. (1836). *Poetische Werke in Deutscher Sprache 2*. Leipzig: Brockhaus.
- de Balzac, H. (1842). *Œuvres complètes*. volume 2. Paris: Furne, Dubochet, Hetzel et Paulin.
- Barbieri, M. (2003). *The organic codes. An introduction to semantic biology*. Cambridge: Cambridge University Press.
- Barbieri, M., J. de Beule & J.-H. Hofmeyr (2014). Code biology: A glossary of terms and concepts. URL: <http://www.codebiology.org/glossary.html>.
- Barrows, E. M. (2011). *Animal behavior desk reference: A dictionary of animal behavior, ecology, and evolution*. Boca Raton, FL: CRC Press.
- Bekoff, M., Allen, C., & Burghardt, G. (Eds.) (2002). *The Cognitive Animal: Empirical and Theoretical Perspectives on Animal Cognition*. Cambridge (Mass.): MIT Press.
- von Bertalanffy, L. (1962). *Modern theories of development*. New York: Harper.
- Beyer, C. (2015). Edmund Husserl. In: Stanford Encyclopedia of Philosophy. URL: <http://plato.stanford.edu/Borchert>.
- Borchert, D. M. (Ed.) (2006). *Encyclopedia of philosophy. Volume 7, Oakeshott-presupposition*. Detroit: Thomson Gale.
- Brentari, C. (2015). *Jakob von Uexküll. The discovery of the Umwelt between Biosemiotics and theoretical biology (biosemiotics 9)*. Dordrecht: Springer.
- Burghardt, G. M. (2008). Updating von Uexküll: new directions in communication research. *Journal of Comparative Psychology*, 122, 332–334.
- Burn, C. C. (2010). Perception. In D. S. Mills et al. (Eds.), *The encyclopedia of applied animal behaviour and welfare* (pp. 459–462). Wallingford, MA: CAB International.
- Canguilhem, G. (2008). *Knowledge of life*. New York: Fordham University Press.
- Carlyle, T. (1928). Goethe. *The Foreign Review and Continental Miscellany*, 3(2), 80–127.
- Castro, O. (2009). *Jakob Von Uexküll*. El concepto de Umwelt y el origen de la Biosemiótica. Master Thesis: Autonomous University of Barcelona (UAB).
- Chambers Dictionary (2015). URL: <http://www.chambers.co.uk/>
- Charles, F. (2004). Umwelt lehre. In F. Charles (Ed.), *International encyclopedia of systems and cybernetics* (p. 642) De Gruyter Saur.
- Chien, J.-P. (2007). *Umwelt, milieu(x) and environment: A survey of cross-cultural concept mutations. Semiotica*, 167–1(4), 65–89.
- Cobley, P. (ed.) (2009). *The Routledge companion to semiotics*. Abingdon; New York: Routledge.
- Dahlerup, V. (1934). *Ordbog over det danske sprog*. København: Nordisk Forlag.
- Danesi, M. (2000). Umwelt. In M. Danesi (Ed.), *Encyclopedic dictionary of semiotics, media, and communications* (p. 236). Toronto: University of Toronto Press.
- Deacon, T. (2012). *Incomplete nature: How mind emerged from matter*. New York: Norton.
- Deely, J. (1991). Modeling anthroposemiosis. In M. Anderson & F. Merrell (Eds.), *On semiotic modeling* (pp. 525–594). Berlin: De Gruyter.
- Deely, J. (2004). Semiotics and Jakob von Uexküll's concept of umwelt. *Sign Systems Studies* 32 (½), 11–34.
- Deely, J. (2011). *Purely objective reality (sSemiotics, cCommunication and cCognition 4)*. Berlin: De Gruyter Mouton.
- Diderot, D. & J. le Rond d'Alembert (1765). *Encyclopédie*. Volume 10. Paris: le Breton, David, Durand, Briasson. Encyclopédie. Volume 10. Paris: le Breton, David, Durand, Briasson.
- Emmeche, C., Kull, K., & Stjernfelt, F. (2002). A brief biosemiotic glossary. In C. Emmeche, K. Kull, & F. Stjernfelt (Eds.), *Reading Hoffmeyer; rethinking biology (Tartu Semiotics Library 3)* (pp. 25–30). Tartu: Tartu University Press.
- Encyclopedia Britannica (2015). URL: <http://www.britannica.com/>
- von Goethe, J. W. (1869). *Italianische Reise. In Goethes Werke X*. Berlin: Hildburghausen Verlag des bibliographischen Instituts.
- von von Goethe, J. W. von (2016). *The essential Goethe*. Princeton, NJ: Princeton University Press.
- Grimm, J., & Grimm, W. (1956). *Deutsches Wörterbuch XI*. Leipzig: Hirschel.
- Heidegger, M. (1996 [1927]). *Being and time*. A translation of Sein und Zeit. Transl. by J. Stambaugh. Albany: State University of New York Press.
- Hoffmeyer, J. (1996). *Signs of meaning in the universe*. Bloomington, Indianapolis: Indiana University Press.
- Hoffmeyer, J. (1998). Umwelt. In P. Bouissac (Ed.), *Encyclopedia of semiotics* (pp. 623–624). New York: Oxford University Press.
- Hoffmeyer, J. (2004). Uexküllian Planmäßigkeit. *Sign Systems Studies*, 32, 73–97.
- Klíková, A., & Kleisner, K. (Eds.) (2006). *Umwelt. koncepce žitého světa jakoba von Uexkülla*. Červený Kostelec: Pavel Mervart.

- Kohn, E. (2013). *How forests think: toward an anthropology beyond the human*. Berkeley: University of California Press.
- Krampen, M., Oehler, K., Posner, R., Sebeok, T. A., & von Uexküll, T. (Eds.) (1987). *Classics of semiotics*. New York: Plenum Press.
- Kull, K. (2001a). Jakob Von Uexküll: An introduction. *Semiotica*, 134(1/4), 1–59.
- Kull, K. (2001b). Umwelt. In P. Cobley (Ed.), *The Routledge companion to semiotics and linguistics* (p. 281). London: New York: Routledge.
- Kull, K. (2009a). Umwelt. In P. Cobley (Ed.), *The Routledge companion to semiotics* (pp. 348–349). Abingdon: New York: Routledge.
- Kull, K. (2009b). Umwelt and modelling. In P. Cobley (Ed.), *The routledge companion to semiotics* (pp. 43–56). London: Routledge.
- Kull, K. (2010). Ecosystems are made of semiotic bonds: consortia, umwelten, biophony and ecological codes. *Biosemiotics*, 3(3), 347–357.
- Magnus, R., & Kull, K. (2012). Roots of culture in the umwelt. In J. Valsiner (Ed.), *The Oxford handbook of culture and psychology* (pp. 649–661). Oxford: Oxford University Press.
- Markoš, A., Grygar, F., Hajnal, L., Kleisner, K., Kratochvíl, Z., & Neubauer, Z. (2010). *Life as its own designer*. Dordrecht, Heidelberg, London, New York: Springer.
- Martinelli, D. (2010). A Glossary of People, Paths and Ideas. In D. Martinelli (Ed.), *A Critical Companion to Zoosemiotics: People, Paths, Ideas (Biosemiotics 5)* (pp. 171–290). Dordrecht: Springer.
- Merleau-Ponty, M. (2003). *Nature. course notes from the Collège de France*. Evanston: Northwestern University Press.
- Merriam-Webster (2015). Dictionary and thesaurus. URL: <http://www.merriam-webster.com/>
- Mildenberger, F., & Herrmann, B. (2014). Nachwort. In F. Mildenberger & B. Herrmann (Eds.), *Uexküll: Umwelt und Innenwelt der Tiere* (pp. 261–330). Berlin: Springer.
- Nöth, W. (1995). *Handbook of semiotics*. Bloomington: Indiana University Press.
- Oxford English Dictionary (2015). URL: <http://www.oed.com/>
- Pappé, H.O. (1967). Philosophical anthropology. In D.M. Borchert (ed.) (2006), *Encyclopedia of philosophy. Volume 7, Oakeshott-presupposition* (pp. 315–324). Detroit: Thomson Gale.
- Rütting, T. (2004). History and significance of Jakob Von Uexküll and of his institute in Hamburg. *Sign Systems Studies* 32.1/2, 35–72.
- Schnedl, G. (2007). Rechtswissenschaftliche und normative umwelt(schutz)begriffe im nationalen und internationalen kontext. In S. Ulrich, G. Schnedl, & R. Pirstner-Ebner (Eds.), *Funktionen des rechts in der pluralistischen wissenschaftsgesellschaft* (pp. 511–546). Wien: Böhlau.
- Sebeok, T. A. (1979). *The sign and its masters*. Austin: University of Texas Press.
- Sebeok, T. A. (1986). *I think I am a verb: More contributions to the doctrine of signs*. New York: Plenum Press.
- Sebeok, T. A. (1989). *The sign and its masters*. Lanham: University Press of America.
- Sebeok, T. A., & Danesi, M. (Eds.) (2010). *Encyclopedic dictionary of semiotics*. Berlin: Mouton de Gruyter.
- Sedov, A. & Chebanov, S. (2009). Биосемиотика/Biosemiotika [Biosemiotics]. In A. V. Oleskin (ed.), *Terminologičeskij slovar' (tezaurus): Gumanitarnaja biologija [Terminological Dictionary (Thesaurus): Humanitarian Biology]*. Moscow: Izdatel'stvo Moskovskogo Universiteta [Moscow University Press], 295–338.
- Sharov, A. (2001). Umwelt-theory and pragmatism. *Semiotica*, 134(1/4), 211–228.
- Sharov, A. (2010). Functional information: towards synthesis of biosemiotics and cybernetics. *Entropy*, 12, 1050–1070.
- Sharov, A., Maran, T., & Tønnessen, M. (2015). Towards synthesis of biology and semiotics. editorial. *Biosemiotics*, 8(1), 1–7.
- Simpson, J. A. (1989). In E. S. C. Weiner (Ed.), *The Oxford English Dictionary. Second edition. Volume XVIII*. Oxford: Clarendon Press.
- Sutrop, U. (2001). Umwelt–word and concept: two hundred years of semantic change. *Semiotica*, 134(1/4), 447–462.
- Spitzer, L. (1942). Milieu and ambiance: An essay on historical semantics. *Philosophy and Phenomenological Research*, 3(2), 169–218.
- Stella, M., & Kleisner, K. (2010). Uexküllian umwelt as science and as ideology: the light and the dark side of a concept. *Theory in Biosciences*, 129(1), 39–51.
- Sjærfelt, F. (2007). *Diagrammatology: an investigation on the borderlines of phenomenology, ontology, and semiotics*. Dordrecht: Springer.
- Teutsch, G. M. (1985). *Lexikon der umweltethik*. Göttingen/Düsseldorf: Vandehoek und Ruprecht/Patmos-Verlag.

- Trésor de la langue française. Dictionnaire de la langue du XIX^e et du XX^e siècle (1789–1960) (1985). 16 volumes. Paris: Gallimard.
- Tinbergen, N. (1951). *The study of instinct*. Oxford: Oxford University Press.
- Tønnessen, M. (2011). *Umwelt transition and Uexküllian phenomenology – An ecosemiotic analysis of Norwegian wolf management* (= *Dissertationes Semioticae Universitatis Tartuensis* 16). Doctoral dissertation. Tartu: Tartu University Press. Introduction available online: http://dspace.utlib.ee/dspace/bitstream/handle/10062/19250/tonnessen_morten.pdf?sequence=1.
- Tønnessen, M. (2015). The biosemiotic glossary project: agent, agency. *Biosemiotics* 8(1), 125–143. With Appendix (Supplementary Material available online: http://link.springer.com/content/esm/art:10.1007/s12304-015-9229-0/file/MediaObjects/12304_2015_9229_MOESM1_ESM.pdf).
- Tsing, A. (2012). Unruly edges: mushrooms as companion species. *Environmental Humanities*, 1, 141–154.
- von Uexküll, J. (1909). *Umwelt und innenwelt der tiere* (1st ed.). Berlin: Verlag von Julius Springer.
- von Uexküll, J. (1920). *Theoretische biologie*. Berlin: Verlag von Gebrüder Paetel.
- von Uexküll, J. (1921). *Umwelt und innenwelt der tiere* (2nd ed.). Berlin: Verlag von J. Springer.
- von Uexküll, J. (1928). *Theoretische biologie* (2nd ed.). Berlin: Verlag von Julius Springer.
- von Uexküll, J. (1934). *Streifzüge durch die Umwelten von Tieren und Menschen: Ein Bilderbuch unsichtbarer Welten (sammlung: Verständliche wissenschaft, Bd. 21)*. Berlin: J. Springer.
- von Uexküll, J. (1940). *Bedeutungslehre (= bios, abhandlungen zur theoretischen biologie und ihrer geschichte sowie zur philosophie der organischen naturwissenschaften. Bd. 10)*. Leipzig: Verlag von J.A. Barth.
- von Uexküll, J. (1956 [1934, 1940]). *Streifzüge durch die Umwelten von Tieren und Menschen. Bedeutungslehre*. Rowohlt, Hamburg.
- von Uexküll, J. (1980). *Kompositionslehre der Natur: Biologie als undogmatische Natur-Wissenschaft*. Ed. by T. von Uexküll. Frankfurt am Main: Ullstein.
- von Uexküll, J. (1982a). The theory of meaning. *Semiotica*, 42(1), 25–82.
- von Uexküll, J. (1992 [1934]). A stroll through the worlds of animals and men: A picture book of invisible worlds. *Semiotica* 89 (4), 319–391.
- von Uexküll, J. (2010a). A foray into the worlds of animals and humans with A theory of meaning (Posthumanities 12). Trans. of Uexküll 1934 and 1940 by Joseph D. O’Neil. Minneapolis: University of Minneapolis Press.
- von Uexküll, T. (1982b). Glossary. *Semiotica*, 42(1), 83–87.
- von Uexküll, T. (1994). Jakob von Uexküll. In T. A. Sebeok (Ed.), *Encyclopedic dictionary of semiotics* (pp. 1131–1135). Berlin: Mouton de Gruyter.
- von Uexküll, T. (2010b). Jakob von Uexküll. In T. A. Sebeok & M. Danesi (Eds.), *Encyclopedic dictionary of semiotics*. Berlin: Mouton de Gruyter.
- von Uexküll, J. (2012). *Omailmad*. Tartu: Ilmamaa.
- von Uexküll, T., & Wesiack, W. (1997). Scientific theory: a bio-psycho-social model. In T. von Uexküll (Ed.), *Psychosomatic medicine* (pp. 11–42). München: Urban & Schwarzenberg.
- Waldau, P. (2013). *Animal Studies: An Introduction*. New York: Oxford University Press.
- Wei, C. A. (2010). Cognition. In D. S. Mills et al. (Eds.), *The encyclopedia of applied animal behaviour and welfare* (pp. 110–112). Wallingford, MA: CAB International.
- Whatmore, S. (2002). *Hybrid geographies: natures, cultures, spaces*. London Thousand Oaks, California: SAGE Publications.
- Wilson, E. O. (1975). *Sociobiology: The New Synthesis*. Cambridge, Mass.: Belknap Press of Harvard University Press.
- Wolfe, C. (2010). *What is posthumanism?* Minneapolis: University of Minnesota Press.