

Morphology in Cognitive Linguistics

Tore Nessel, UiT The Arctic University of Norway

Summary

Cognitive linguistics and morphology bear the promise of a happy marriage. Cognitive linguistics provides theoretical concepts and analytical tools for empirical analysis, while morphology offers fertile ground for testing hypotheses and refining core concepts. It is no wonder, then, that numerous contributions to the field of morphology have been couched in cognitive linguistics, and that morphological phenomena have figured prominently in cognitive linguistics.

Cognitive linguistics is a family of closely related frameworks that share the idea that language should be analyzed in terms of what is known about the mind and brain from disciplines other than linguistics. Cognitive linguistics furthermore adopts a semiotic perspective, claiming that the *raison d'être* of language is to convey meaning. Another central tenet is the usage-based approach, the idea that grammar emerges through usage, which implies a strong focus on language use in cognitive linguistics.

An example of how cognitive linguistics relates morphology to general principles of cognition is the application of general principles of categorization to morphology. Morphological categories are analyzed as radial categories, i.e. networks structured around a prototype. Such category networks can be comprised of the allomorphs of a morpheme or be used to model theoretical concepts such as paradigm and inflection class.

The radial category is also instrumental in analyzing the meaning of morphological concepts. Rather than assuming abstract invariant meanings for morphemes, cognitive linguistics analyzes the meaning of morphological phenomena through networks of interrelated meanings. The relationships among the nodes in a category network are analyzed in terms of general cognitive processes, such as metaphor, metonymy and blending.

The usage-based approach of cognitive linguistics manifests itself in the strong focus on frequency effects in morphology. It is argued that frequency is an important structuring principle in cognition, and that frequent forms have a privileged status in a morphological paradigm.

Keywords

Cognitive linguistics, metaphor, metonymy, prototype, radial category, usage-based, construction, constructicon, product-oriented generalization

1. Cognitive Linguistics – Language as a “Constructicon”

This article revolves around two questions – a “how?” and a “what?”. First, I wish to show *how* morphological phenomena can be analyzed in cognitive linguistics. Second, the article aims to show *what* cognitive linguists have done in the field of morphology so far. However, in a short article like this a comprehensive overview of all contributions to morphology by cognitive linguists is not feasible, and the reader will have to be satisfied with a few examples for each phenomenon discussed.

Cognitive linguistics is a family of broadly compatible theoretical approaches that share the working hypothesis that language is an integral part of cognition. Cognitive linguistics thus hypothesizes that language is *not* a largely independent module in the mind. It is furthermore assumed in cognitive linguistics that language is not made up of a set of separate modules for

phonology, morphology, syntax, etc., and that there is no clear-cut division line between lexicon and grammar. Instead, cognitive linguistics describes language as a large “constructicon” – an extensive network of constructions, i.e. pairings of form and meaning, at different levels of complexity. While “construction” is traditionally used about syntactic constructions, cognitive linguistics also regards words as constructions (see e.g. Booij 2010: 11-16).¹

Three properties of the “constructicon” are particularly important for present purposes. First, as mentioned, cognitive linguists consider general cognitive principles directly relevant for linguistic analysis. In Langacker’s (2008: 8) words, the general strategy is to “invoke only well-established or easily demonstrated mental abilities that are not exclusive to language” and then apply these to linguistic analysis. For instance, the assumption is that what holds for categorization in general is also relevant for linguistic categories. This has led cognitive linguists to apply the theory of prototypes, which originated in cognitive psychology (Rosch 1973 and 1978), to linguistic categories on all levels of linguistic analysis – including morphological categories.

A second important property of the “constructicon” concerns the semiotic approach taken by cognitive linguistics. Language is seen as a system whose primary function is to convey meaning, and constructions are accordingly described as schemas that are signs linking form and meaning (Langacker 2008: 8-9). For morphology, this has the consequence that morphosyntactic features such as “plural” and “genitive” are analyzed as entities that convey meaning much in the same way as lexical items do.

A third important point is that cognitive linguistics adopts a “usage-based” perspective. The schemas in the “constructicon” are generalizations over surface forms actually occurring in language use. In the words of Bybee (2001: 27), “schemas [...] have no existence independent of the lexical units from which they emerge”. In short, the “constructicon” is a network of schemas over surface forms, rather than a machine that generates surface forms based on abstract linguistic representations.

2. Schemas vs. Rules and Constraints – Product Oriented Generalizations

Assume that a language user is exposed to the nominative and dative singular forms of the Russian nouns *les* ‘forest’, *dom* ‘house’ and *stul* ‘chair’ (here given in a broad phonetic transcription):

- (1) a. Nominative singular: [lʲes], [dom], [stul]
- b. Dative singular: [lʲesu], [domu], [stulu]

On the basis of such forms the language user can extract constructional schemas that contain the information shared by two or more forms. One generalization is that the forms with the meaning ‘forest’ all start in the string [lʲes], which may be followed by a vowel. We can state this as follows, where the information to the left of the slash represents form, while the information after the slash concerns meaning:²

- (2) Schema for a lexeme: [lʲes.../FOREST]

¹ It should be pointed out that although construction-based approaches represent one main strand of cognitive linguistics, not all researchers identifying with cognitive linguistics necessarily adopt all terms and concepts used in Construction Grammar. The present article adopts a constructionist perspective, but also explores work from other areas in cognitive linguistics, such as metaphor and metonymy.

² For the purposes of the present article, I will use the notation and representational format of Langacker (1987, 1991a and 2008) and not discuss other notations (e.g. that of Constructional Morphology, Booij 2010 and 2016). While notations vary, the insights are shared across various approaches in cognitive linguistics.

At the same time, the language user can make the generalization that dative singular forms end in [u], which can be represented as the following schema:

(3) Schema for an inflectional affix: [...u/DATIVE SINGULAR]

Schemas for derivational affixes are of the same type. Thus, a language user exposed to diminutive forms such as [pʲisok] ‘small forest’, [ʌstrʌvok] ‘small island’ and [grʲibok] ‘small mushroom’ may extract the following schema, which shows that the content we (simplistically) can refer to as “diminutive” is expressed by word forms involving [ok] preceded by any string of sounds:

(4) Schema for a derivational affix: [...ok/DIMINUTIVE]

As can be seen from (3) and (4), schemas for inflectional and derivational affixes are of the same type, which indicates that cognitive linguistics does not assume a crisp division line between inflection and derivation. This does not mean that inflection and derivation are the same, but that they occupy different parts of a continuum ranging from typical inflectional affixes that are relevant for syntax and do not change the syntactic category of the word to typical derivational affixes that are not syntactically relevant, but can change a word’s syntactic category.³

Schemas for affixes like (3) and (4) have a dual purpose. On the one hand, if a language user comes across a form ending in [u] of an unfamiliar noun, s/he may relate this form to the schema in (3) and draw the conclusion that the form in question is dative singular. On the other hand, if one wants to create a dative singular form of a word, for which one has not encountered this case form before, one can use the schema in (3) to create a form ending in [u].

Since schemas can be used to interpret and create morphological forms, they share many functions with the procedural rules of classical generative grammar. However, schemas are not procedures that apply to abstract underlying representations, but rather output-based generalizations over forms occurring in utterances. Insofar as schemas are not procedural, they resemble constraints of e.g. Optimality Theory. An important difference, however, is the fact that in Optimality Theory constraints are often formulated as negative prohibitions (e.g. NOCODA: “syllables do not have codas”, Prince and Smolensky 2004). Schemas, on the other hand, are always stated in positive terms; they are generalizations over forms actually occurring in utterances, not over elements that are prohibited.

Constructional schemas come with the advantage that they enable us to straightforwardly accommodate so-called product-oriented generalizations (Bybee and Slobin 1982, Bybee 2001), i.e. generalizations that specify the properties of some well-formed structure without relating it to any “source” (e.g. an abstract underlying representation) on which it is purportedly based. Consider the following example from present tense forms of Russian verbs, which typically have a root followed by a derivational suffix, which in turn is followed by an inflectional ending. In the following examples, hyphens are used to mark morphological boundaries:

- (5) a. [aj]: [igr-aj-ut] ‘they play’
b. [ej]: [krʌsnʲ-ej-ut] ‘they redden’
c. [uj]: [ʌbrʌz-uj-ut] ‘they form’

It is possible to formulate a procedural rule that adds each of the three derivational suffixes [aj], [ej] and [uj] to the root. This would produce the correct forms, but fails to capture the generalization

³ Notice that I classify Russian diminutives as derivational. However, since they do not change the word’s syntactic category, diminutives are plausibly analyzed as non-prototypical derivation.

that all three suffixes consist of a vowel followed by [j]. This product-oriented generalization can be straightforwardly represented by means of a constructional schema:

(6) Schema for Russian present tense forms: [...Vj...]

This schema not only generalizes over the suffixed verbs in (5), but also over verb forms where the [Vj] sequence is part of the root. A case in point is [laj-ut] ‘they bark’. This is important, because verbs with an unproductive suffix tend to acquire the [Vj] sequence in present tense forms through a process that is known as “suffix shift” in Russian linguistics (Nesset 2010a, 2010b and Nesset and Janda 2010). Thus, for verbs like *maxat* ‘wave’ and *kapat* ‘drip’, in addition to the older [maʂ-ut] ‘they wave’ and [kaplʲ-ut], one finds forms like [mλx-aj-ut] and [kap-əj-ut] with the same meanings.⁴ However, suffix shift is not attested for verbs like ‘bark’, which is expected since forms like [laj-ut] ‘they bark’ already conform to the schema in (5) (Nesset 2010b). On a source-oriented analysis, on the other hand, we would expect unattested forms like *[laj-əj-ut], where the productive suffix is added to the root. In this way, processes of language change such as suffix shift in Russian verbs provide evidence for product-oriented generalizations represented as constructional schemas.

3. The Quest for Meaning in Morphology – the Radial Category

As mentioned in section 1, cognitive linguistics insists that morphosyntactic features like genitive and plural are not just arbitrary indexes that can be manipulated by the syntax, but categories that convey meaning. In focusing on the meaning of grammatical categories, cognitive linguistics follows the tradition of Roman Jakobson (1936). However, Jakobson proposed “invariant meanings”, i.e. meanings that cover all uses of, say, the genitive case. Wierzbicka (1980) has argued that such invariant meanings are excessively abstract and have little predictive value. Cognitive linguistics therefore instead describes the meanings of grammatical categories as networks of schemas that may be organized around one or more prototypical schemas. Such categories are called “radial categories” (Lakoff 1987).

Figure 1 gives a radial category for the meanings of the Russian genitive case, proposed by Janda and Clancy (2002: 111).

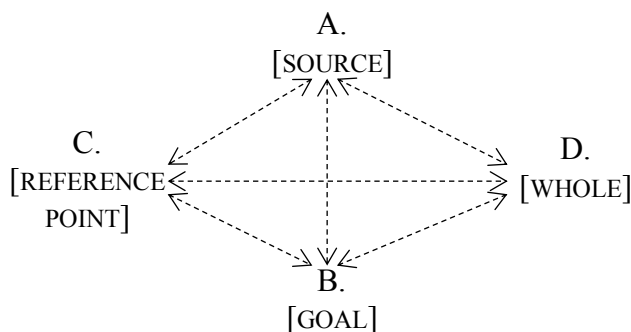


Figure 1: Radial category for the Russian genitive (adapted from Janda and Clancy 2002: 111)

The following examples that all involve the genitive form *stola* of *stol* ‘table’, illustrate the four schemas proposed by Janda and Clancy:

⁴ The alternation between [aj] and [əj] in the suffix is automatic and due to stress, a phenomenon that will not be explored in this article.

- (7) a. SOURCE:
Tarelk-a upa-l-a so stol-a.
 plate-NOM.SG fall-PST-F from chair-GEN.SG
 ‘The plate fell from the table.’
- b. GOAL:
Ivan doše-l do stol-a
Ivan go-PST to chair-GEN.SG
 ‘Ivan went all the way up to the table.’
- c. REFERENCE POINT:
Sergej stoja-l u stola
Sergey stand-PST by chair-GEN.SG
 ‘Sergey was standing by the table.’
- d. WHOLE:
nožk-a stol-a
leg-NOM.SG chair-GEN.SG
 ‘leg of a table’

In all these examples, we are dealing with a relationship between a “figure” in the nominative and a “ground” in the genitive (*stola*). This relationship is of four types. The ground may be a source from which the figure moves away as in (7a), or a goal which the figure approaches as in (7b). In (7c), the genitive is a reference point which the figure is located next to, and, finally, in (7d) the ground is a whole, which the figure is a part of. The dashed arrows in the figure represent “extension relations” (Langacker 1987: 371-373), i.e. relations between partially compatible schemas. The category network in Figure 1 may be somewhat atypical since it contains four equally central schemas, rather than one prototype and a number of peripheral members.

4. The Quest for Meaning in Morphology 2 – Metaphor

A cornerstone of cognitive linguistics is the theory of metaphor introduced by Lakoff and Johnson (1980). In the relevant sense, metaphor can be defined as “a cross-domain mapping in the conceptual system” (Lakoff 1993: 203). By way of example, consider the TIME IS SPACE metaphor (Haspelmath 1997), which captures the fact that we frequently describe the domain of time in spatial terms. This is relevant for morphological categories. If we go back to the Russian genitive discussed in the previous section, we find numerous metaphorical extensions to the domain of time from the spatial uses illustrated in (7). The following example suffices to illustrate the point:

- (8) *perv-ye dn-i avgust-a*
 first-NOM.PL day-NOM.PL August-GEN.SG
 ‘the first days of August’

Here, the genitive form (the ground) of *avgust* ‘August’ represents a temporal whole, of which the figure in the nominative, *pervye dni* ‘the first days’, is a part. In the relevant sense, there are mapping relations between the two domains of time and space, and we are therefore dealing with a metaphor as described in Lakoff’s definition cited above.

A more complex example of the TIME IS SPACE metaphor comes from the category of aspect in Russian, where perfective aspect is marked by a number of derivational prefixes that are added to simplex imperfective verbs. Drawing on the familiar observation that the perfective-imperfective distinction resembles the distinction between count and mass nouns (Dahl 1985: 76, Langacker 1987: 248-267 and 1991b: 87), Janda (2004) argues that the distinction between solid objects and

fluid substances motivates the use of the two aspects in Russian. For instance, in the same way as solid objects such as rocks can be placed sequentially, the perfective aspect is used for sequentially ordered events. Fluid substances (e.g. gin and tonic) can be mixed together and occupy the same location (e.g. a glass). Janda argues that this behavior in the spatial domain motivates the fact that imperfective verbs, which Janda analyzes as metaphorical substances, are used when two events unfold simultaneously, thus being mixed together at the same temporal (metaphorical) location.

5. The Quest for Meaning in Morphology 3 – Metonymy

In the same way as metaphor provides links between schemas in a radial category, the meanings of a morphological category can also be related in terms of metonymy. Radden and Kövecses (1999: 21) define metonymy as “a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same cognitive model.” For present purposes, it is sufficiently precise to equate Radden and Kövecses’ “cognitive model” with Lakoff’s “domain”, so in a nutshell metaphor involves mappings *across* domains, whereas metonymical relations are found *inside* a domain. Perhaps the most well-known metonymical relation holds between parts and wholes, as in the following example where a body part (the head) stands for the whole person:

(9) We need a good head for this project. (Janda 2011: 360).

Janda (2011) argues that metonymy is not restricted to lexical examples like (9), but is also relevant for word-formation (see also Dirven 1999 and Panther and Thornburg 2001). Consider the following Czech and Russian examples from Janda (2011: 360):

- (10) a. *brjux-an* (lit. ‘belly’-*an*) ‘person with a large belly’ (Russian)
 b. *břich-áč* (lit. ‘belly’-*áč*) ‘person with a large belly’ (Czech)

What is the meaning of the derivational suffixes *-an* and *-áč*? On Janda’s analysis, these suffixes are instructions to perform metonymical shifts from the body part (the belly) denoted by the stem to the whole person. Janda analyzes a large body of material from Czech, Russian and Norwegian and concludes that metonymy is pervasive in the derivational morphology of all three languages.

In the previous section, we saw that metaphor is relevant for Russian aspect through mappings from the spatial domain (solid objects vs. fluid substances) to the temporal meanings of aspectual prefixes. In Nessel 2009, it is argued that metonymy also plays a role. When a perfectivizing prefix is added to a verb, the resulting verb is typically used about single actions at one point in time, but a number of non-prototypical meanings are also attested, one of which is referred to as the “salient example meaning” (Russian: *nagljadno-primernoje značenie*). Consider the following example from V. Orlov’s novel *Al’tist Danilov*, where a certain Kudasov often comes to dinner without being invited (Nessel 2009: 70):

- (11) *Kudasov ne nuž-en, odnako on-i ego terp-jat. [...]*
 Kudasov NEG needed-M.SG yet they-NOM.PL he.ACC.SG tolerate.IPFV-3.PL.
Vs-e ravn-o on prid-et, izvin-it-sja i sjad-et
 All-N.SG even-N.SG he.NOM.SG come.PFV-3.SG excuse.PFV-3.SG-REFL and sit.PFV-3.SG
za stol.
 behind chair.ACC.SG
 ‘Nobody needs Kudasov, although they tolerate him. Nevertheless, he comes, excuses himself in sits down at the table.’

Although perfective verbs are typically used for single actions at one point in time, the context here indicates that we are dealing with Kudasov’s repeated visits. Arguably, what motivates the use of the perfective aspect in such cases is the metonymical shift whereby one salient example stands for a whole series of similar actions.

6. A Hierarchical “Constructicon”

The radial categories we have considered so far relate schemas of the same level of specificity, but cognitive linguistics also assumes hierarchical relationships between schemas and subschemas of different levels of specificity. A good illustration is compounding in Japanese (Booij 2010: 69-71). While Japanese compounds are normally right-headed, there is a class of left-headed Sino-Japanese compounds consisting of a verbal noun to the left followed by an internal argument. Booij (2010: 69) provides the following example:

- (12) Soo-kin
Send-money
‘remit’

The question is how to capture the generalization that compounds in Japanese are typically right-headed, but at the same time accommodate the smaller class of Sino-Japanese compounds illustrated in (12). Booij (2010) proposes a hierarchy of schemas of the type presented in Figure 2. On the top level, we find the maximally general schema $[X Y]_Z$ which only says that Japanese has compounds consisting of two morphemes, represented as X and Y. This schema has two subschemas. To the right, we have the default schema $[X Y]_Y$ where the subscript $_Y$ indicates that the element to the right, Y, is the head. The corresponding schema to the left, $[X Y]_X$ with X as the head, accounts for the class of left-headed compounds. This schema has the more specific subschema $[VN N]_{VN}$, that accommodates the class of Sino-Japanese left-headed compounds involving verbal noun (symbolized as VN) as its head. Finally, at the bottom level, we find a schema representing one type of such compounds, namely the ones with *soo* ‘send’ as its head. In the notation of Langacker (1987, 1991a, 2008), solid arrows connect schemas with their fully compatible subschemas.

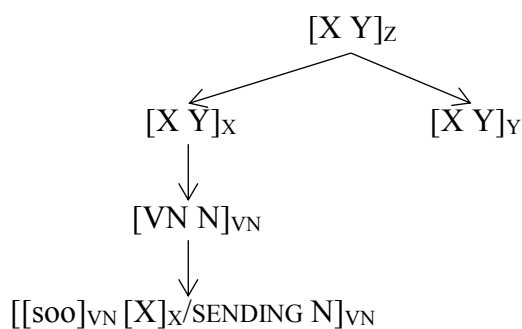


Figure 2: Hierarchical network of schemas and subschemas for Japanese compounds (adapted from Booij 2010: 70)

7. Non-Compositionality: Compounds

A recurring topic in cognitive linguistics is non-compositionality – how can we account for cases where the meaning of a complex word cannot be derived from the meanings of its parts? Many compounds are of this type, and compounds have received considerable attention in cognitive

linguistics (e.g. Tuggy 1987, Ryder 1994, Geeraerts 2002, Benczes 2006, Jackendoff 2009, and Eiesland 2015). Consider the following English examples from Benczes (2006: 185):

- (13) a. *hen party*
 b. *belly button*
 c. *phone neck*
 d. *humpback*

A *hen party* is a party for women, not for birds, and a *belly button* is not a button on a garment, but a body part. A *phone neck* is furthermore not a type of neck, but rather a type of pain resulting from holding a telephone in a non-ergonomic way, and a *humpback* can denote a kind of whale, not just a body part. Cognitive linguistics offers a straightforward way to analyze non-compositional words, since it is possible to include information about both parts and wholes in constructional schemas. Figure 3 provides an illustration based on Langacker’s (1987, 1991a-b, 2008) notation style. The compound integrates representations of the two parts *hen* and *party*, which specify the meanings of these words, but at the same time a representation of the whole is included, where the non-compositional meaning of the compound is given. The schema for the compound consists of all three components, as well as the relationships holding between them, represented as solid lines without arrows. Since the schema in Figure 3 illustrates a simple example, it does not provide much information. However, the figure suffices to show how non-compositional meanings can be represented in cognitive linguistics – including more complex cases.

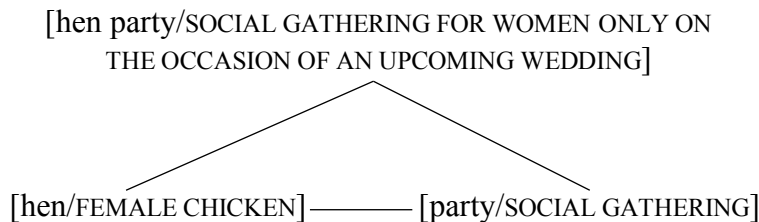


Figure 3: Schema for non-compositional compounds

Although the meaning of many compounds is non-compositional, cognitive linguistics does not assume that the relevant meanings are unmotivated or arbitrary. On the contrary, the relationships between the meanings of the parts and the wholes tend to involve well-known cognitive phenomena, such as metaphor and metonymy. In *hen party* in (13a), *hen* can be analyzed as a metaphorical woman, and in *belly button* in (13b) the use of *button* is metaphorical. *Phone neck* in (13c) and *humpback* in (13d), on the other hand, involve metonymy. In the former, *neck* metonymically stands for a ‘pain in the neck’, while at the same time *phone* stands for ‘a way of holding the phone’. In *humpback*, the compound as a whole has a metonymical meaning, insofar as a characteristic property of one body part has given name to the whole animal. In addition to metaphor and metonymy, Fauconnier and Turner’s (2002) theory of conceptual integration is sometimes invoked to account for the meaning of non-compositional compounds (see e.g. Benczes 2006: 142-143 and Nessel 2016). The fact that cognitive linguistics relates compounds and non-compositional meanings in general to metaphor, metonymy and conceptual integration testifies to the explanatory potential of cognitive linguistics.

8. Allomorphy

How is allomorphy handled in cognitive linguistics? For expository purposes, it is sufficient to consider the relationship between the English indefinite articles *a* and *an*. Assume (somewhat

simplistically) that their meaning can be described exhaustively as “indefinite”, and that there are no exceptions to the generalization that *a* occurs before consonants (*a tiger*), while *an* is used before vowels (*an elephant*) (but see Bauer 2003: 16 and Gabrielatos et al. 2010). Insofar as the two morphs display identical meanings and are in complementary distribution, we are dealing with an obvious case of allomorphy. For the analysis of such data, cognitive linguistics once more makes use of schemas and radial categories. In Figure 4, there is one schema for *an* followed by a vowel and one for *a* with a following consonant. A more abstract schema in the top portion of the figure contains the information that is shared by the two lower level schemas, namely that the English article marking indefiniteness starts with *a*.

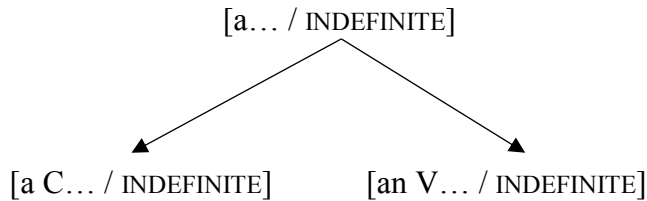


Figure 4: Network for the a/an allomorphs in English

Although the network in Figure 4 contains relevant information about the *a/an* allomorphy, the network arguably does not make explicit that it is the following vowel that conditions the choice between *a* and *an*. In order to capture this, we may appeal to tripartite schemas of the type illustrated in Figure 3 in the previous section. Consider the schema in Figure 5, which concerns *an*. For convenience, semantic information is omitted. In the bottom right portion the V-initial word is preceded by suspension points included in a circle. This is what Langacker (2008: 198) refers to as an “elaboration site”, i.e. an “empty slot” that needs to be filled. We may assume that nouns come with an empty slot for an indefinite article. The dotted line from the elaboration site to *an* indicates that the elaboration site must be filled by *an*, i.e. that V-initial words select for *an*. In this way, we capture the generalization that the choice of *an* is conditioned by the phonological shape of the following word. For more on schemas of this type, see Nessel (2008: 83-84).

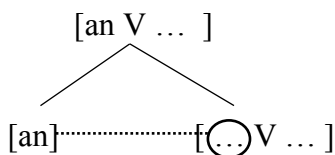


Figure 5: Phonologically conditioned allomorphy in cognitive linguistics

The exposition above shows how allomorphy can be accounted for in cognitive linguistics. A much deeper question is what allomorphy really *is*. Endresen (2014) argues that cognitive linguistics can contribute to our understanding of this concept. She proposes that allomorphy has a gradient nature and can be analyzed as a radial category organized around a prototype. The prototypical allomorphic relationship involves phonological conditioning of morphs that are semantically identical, while cases with non-phonological conditioning and cases where the traditional criteria of identical meanings and complementary distribution are not completely satisfied are analyzed as less prototypical. Endresen’s analysis suggests that notions such as “radial category” and “prototype” are useful not only for the analysis of linguistic data, but also inform our understanding of theoretical concepts in morphology.

9. Paradigms and Inflection Classes – Second-Order Schemas

In this section, we consider so-called second-order schemas, which enable us to account for inflectional paradigms and inflection classes. Three conceptions of inflectional paradigms are readily conceivable. First, one may think of a paradigm as a table where each inflected form of a lexeme occupies one cell. This traditional “tabular model” involves no structure, insofar as all members of the paradigm enjoy the same status. An alternative is to conceive of paradigms as structured categories with central and peripheral members (see e.g. Wurzel 1984: 116–124 and 1989: 112–121, and Bybee 1985: 50–58). A third option is to consider paradigms epiphenomenal and hence theoretically unimportant (e.g. Distributed Morphology, Halle and Marantz 1993). As the reader may have guessed at this point, it is the second approach that is congruent with cognitive linguistics – paradigms are analyzed as structured networks on a par with other linguistic categories.

By way of example, consider the data from Russian verbs in Table 1 (Nesset 2008: 206-209). As can be seen from the table, the third person plural present tense form has two suffixes, [ut] and [at] (in broad phonetic transcription), while the present active participle displays a choice between the suffixes [uʃ] and [aʃ], which are followed by an adjectival agreement suffix here simply represented as AGR. The important generalization is that there is a systematic relationship between the suffixes of the third person plural and the participle; if the third person plural has [u], then the participle also has [u], and if the third person plural has [a], the participle has [a]. How can this generalization be captured by means of schemas?

Class:	3 plural	Active participle	Verb
1	[ut]: [dʲeləj-ut]	[uʃ]: [dʲeləj-uʃ-AGR]	<i>delat</i> ‘do’
2	[at]: [gəvʌrʲ-at]	[aʃ]: [gəvʌrʲ-aʃ-AGR]	<i>govorit</i> ‘speak’

Table 1: Third person plural and active participles in Russian. Square brackets are used for broad phonetic transcription and italics for transliterated orthography, Hyphens represent boundaries between morphemes.

The first step is to establish schemas for each individual form:

- (14) a. [...ut/3 PL]
 b. [...uʃ^j+AGR/PARTICIPLE]
 c. [...at/3 PL]
 d. [...aʃ^j+AGR/PARTICIPLE]

In order to capture the systematic relationships among the forms, we may assume that the schemas are connected and formulate schemas for these connections. In the following schemas, the implicative relationships between the third person plural and the participle are represented as dashed arrows:

- (15) a. [[...ut/3 PL] --> [...uʃ^j+AGR/PARTICIPLE]]
 b. [[...at/3 PL] --> [...aʃ^j+AGR/PARTICIPLE]]

The dashed arrows represent the implicative relationships between the third person plural and the participle. Since the schemas in (15) are schemas over schemas, they are referred to as “second-order schemas” (Nesset 2008, Kapatsinski 2013, Booij 2016).

Although the simple examples in (15) concern only a small part of the Russian verb paradigm, the approach can be extended so that full paradigms can be accounted for in terms of second-order schemas. The examples in (15) furthermore illustrate how inflection classes can be handled in cognitive linguistics. The two schemas represent alternative suffixes for the same

morphosyntactic features. In cognitive linguistics, inflection classes can be analyzed as alternative second-order schemas that apply to different groups of words (Neset 2008: 62-63).

10. A Usage-Based Approach: Frequency Effects

A large body of empirical research shows that frequency influences language structure, and that frequency effects are important in morphology. For instance, high token frequency protects words against regularization through analogical change, and, accordingly, irregular forms tend to have high token frequency, while low frequency forms are regular (Bybee 2007).

Since cognitive linguistics adopts a usage-based approach to language, the role of frequency has received considerable attention. As mentioned earlier, no clear-cut division line is assumed between the language system and language use; instead, constructional schemas are generalizations that grow out of concrete usage events. Depending on the frequency of activation, schemas differ in “entrenchment”, which Langacker (1987: 59) describes as follows (see also discussion in Langacker 2017):

- (16) “Linguistic structures are [...] conceived as falling along a continuous scale of entrenchment in cognitive organization. Every use of a structure has a positive impact on its degree of entrenchment, whereas extended periods of disuse have a negative impact. With repeated use, a novel structure becomes progressively entrenched, to the point of becoming a unit.”

In short, through repetition a word becomes more entrenched in the mental “constructicon”, a process that may establish the word as a holistic unit. By way of example, consider the rivalry between the two English synonyms *universality* and *universalness*. Google searches performed in September 2017 indicate that *universality* is more than 500 times more frequent than its rival. While it is possible that both words have achieved unit status, it appears safe to assume that the schema for *universality* (which is based on all usage events involving this word) is more entrenched than the one for *universalness*.

Although it is not controversial in cognitive linguistics that there is a relationship between frequency in a corpus and entrenchment in the mental grammar of a language user, the exact nature of this relationship is complex and subject to debate. Schmid (2014, 2015, and 2017) offers a multifaceted theory, which is relevant for morphology. First, Schmid (2014: 38) argues that “frequency is never *frequency as such*, i.e. absolute frequency, but always *relative frequency*, that is the frequency of occurrence of one thing as compared to that of another” (original emphasis). In other words, according to Schmid, the mental grammar of a native speaker of English does not reflect the corpus frequency of *universalness* in any direct way, but the fact that *universalness* is much less frequent than *universality* may be part of the mental grammar.

A second point raised by Schmid (2014, 2015, and 2017) concerns the social aspect of language. Language use involves the interaction of many speakers, so the entrenchment of a pattern in the mental grammar of a single speaker arises from the interaction with other speakers in a speech community. Therefore, Schmid argues, cognitive linguistics must pay equal attention to cognitive processes in the mind of individual speakers (such as entrenchment) and social processes (such as the conventionalization of a linguistic pattern in a speech community). In his “Entrenchment-and-Conventionalization Model”, Schmid provides in-depth discussion of the interaction between entrenchment and social processes. Note in this connection that cognitive linguistics has shown that there may be considerable differences in the mental grammars of individual language users in the same speech community (Dąbrowska 2015). This suggests that

although speakers may produce very similar utterances, the degree of entrenchment of morphological patterns may vary substantially among speakers of the same language.

Third, Schmid (2014: 6) argues that strictly speaking it is not constructions per se that vary in entrenchment, but what he calls “associations”, i.e. the processes that create links between cognitive representations. Such associations can be “symbolic”, i.e. create links between meaning and form, or they can connect a schema with the elements surrounding it in running text (“syntagmatic associations”) or with “competing associations” such as co-hyponyms (“paradigmatic associations”, Schmid 2014: 10-11). Finally, Schmid (2014: 14) considers “pragmatic associations” that link constructional schemas to the speech situation. Taken together, Schmid’s “Entrenchment-and-Conventionalization Model” offers a detailed nomenclature that facilitates informed analysis of frequency effects in morphology.

A traditional assumption in morphology is that regular forms such as “weak” verbs in English are accounted for by rules, while irregular forms such as English “strong” verbs are stored in the mental lexicon (Pinker 1999). This assumption is relevant for frequency effects; since frequency is likely to affect forms stored in the lexicon, but not forms accounted for by general rules, the prediction is that frequency effects would be found in irregular forms, but not in regular forms. Cognitive linguistics yields different predictions. Since in cognitive linguistics both regular and irregular forms are accounted for by the same mechanisms (networks of constructional schemas, which are sensitive to frequency), we expect frequency effects to apply to forms regardless of their degree of regularity. There appears to be evidence supporting the cognitive linguistics approach. For instance, Baayen et al. (2003) report on experimental evidence from regular Dutch plurals, showing robust frequency effects. In a series of psycholinguistic experiments, they compared the response times for regular plural forms and found that plural forms of nouns such as *wolk* ‘cloud’ that predominantly occur in the plural displayed significantly shorter response times than nouns that are predominantly attested in the singular (e.g. *soep* ‘soup’). They argue that their results go “against the idea that storage in the mental lexicon is restricted to irregular complex words, and that regular complex words are always processed by rule” (Baayen et al. 2003: 382).

11. The Quantitative Turn

As pointed out by Janda (2013 and 2017), cognitive linguistics underwent a “quantitative turn” in the first decade of the new millennium. Cognitive linguistics started out as a “qualitatively oriented” approach to language where concepts such as schema, radial category network, metaphor and metonymy were largely discussed on the basis of data from introspection or smaller datasets created manually. However, with the advent of large electronic corpora cognitive linguists began analyzing larger datasets which required more sophisticated statistical modeling. In her investigation of all articles published in the journal *Cognitive Linguistics* since its first volume in 1990, Janda (2017: 498-499) demonstrates that since 2008 more than 50% of all articles each year are “quantitative” in the sense that the author “reports numbers for some kind of authentic language data”.

The quantitative turn has affected morphology as much as any other subfield of cognitive linguistics. A couple of examples suffice to illustrate this trend. On the basis of a corpus-based investigation of “suffix shift” in Russian verbs, Baayen et al. (2010) discuss the problem of non-independence of the elementary observations in a dataset, and argue that mixed effects modeling can handle the problem in a principled way. The benefit for morphology is a better understanding of the interaction of factors that motivate analogical change in Russian verbs.

While Baayen et al. (2010) explore one statistical model, Baayen et al. (2013) take the focus on quantitative methods one step further and compare three approaches: traditional regression

models, “tree and forest” (Strobl et al. 2009), and “naive discriminative learning” (Baayen et al 2011). The test site includes rival forms in morphology, i.e. situations where two seemingly synonymous forms “compete” for the same slot in a language. An English example already alluded to in the previous section is the rivalry between the suffixes *-ness* and *-ity* in abstract nouns such as *universalness* and *universality*. On the basis of a detailed investigation of datasets from Russian, which inter alia involve verbal prefixes and suffixes, Baayen et al. (2013) describe a number of differences among the three models under scrutiny. However, their most striking finding is perhaps that “[a]cross the four data sets, the different statistical methods provide very similar results” (Baayen et al. 2013: 287). They argue that this convergence is reassuring since it indicates that different models can be used in parallel, thus bringing out the strengths of each model and compensating for their weaknesses.

Although it is likely that statistical modeling and quantitative analysis of large datasets will play an important part in cognitive linguistics in the years to come, it is possible that the introduction of new theoretical concepts may make the pendulum swing back towards more qualitatively oriented research. Time will show.

12. Concluding remarks

As shown in this article, the starting point of morphological analysis in cognitive linguistics is the construction ([section 1](#)). Constructions – pairings of meaning and form – are accounted for by means of schemas ([section 2](#)) that constitute radial categories structured around prototypes ([section 3](#)). Important conceptual links between schemas in a radial category are metaphor ([section 4](#)) and metonymy ([section 5](#)). There are also hierarchical relationships between schemas for constructions of different degrees of specificity ([section 6](#)) and an individual schema can include information about a complete structure, but also about its parts ([section 7](#)). Schemas furthermore may contain empty slots (“elaboration sites”) that may be filled by material from other schemas ([section 8](#)), and it is possible to construct so-called second-order schemas that are schemas over schemas ([section 9](#)). Schemas vary in their degree of entrenchment ([section 10](#)) and form a natural starting point for quantitative investigations of morphological phenomena ([section 11](#)).

Taken together, the tools described in this article facilitate analysis of classic morphological issues, such as rules vs. constraints, allomorphy, paradigms, and inflection classes. But at the same time, cognitive linguistics to some extent shifts the focus away from these classic issues and instead emphasizes other aspects of morphology, two of which have figured prominently in the present article. First, in cognitive linguistics no effort is spared to provide detailed and insightful analyses of how morphological categories convey meaning, including in complex structures where meaning is non-compositional or involves metaphor or metonymy. Second, the complex relationship between frequency in a corpus and entrenchment in a mental grammar is a topic that is likely to occupy cognitive linguists for a long time.

13. Further Reading

Although this article has addressed a number of important issues relevant for morphology, this short text does not do justice to cognitive linguistics as a whole. Interested readers might want to consider some of the foundational works, such as Langacker’s *Foundations of Cognitive Grammar* (1987 and 1991a), Lakoff and Johnson’s *Metaphors We Live By* (1980), Lakoff’s *Women, Fire, and Dangerous Things* (1987), Talmy’s *Toward a Cognitive Semantics* (2000), Goldberg’s (1995 and 2006) books on constructions and Fauconnier and Turner’s (2002) introduction to conceptual integration. There are also a number of textbooks on the market, notably Taylor (2002), Croft and Cruse (2004), and Langacker (2008 and 2013). Evans (2007) provides a glossary of important

concepts. In recent years, three handbooks of cognitive linguistics have been published (Geeraerts and Cuyckens 2007, Dąbrowska and Divjak 2015, and Dancygier 2017). Finally, it should be mentioned that some of the recent handbooks in morphology contain articles related to cognitive linguistics (e.g. Lieber and Štekauer 2009 and Hippisley and Stump 2016).

References

- Baayen R. H., J. M. McQueen, T. Dijkstra & R. Schreuder (2003). Frequency effects in regular inflectional morphology: Revisiting Dutch plurals. In by R. H. Baayen and R. Schreuder (Eds.): *Morphological Structure in Language Processing* (pp. 355-390). Berlin: De Gruyter.
- Baayen, R. H., L. A. Janda & T. Nessel (2010). Capturing correlational structure in Russian paradigms: A case study in logistic mixed-effects modeling. *Corpus linguistics and linguistic theory* 6(1), 29-48
- Baayen, R. H., P. Milin, D. F Đurđević, P. Hendrix, & M. Marelli. (2011). An amorphous model for morphological processing in visual comprehension based on naive discriminative learning. *Psychological Review*, 118(3), 438-482.
- Baayen, R. H., A. Endresen, L. A. Janda, A. Makarova & T. Nessel (2013). Making choices in Russian: pros and cons of statistical methods for rival forms. *Russian Linguistics* 37(3), 253-291.
- Bauer, L. (2003). *Introducing linguistic morphology*. Edinburgh: Edinburgh University Press.
- Benczes, R. (2006). *Creative Compounding in English*. Amsterdam/Philadelphia: John Benjamins.
- Booij, G. (2010). *Construction Morphology*. Oxford: Oxford University Press.
- Booij, G. (2016). Construction Morphology. In A. Hippisley & G. Stump (Eds.): *The Cambridge handbook of Morphology* (pp. 424-448). Cambridge: Cambridge University Press.
- Bybee, J. (1985). *Morphology*. Amsterdam/Philadelphia: John Benjamins.
- Bybee, J. (2001). *Phonology and language use*. Cambridge: Cambridge University Press.
- Bybee, J. (2007). Diachronic linguistics. In D. Geeraerts & H. Cuyckens (Eds.): *The Oxford handbook of cognitive linguistics* (pp. 945-987). Oxford: Oxford University Press.
- Bybee, J. & D. Slobin (1982). Rules and schemas in the development and use of the English past tense. *Language* 58: 265-289.
- Croft, W. & D. A. Cruse. (2004). *Cognitive linguistics*. Cambridge: Cambridge University Press.
- Dąbrowska, E. (2015). Individual differences in grammatical knowledge. In E. Dąbrowska & D. Divjak (Eds.): *Handbook of cognitive linguistics* (pp. 650-668). Berlin: De Gruyter Mouton.
- Dąbrowska, E. & D. Divjak (Eds.): *Handbook of cognitive linguistics*. Berlin: De Gruyter Mouton.
- Dahl, Ö. (1985). *Tense and aspect systems*. Oxford: Basil Blackwell.
- Dancygier, B. (Ed.): *The Cambridge Handbook of Cognitive Linguistics*. Cambridge: Cambridge University Press.
- Dirven, R. (1999). Conversion as a conceptual metonymy of event schemata. In: K.-U. Panther & G. Radden (Eds.), *Metonymy in language and thought* (pp. 275-288). Amsterdam/Philadelphia: John Benjamins.
- Eiesland, E. A. (2015). *The semantics of Norwegian noun-noun compounds*. University of Oslo PhD dissertation.
- Endresen, A. (2014). *Non-Standard allomorphy in Russian prefixes: Corpus, experimental, and statistical exploration*. University of Tromsø PhD dissertation.
- Evans, V. (2007). *A Glossary of Cognitive Linguistics*. Edinburgh: Edinburgh University Press.
- Fauconnier, G. & M. Turner. (2002) *The way we think. Conceptual blending and the mind's hidden complexities*. New York: Basic Books.

- Gabrielatos, C., Torgersen, E., Hoffmann, S. & Fox, S. (2010). A corpus-based sociolinguistic study of indefinite article forms in London English. *Journal of English Linguistics*, 38(4), 297-334.
- Geeraerts, D. (2002). The interaction of metaphor and metonymy in composite expressions. In: R. Dirven & R. Pörings (Eds.), *Metaphor and metonymy in comparison and contrast* (pp. 435-465). Berlin: Mouton.
- Geeraerts, D. & H. Cuyckens (Eds.): *The Oxford handbook of cognitive linguistics*. Oxford: Oxford University Press.
- Goldberg, A. E. (1995). *Constructions*. Chicago and London: The University of Chicago Press.
- Goldberg, A. E. (2006). *Constructions at work*. Oxford: Oxford University Press.
- Halle, M. & A. Marantz. (1993). Distributed morphology and the pieces of inflection. In K. Hale & S. J. Keyser (Eds.), *The view from building 20* (pp. 111-176). Cambridge, MA: MIT Press.
- Haspelmath, M. (1997). *From space to time: Temporal adverbials in the world's languages*. Munich: Lincom Europa.
- Hippisley, A. & G. Stump (Eds.): *The Cambridge handbook of Morphology*. Cambridge: Cambridge University Press.
- Jakobson, R. (1936). Beitrag zur allgemeinen Kasuslehre. *Travaux du Cercle Linguistique de Prague* 6: 240-288.
- Jackendoff, R. (2009). Compounding in Parallel Architecture and Conceptual Semantics. In R. Lieber & P. Štekauer (Eds.), *The Oxford Handbook of Compounding* (pp. 105-128). Oxford: Oxford University Press.
- Janda, L. A. (2004). A metaphor in search of a source domain: the categories of Slavic aspect. *Cognitive Linguistics* 15(4), 471-527.
- Janda, L. A. (2011). Metonymy in word-formation. *Cognitive Linguistics* 22(2), 359-392.
- Janda, L. A. (2013). *Cognitive linguistics: The quantitative turn. The essential reader*. Berlin: De Gruyter Mouton.
- Janda, L. A. (2017). The quantitative turn. In B. Dancygier (Ed.): *The Cambridge Handbook of Cognitive Linguistics* (pp. 498-514). Cambridge: Cambridge University Press.
- Janda, L. A. & S. J. Clancy (2002). *The Case Book for Russian*. Columbus, Ohio: Slavica.
- Kapatsinski, V. (2013). Conspiring to mean: Experimental and computational evidence for a usage-based harmonic approach to morphophonology. *Language* 89, 110-148.
- Lakoff, G. (1987). *Women, Fire, and Dangerous Things*. Chicago and London: The University of Chicago Press.
- Lakoff, G. (1993). The contemporary theory of metaphor. In: A. Ortony (Ed.), *Metaphor and Thought* (pp. 202-251). Cambridge: Cambridge University Press.
- Lakoff, G. & M. Johnson. (1980): *Metaphors we live by*. Chicago and London: The University of Chicago Press.
- Langacker, R. W. (1987). *Foundations of Cognitive Grammar*. v. 1. Stanford: Stanford University Press.
- Langacker, R. W. (1991a). *Foundations of Cognitive Grammar*. v. 2. Stanford: Stanford University Press.
- Langacker, R. W. (1991b). *Concept, Image, and Symbol: The Cognitive Basis of Grammar*. Berlin/New York: Mouton de Gruyter.
- Langacker, R. W. (2008). *Cognitive Grammar: A basic introduction*. Oxford: Oxford University Press.
- Langacker, R. W. (2013). *Essentials of cognitive grammar*. Oxford: Oxford University Press.

- Langacker, R. W. (2017). Entrenchment in Cognitive Grammar. In H.-J. Schmid (Ed.), *Entrenchment and the Psychology of Language Learning* (pp. 39-56). Boston: APA and Berlin: Walter de Gruyter.
- Lieber, R. & P. Štekauer (Eds.), *The Oxford Handbook of Compounding*. Oxford: Oxford University Press.
- Nesset, T. (2008): *Abstract phonology in a concrete model. Cognitive linguistics and the morphology-phonology interface*. Berlin: Mouton de Gruyter.
- Nesset, T. (2009). Metonymy of aspect/aspects of metonymy. *Scando-Slavica* 55, 65-77.
- Nesset, T. (2010a). Suffix shift in Russian verbs: a case for markedness? *Russian Linguistics* 34, 123-138.
- Nesset, T. (2010b). Why not? Prototypes and blocking of language change in Russian verbs. In E. Tabakowska, M. Choinski & L. Wiraszka (Eds.): *Cognitive linguistics in action: From theory to application and back* (pp. 123-144). Berlin: Mouton de Gruyter.
- Nesset, T. (2016). Spøkelsesfiske, makrellfotball og traktoregg: norske sammensetninger og konseptuell integrasjon. *Maal og Minne* 2, 85–110
- Nesset, T. & L. A. Janda. (2010). Paradigm structure: Evidence from Russian suffix shift. *Cognitive Linguistics* 21(4), 699–725.
- Panther, K.-U. & L. Thornburg. (2001). A Conceptual Analysis of *-er* Nominals. “In S. Niemeier und M. Pütz (Eds.): *Applied Cognitive Linguistics II: Language Pedagogy* (pp. 149-200). Berlin and New York: Mouton de Gruyter.
- Pinker, S. (1999): *Words and Rules: The ingredients of language*. London: Weidenfeld and Nicolson.
- Prince, A. & P. Smolensky (2004) *Optimality Theory. Constraint Interaction in Generative Grammar*. Oxford: Basil Blackwell.
- Rosch, E. (1973). Natural categories. *Cognitive psychology* 4, 328-350.
- Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.) *Cognition and Categorization* (pp. 27-48). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Ryder, M. E. (1994). *Ordered chaos: The interpretation of English noun-noun compounds*. Berkeley and Los Angeles: University of California Press.
- Schmid, H.-J. (2014). Lexico-grammatical patterns, pragmatic associations and discourse frequency. In: T. Herbst, H.-J. Schmid & S. Faulhaber (Eds.): *Constructions - collocations – patterns* (239-293). Berlin: Mouton de Gruyter.
- Schmid, H.-J. (2015). A blueprint of the Entrenchment-and-Conventionalization Model. *Yearbook of the German Cognitive Linguistics Association* 3, 1-27.
- Schmid, H.-J. (2017). A framework for understanding linguistic entrenchment and its psychological foundations. In H.-J. Schmid (Ed.), *Entrenchment and the Psychology of Language Learning* (pp. 9-35). Boston: APA and Berlin: Walter de Gruyter.
- Strobl, C., J. Malley & G. Tutz (2009). An introduction to recursive partitioning: rationale, application, and characteristics of classification and regression trees, bagging, and random forests. *Psychological Methods* 14(4), 323-348.
- Talmy, L. (2000). *Toward a cognitive semantics* (2 vols.). Cambridge, Mass.: MIT Press
- Taylor, J. R. (2002) *Cognitive grammar*. Oxford: Oxford University Press.
- Tuggy, D. S. (1987). Scarecrow Nouns, Generalizations, and Cognitive Grammar. In: S. DeLancey & R. S. Tomlin (Eds.), *Proceedings of the Third Annual Meeting of the Pacific Linguistics Conference*, 307-320. Department of Linguistics, University of Oregon
- Wierzbicka, A. (1980). *The case for surface case*. Ann Arbor: Karoma Publishers.

- Wurzel, W. U. (1984). *Flexionsmorphologie und Natürlichkeit*. Berlin: Akademie-Verlag.
- Wurzel, W. U. (1989). *Inflectional Morphology and Naturalness*. Dordrecht, Boston and London: Kluwer Academic Publishers.