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The grammar network: How linguistic structure is shaped by language use by Holger Diessel (review)

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REVIEWS

The grammar network: How linguistic structure is shaped by language use. By HOLGER DIESSEL. Cambridge: Cambridge University Press, 2019. Pp. xviii, 290. ISBN 9781108671040. \$110 (Hb).

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The network is one of the key concepts that describe our life experience. We communicate via social networks and use the World Wide Web. The masses of big data we produce, consciously or not, are analyzed by neural network algorithms. It is not surprising that networks are a popular concept in linguistics as well. Well-known examples are the construction in CONSTRUCTION GRAMMAR, radial polysemy networks in COGNITIVE SEMANTICS, and semantic maps in typology. *The grammar network* by Holger Diessel takes the network approach to a new level, integrating different strands of usage-based linguistics and discussing a multitude of different phenomena of grammar and lexicon, from lexical polysemy to word order, and from parts of speech to morphological productivity. The aim of his book is to elaborate on and integrate two main ideas of usage-based linguistics: first, all aspects of linguistic structure are emergent and fluid, being shaped by domain-general processes in language use; second, the grammatical system is organized as a network.

The book consists of eleven chapters. The introductory chapter describes the aims of the book and summarizes the general principles of usage-based linguistics. It questions the usefulness of such distinctions as competence vs. performance, synchrony vs. diachrony, and words vs. rules. Usage-based linguistics sees grammar as an emergent system, which has evolved for the purposes of communication and processing on the basis of general cognitive principles. From this follows an important methodological conclusion: ‘we cannot approach the study of grammar with a pre-defined set of primitive categories. On the contrary, what we need to explain is how linguistic categories evolve, stabilize and change’ (6).

In the first part of the book D introduces the basic assumptions and concepts, describing the architecture of the grammar network (Ch. 2) and the domain-general principles of language use (Ch. 3). The most important elements of a grammar network are signs (constructions and lexemes). The links (edges) in a network can be symbolic (connecting form and meaning), sequential (connecting elements in sequences, similar to syntagmatic relationships), and taxonomic (connecting patterns at different levels of abstraction). Analogous to activation strength in neural networks, the links have different weights, which depend on different factors, such as frequency of occurrence in linguistic input and output, conceptualization, and pragmatic inference. A grammar network is nested, which means that nodes of a network can themselves be analyzed as networks.

Different from Goldberg’s (1995) construction grammar, D makes a distinction between constructions and lexemes. Lexemes are monomorphemic words and other morphemes, which tap directly into world knowledge. In contrast, constructions are meaningful templates with slots for other linguistic expressions, which provide instructions for integration of lexical expressions into a coherent semantic representation. Based on this distinction, three further types of links are proposed: lexical (connecting lexemes with similar or contrastive forms and meanings), constructional (connecting constructions at the same level of abstraction), and filler-slot relationships (connecting particular lexemes or phrases with particular slots of constructional schemas).

The grammar network is shaped by domain-general cognitive processes (Ch. 3). The most important ones are social cognition, conceptualization, and memory, which compete in determining linguistic decisions—that is, the choice between different ways of conveying one’s communicative intention for the speaker and between different interpretations for the hearer. There is evidence, for instance, that ‘speaker-oriented processes’, such as memory retrieval, priming, and automatization, can dominate ‘hearer-oriented processes’ of common ground and audience design. The domain-general processes leave long-term effects on language structure in diachronic change, and on individual language development in ontogeny. At the same time, D emphasizes that L1 acquisition

and diachronic change differ substantially. In particular, children extract novel schemas from the input, while diachronic change involves the modification of already existing ones.

In the second part of the book, D focuses on the interpretation of signs as networks, beginning with taxonomic links between representations at different levels of abstraction (Ch. 4). The main focus is on constructional schemas. D provides a review of several classical studies, which show that children are able to extract fully schematic representations of constructions and grammatical categories from phonetic sequences. He revisits Chomsky's famous argument from the poverty of the stimulus and argues that ambient language is more regular than was previously assumed. In addition, D includes case studies of the emergence of the determiner schema and secondary modal verb schemas (e.g. *gonna, wanna, gotta*) in the history of English.

Repeated production and processing of the same sequence of linguistic elements creates sequential links between them due to automatization and chunking. These processes are discussed in Ch. 5. The links can be between lexemes, as in collocations (e.g. *How are you?, unmitigated disaster, as if*), or between elements of abstract constructional schemas (e.g. Agent, Recipient, and Object of the ditransitive construction). Sequential links are responsible for the emergence of syntactic constituents and basic linguistic categories, such as word and morpheme. For example, inflectional and derivational morphemes emerge from words as a result of phonological reduction driven by the speaker-oriented and hearer-oriented processes discussed in Ch. 3. The strength of sequential links varies on a continuum, which explains different degrees of compositionality, idiomacity, and syntactic constituency in language structure. Moreover, D offers an explanation of the crosslinguistic tendency for postposed grams to undergo affixation more often than preposed grams. It can be explained by the fact that grams are more predictable given content words than the other way around. This asymmetry can also account for the fact that disfluencies are more often observed between preposed grams and content words, than between content words and postposed grams (Himmelmann 2014).

Representations of linguistic forms with semantic interpretations are called symbolic links. They evolve from recurrent paths of interpretation that have become automated from repetition, as argued in Ch. 6. Linguistic concepts are organized in conceptual networks, such that activation of one concept leads to activation of its neighbors—a process known as activation spreading. Symbolic links involve knowledge structures, or domains, and conceptual gestalts (frames). D discusses polysemy networks and the notorious problem of distinguishing between polysemy and vagueness. The network model presupposes a flexible relationship between semantics and pragmatics, as well as between encoding and inferencing. Regarding the semantics of constructions, D mentions the fact that constructions differ in the degree to which they constrain the interpretation of the lexemes. For example, Japanese relative clauses, which often allow for multiple interpretations, require more contextual inference on the part of the addressee than do relative clauses in English and other European languages.

Part III discusses relationships between fillers and slots in constructions. A network model of argument structure is presented in Ch. 7. The central role in this model is played by filler-slot links, which are strengthened by semantic compatibility and cooccurrence frequency. Innovative uses of lexemes (as in the famous sentence *She sneezed the napkin off the table*) is determined by their similarity to the lexemes that occur in the construction, as illustrated by the historical development of the *way*-construction and the double-object construction. Other important factors include type and token frequency of the construction, as well as the relationships between competing constructions.

In Ch. 8, D presents a network approach to parts of speech, which are viewed as emergent categories evolving from the associative connections between lexemes and semantically and pragmatically specified slots of constructional schemas. Combining Croft's (1991) theory relying on the pragmatic functions of lexemes in speech (that is, reference, predication, and modification) with Langacker's (1991) ideas of nouns and verbs as constructional schemas, D argues that the pragmatic functions do not apply directly to lexemes, but to particular slots of constructions, such as N- or V-schemas, which attract semantically compatible lexical items. Despite substantial crosslinguistic variation, it is possible to formulate several crosslinguistic generalizations about N/V-schemas:

- all languages have multiword constructions in which lexemes are used for reference and predication;
- all languages have some formally distinct N/V-schemas for reference and predication;
- all languages have two separate classes of lexical expressions that occur in N-schemas or V-schemas.

As for other parts of speech, D shows that adjective schemas in some languages are less open to lexemes than N/V-schemas are, such that some property roots are realized in N-schemas (as in Hausa) or V-schemas (as in Mojave). He also examines count or mass nouns, which represent subschemas of N-schemas, as well as irregular vs. regular verbs and aspectual classes, which are treated as subschemas of V-schemas. D shows that in all of these cases, the associations between the subschemas and lexemes are gradient and shaped by language use. Finally, function words are likewise associated with different schemas, but their main difference from the major classes is that their roots originate from other types of expressions through the process of grammaticalization.

The network approach can be extended to syntactic constituents, as demonstrated in Ch. 9. Arguing against the traditional analysis of phrase structure in formal syntax, D shows that phrase structure emerges from the interaction of the domain-general processes. Syntactic constituents are semantically motivated. For example, the figure of a frame evoked by a verb entails base concepts, which are usually elaborated by nouns. In contrast to the formal explanations of Greenbergian word-order correlations by the 'head-direction parameter' of the language faculty, D interprets the correlations as a network of locally related constructions, which are linked by the relationships of analogy and as source and target constructions in grammaticalization.

The grammar network also includes horizontal relations between semantically and/or formally similar constructions. These horizontal relations are discussed in the fourth and final part of the book. In Ch. 10, D argues that constructional relationships are similar to associations between lexemes in the mental lexicon. The relationships of similarity are supported by structural priming, when a construction is activated more easily after a semantically or formally similar construction. Constructional environment can also explain asymmetries in the processing and acquisition of subject and object relative clauses, as well as language change, as illustrated by a diachronic study of subject-auxiliary inversion in English.

Relationships of contrast between constructions are the topic of Ch. 11, which focuses on paradigmatic alternatives of grammatical categories, such as voice and number. It addresses the issue of structural markedness, which emerges as a result of an interplay of speaker-oriented and hearer-oriented processes discussed in Ch. 3. The crosslinguistic regularities in differential object marking can be explained by the associations between the core grammatical roles and their semantic and pragmatic properties, such as agentivity, animacy, topicality, and definiteness. D concludes the chapter with a discussion of semantic maps, which capture crosslinguistically common trajectories in the development of case markers.

The grammar network is a stunning book. It provides an amazing wealth of evidence related to many diverse linguistic phenomena in different languages. It is written by a renowned scholar with uniquely broad and deep expertise in language acquisition research, typology, and usage-based and cognitive linguistics. The book represents a milestone for general linguistics and makes an important contribution to many theoretical debates in usage-based linguistics and beyond. For example, the network interpretation of part-of-speech categories (Ch. 8), the asymmetries in processing of subject and object relative clauses (Ch. 10), and the crosslinguistic suffixing preference (Ch. 5) are very insightful and thought-provoking.

Containing plenty of evidence and examples, *The grammar network* leaves out some aspects of language use, which is understandable. For example, it does not consider sociolinguistic variation and the associations between linguistic forms and different aspects of the communicative situation. It seems, however, that these associations lend themselves very easily to the network approach as well. For example, phenomena related to indexical fields (Eckert 2008) can be regarded as a complex network with linguistic variables (e.g. /t/ release or /ing/), social groups (e.g. gay men or nerd girls), and stereotypical social meanings (e.g. formal, pretentious, or insincere) as nodes. One can also mention associations between linguistic features, situational contexts, and

genres as conventional text varieties, such as registers, genres, and styles (Biber & Conrad 2009). It would be interesting to see the network approach extended to these phenomena.

Notably, some of the ideas developed in *The grammar network* are echoed in another recent book, *The dynamics of the linguistic system* by Hans-Jörg Schmid (2020). In both books, a central role is played by different types of associations that emerge as a result of language use. Yet Schmid focuses more on the local processes of entrenchment and conventionalization that create those associations in a usage event, whereas D is more interested in exploring how they can explain crosslinguistic facts about language structure, change, and development. The books thus complement each other nicely.

Since one of the inspirations for the network approach is artificial neural networks, which were in their turn inspired by biological neural networks, one might also wonder how the grammar network is supported by the brain. On a lower level, our brain contains billions of neurons connected by synapses. On a higher level, there is covariation of different, often quite distant, brain regions during functionally similar linguistic tasks (e.g. Fedorenko & Thompson-Schill 2014). To what extent is the grammar network shaped by the large-scale and small-scale network structures and processes in the brain? It would be interesting to learn more about that, as well.

Yet the most pressing issue, in my view, is how to apply the network approach in practice. In particular, how can we measure the strength of the links between different linguistic forms and concepts, constructions and fillers, or between different constructions? Artificial neural networks, for example, have different weights and biases, which are learnable from the data. A network model of grammar, ideally, should also be able to provide such information, in order to make falsifiable predictions. Providing a unified theoretical framework, the book does not offer a unified methodology, which would admittedly be a daunting task.

In addition to weights, we should also be careful about directionality of the associations. This issue is mentioned in the book (pp. 21–22), but requires more attention, in my view. Take the description of a network of core syntactic roles (A and P) and their semantic and pragmatic properties in Section 11.4, for example. In particular, it shows that P-arguments are associated with patienthood, inanimacy, indefiniteness, and nontopicality. However, if we take actual corpus data (spontaneous conversations) in typologically different languages (Levshina 2021), we will see that P-arguments are not typically indefinite and new. In fact, they are more often definite and discourse-given or accessible. At the same time, if we look at the distribution of indefinite and new referents, we will see that they are more likely to appear as P than as A. A network model should reflect this asymmetry. An example is shown in Figure 1. The weights, which represent the conditional probabilities of the P role given different features and the conditional probabilities of the features given the P role, are computed based on the frequencies in the Santa Barbara Corpus of American English (see details in Levshina 2021).

Another question about directionality concerns sequential links. In Ch. 5, we read: ‘sequential links are asymmetrical: they usually have an inherent forward orientation’ (63). Language users can predict the occurrence of upcoming elements. At the same time, I wonder how the network approach can explain effects of predictability of a target word given the following word, which were observed in studies of duration and phonological reduction of words, and which in some cases had a stronger effect than predictability given the previous word (e.g. Bell et al. 2009, Seyfarth 2014).

In Ch. 9, which is dedicated to syntactic constituents, D introduces a distinction between compound phrases (consisting of lexical units) and grammatical phrases (consisting of a lexical and grammatical unit), which are shaped by grammaticalization. This distinction presupposes a clear-cut separation of content and function words, but how tenable is it from a usage-based perspective? Moreover, since the term ‘grammaticalization’ is an umbrella term for many different processes (phonetic reduction, loss of semantic integrity, decategorization, etc.), which do not necessarily covary (Bisang & Malchukov 2020), it would be useful to specify which of those processes shape syntactic constituents.

The discussion of the crosslinguistic preference to put short and ‘light’ constituents before long and ‘heavy’ ones (Section 9.6) would benefit from a mention of crosslinguistic variation. If a lan-

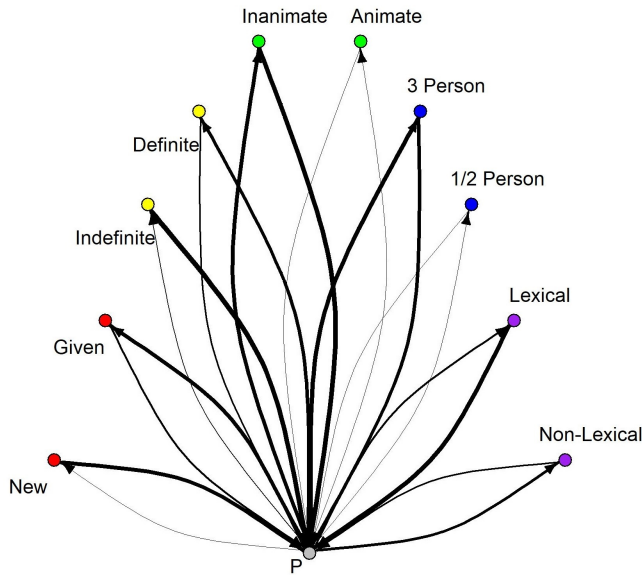


FIGURE 1. A weighted directed network of the P-role and its features based on crosslinguistic corpus data in Levshina 2021.

guage is verb-final, this bias can be weaker, nonexistent, or even reversed, depending on the construction in question (e.g. Hawkins 1994, Liu 2020).

Of course, it is impossible to discuss all nuances and details in one book, so these questions should be regarded as invitations for elaboration in the future. The book is already extremely rich in detail, and its central claims are supported by solid evidence. It is also very clearly written, logically structured, and carefully edited. I have found only two issues, which appear in the illustrations. Figure 8.1 has the labels of different schemas in the wrong order. The order is syntactic (top), phrasal (middle), and morphological (bottom). In Figure 10.4, the y-axis labels are incorrect and should represent percentages, as in the original study by Diessel and Tomasello (2005).

To summarize, *The grammar network* is a major contribution to general linguistics. It provides a unified theoretical foundation for a rich variety of phenomena and sets new standards for future linguistic research. It is highly recommended to all students of linguistics. For those interested in the usage-based perspective of language, this book is indispensable.

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Grammatical theory: From transformational grammar to constraint-based approaches. 4th revised and extended edn. (Textbooks in language sciences.) By STEFAN MÜLLER. Berlin: Language Science, 2020. Pp. 853. ISBN 9783961102747. \$50.

Reviewed by PETER W. CULICOVER, *The Ohio State University*
and *University of Washington*

In *Grammatical theory* (henceforth *GT*), Stefan Müller (henceforth *M*) provides a rich critical overview of the current state of research in syntactic theory. The book presents an authoritative discussion of the major theoretical frameworks in contemporary linguistics in a way that manages to be at once comprehensive, detailed, and critical. Furthermore, it strives to do so in a format that works both as an introductory textbook and as an advanced monograph on an impressive range of topics that are at the forefront of contemporary research. All of these features make *GT* a formidable achievement on many fronts. In some respects, though, the book's ambitious goals compromise its general structure and organization as a cohesive text. Some concrete examples are given below.

1. STRUCTURE. *GT* is organized into two parts. Part I introduces the general background for discussion (Chs. 1 and 6) and reviews a range of theories that have played an important role in linguistic theorizing over the past century: PHRASE STRUCTURE GRAMMAR (Ch. 2), GOVERNMENT AND BINDING (GB; Ch. 3), MINIMALISM (Ch. 4), GENERALIZED PHRASE STRUCTURE GRAMMAR (GPSG; Ch. 5), LEXICAL-FUNCTIONAL GRAMMAR (LFG; Ch. 7), CATEGORIAL GRAMMAR (Ch. 8), HEAD-DRIVEN PHRASE STRUCTURE GRAMMAR (HPSG; Ch. 9), CONSTRUCTION GRAMMAR (CxG; Ch. 10), DEPENDENCY GRAMMAR (Ch. 11), and TREE-ADJOINING GRAMMAR (TAG; Ch. 12). The discussion in these chapters is mostly aimed at readers without prior knowledge of grammatical theory.

Part II presents a more personal view on topics that cut across theories and pertain to some of the most lively issues in linguistics today: the innateness of linguistic knowledge (Ch. 13), the opposition between generative-enumerative and model-theoretic formalisms (Ch. 14), the competence/performance distinction (Ch. 15), language acquisition (Ch. 16), generative capacity (Ch. 17), general topics concerning the abstract properties of syntactic structures (Ch. 18), empty elements (Ch. 19), the diversity of displacement phenomena (Ch. 20), lexicalism (Ch. 21), analyses of complex predicates (Ch. 22), and the tools for capturing crosslinguistic generalizations (Ch. 23). This part of the book is aimed at more advanced readers and presupposes most of the material presented in Part I.