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Review

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Holger Diessel, *The grammar network: How linguistic structure is shaped by language use*. Cambridge: Cambridge University Press, 2019. Pp. xvii + 289. ISBN 9781108671040.

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The usage-based approach has marked a paradigm shift from the structuralist and generativist traditions in linguistics. Holger Diessel's work on language change (1999), language acquisition (2004) and frequency effects in language (2007) has had a strong impact on the development of this approach. In his review article on Joan Bybee's *Language, usage and cognition*, Diessel (2011: 840) explained that '[a] comprehensive treatment of usage-based linguistics would have to integrate research from functional and cognitive linguistics, sentence processing, first language acquisition, and other research in cognitive science'. The current book aims at achieving such a comprehensive account, as well as at boosting the explanatory power of the usage-based approach, by devising a comprehensive dynamic network model.

The network view of grammar, in which all aspects of linguistic structure are analyzed in terms of associative connections between nodes (lexemes, categories and constructions), had been previously expressed in a large number of studies (see p. 9 for an overview) but never developed into an explicit theory. The dynamic model presented in this study seamlessly adopts concepts from both psychology and cognitive science to demonstrate the fluid organization of grammatical knowledge and concepts (e.g. noun, case, subject). In fact, the core proposal is based on the neural networks commonly used by cognitive scientists to model cognitive processes. In neural networks, the links between nodes have activation values that are shaped by frequency of processing: the more often a particular link (or pattern of links) is processed, the stronger are the values of the connections and the higher is the probability that these links will be reused. Thus, Diessel also incorporates frequency effects into an innovative network proposal that offers a radical alternative to traditional research on grammar.

The book is conveniently divided into four parts, which are further subdivided into twelve chapters. It integrates a vast number of studies providing specific examples and evidence from a range of world languages, although roughly 70 percent of the studies reviewed focus on the acquisition and/or the development of English. Consonant with the promise that reading this volume 'does not presuppose expert knowledge in any research area' (Preface), most sections include brief overviews of previous relevant theoretical accounts of the concepts and phenomena in focus. In addition, chapters and

sections are either chronologically arranged or they advance from more general to more specific and current issues. The overall concise style of writing favors the inclusion of appreciated summaries at the end of almost every section.

Part I (chapters 2 and 3) introduces the general architecture of the network: every kind of linguistic item (lexeme, category or construction) constitutes a node which is linked to other nodes by means of associative connections shaped by domain-general cognitive processes. These come from three general domains: social cognition, conceptualization and memory. First, communication presupposes basic forms of social cognition which trigger audience design (i.e. speakers constructing language according to what they think hearers might need to understand it) and might directly affect grammatical development and evolution. Second, the process of conceptualization structures humans' frequent experiences so that they become associated with specific lexemes and constructions – thus fabricating semantic conventions. Third, a number of memory-related processes affect (unconscious) decisions made by language users; these include attention, categorization, abstraction, analogy, priming and automatization (see pp. 30–5 for definitions). Crucially, these three general cognitive processes are responsive to frequency of occurrence, which strengthens the activation of particular links between the nodes and increases their probability of being (re)used in the future. One of the main contentions of the network approach is that, in order to understand (unconscious) linguistic decision-making in usage, it is central to analyze the competition between the self-oriented (memory-related) and the other-oriented (social cognition) processes involved.

Influenced by the competition between cognitive processes, grammatical concepts are dynamic entities that emerge from the association of nodes in a nested network, where nodes themselves become networks at a different level of analysis. At a basic level, linguistic signs (lexemes and constructions) are connected by means of taxonomic, sequential and symbolic associations. Part II (chapters 4, 5 and 6) provides details and specific evidence on the three basic types of links that can hold between linguistics signs.

The linguistic generalizations (i.e. schemas) behind both L1 acquisition and language change emerge from users' actual experience with lexical expressions. Since they result from abstraction, taxonomic relations rely on the recognition of similarity but are also notably shaped by frequency. Chapter 4 offers good evidence, from relevant experimental studies, that children gradually acquire schemas in a bottom-up fashion that is 'driven by both distributional and communicative aspects of language use' (p. 62). Proof of taxonomic relations also comes from language change: in the development of both secondary auxiliaries and determiners in English, a number of related constructions converged on two new emerging 'radial' schemas (pp. 56–61).

Chapter 5 offers a detailed account of sequential relations. It highlights the role of automatization in the formation of prefabricated units or *chunks* (see Bybee 2010). These reduce the number of lexical choices for language users and facilitate utterance planning and subsequent processing; accordingly, they have a deep impact on the cognitive organization of memory and linguistic knowledge. First, the chapter focuses on experimental evidence of (i) *chunking*, i.e. the hypothesis that frequent word strings

are stored and processed as units, and (ii) the correlation between phonetic reduction and frequency, i.e. the tug-of-war between routinized articulatory gesture and predictability/explicitness in speaker–hearer interaction. Second, the chapter reviews the status of traditional grammatical concepts such as word, morpheme, affix or constituent within the usage-based approach: they are all shaped by domain-general processes and are consequently viewed as 'fluid categories derived from language use' (p. 72; e.g. the loss of lexical links due to automatization and fusion in items such as *breakfast* and *gonna*).

As linguistic signs, both lexemes and constructions involve symbolic relations (chapter 6), which evolve from entrenched (and conventionalized) paths of interpretation shaped by automatization (and social cognition). However, their meanings derive from different cognitive processes: on the one hand, lexemes constitute points of access to an open-ended network of encyclopedic knowledge reflecting experience. They convey concepts that are interpreted against the background of a system of other related concepts, which is hierarchically organized in different *frame* and *domain* nodes (see Fillmore 1982). On the other hand, constructions 'generalize over linguistically evoked meanings' (pp. 107–8) and thus provide language users with particular processing instructions for the interpretation of lexemes (e.g. the highly specific structural cues supporting the processing of head nouns in English relative clauses).

Taken together, the basic taxonomic, sequential and symbolic associations between linguistic signs shape the 'continuum of fluid processing units' (p. 89) in the network, which ranges from simple morphemes (to multi-word sequences) to syntactic constructions. Additionally, three other types of links are required in order to capture the higher-level cognitive organization of the network, namely filler–slot, constructional and lexical links. Parts III and IV, which elaborate on the nature of these three higher-level associations, constitute the most groundbreaking half of the volume in reference to previous usage-based and constructional accounts. Part III deals with filler–slot relations, which specify associations between individual lexemes and particular slots of constructional schemas, with respect to syntactic relations (chapter 7), parts of speech (chapter 8) and phrase structure (chapter 9). Part IV presents the view that the cognitive organization of grammar (constructional relations) parallels the network structure of the mental lexicon (lexical relations). There is general agreement among psychologists and (most) linguists that lexical items are stored in an activation network influenced by frequency: lexemes which are frequently used in a *frame* or a *domain* develop stronger taxonomic links, but lexical relations also connect lexemes horizontally with similar or contrastive forms and meanings by means of categorization and priming. Part IV provides evidence that, likewise, grammatical structure does not only involve taxonomic relations between constructions (see Goldberg 2006), but also horizontal relations between 'semantically or formally similar constructions at the same level of abstraction' (p. 199). Thus, the 'ecological location' of a construction in the network is also influenced by its similarity (chapter 10) and/or contrast (chapter 11) with other constructions.

Chapter 7 analyzes argument structure as a core instance of the network associations between particular lexemes and constructional schemas. Filler–slot relations between verbs and argument-structure constructions reflect (i) the general semantic compatibility between verbs and schemas and (ii) language users' probabilistic experience with particular lexemes and constructions. Factors that influence the extensibility or productivity of verb-argument schemas in the network include semantic similarity, type and token frequency, and the particular distributional (and/or pragmatic) relationships between schemas in the network. As regards the latter, the chapter includes relevant evidence from recent experimental studies on the effect of language users' experience with alternating versus nonalternating verbs across different constructions (e.g. the case of the dative alternation in English).

Chapter 8 proposes that grammatical word classes emerge from the interaction between lexemes and particular constructional slots in the network: the morphosyntactic properties of nouns, verbs, etc. are thus seen as properties of these slots, and category membership is gradient. The main argument in this chapter follows naturally from chapter 7: grammatical constructions attract lexemes that match the conceptual profile of a particular slot but repel lexemes that do not match their semantic specifications. Furthermore, the associations between lexemes and constructional slots are also influenced by language users' experience: certain lexical roots (e.g. those designating objects or actions) are tied to specific constructional slots (N-schemas or V-schemas, respectively) by probabilistic associations that allow for coercion into novel interpretations (or recategorization).

Chapter 9 extends the network approach to the analysis of phrase structure. The model suggests a novel distinction as regards the types of syntactic constituents that provide the basic ground for some of the hypotheses presented in this chapter as to how word order correlations are shaped by language use. On the one hand, phrases can be labeled as 'compound' when they combine two lexical units as immediate constituents (e.g. 'verb–object' or 'adjective–noun') and are thus 'organized around content words whose relational properties are due to general conceptual processes of frame semantics' (p. 181; e.g. the adjective *furry* evokes a *frame* including a base concept of an animal). On the other hand, 'grammatical' phrases combine a grammatical function word with a lexical component (e.g. 'auxiliary–verb' or 'determiner–noun') and are 'organized around function words whose relational properties are due to grammaticalization' (p. 182; e.g. the auxiliary *will* evolved from a main verb meaning 'want' followed by an infinitive as object complement). The network approach invokes two specific cognitive processes, grammaticalization and analogy, to account for the word order correlations attested between different pairings of the compound and grammatical phrasal types (in particular, the combination of a compound phrase with a grammatical one or of two compound phrases).

Chapter 10, which opens part IV of the volume, begins with a short discussion of the cognitive factors that have been shown to influence access to the mental lexicon: frequency, priming and semantic and formal similarity. The chapter then goes on to demonstrate how these factors also affect the development of constructions (i.e. grammatical structure), by offering experimental evidence (i) that structural priming

has a facilitating effect on the processing of formally similar constructions with different meanings; (ii) that native speakers rely on similar 'sentence neighbors' (such as the SVO family) in order to more efficiently process subject relative clauses in English; and (iii) that children acquire relative clauses 'in a piecemeal, bottom-up way whereby new relative clauses are learned based on [similar] constructions they already know' (p. 214). The chapter also offers convincing evidence from language change on horizontal links of similarity between constructions: the evolution delineated by Diessel for English subject auxiliary inversion comes to show that it 'can be seen as a syntactic blend' preserving the original (X)-V-S pattern [V1] in the initial part of the construction, but which has also 'acquired the obligatory use of the S-V-(O) pattern [V2] under the influence of declarative main clauses in the second part of the construction' (p. 220).

Chapter 11 focuses on semantically contrastive constructions which are organized in paradigms of specific categories. Within taxonomies (such as voice, case or number), infrequent and unexpected categories are often marked explicitly by morphological means. Thus, the encoding of asymmetries of grammatical categories in the network crucially arises from the 'intricate interplay between speaker-oriented and hearer-oriented processes of language use' (p. 224). On the one hand, the predictability of a particular construction motivates hearer-oriented processes: differential object marking (DOM), in languages like Spanish, originates from an efficient strategy to announce (animate) objects that the hearer should distinguish from the subject. In fact, the marked variants in Romance DOM systems derive from left-dislocated constructions originally employed to establish a topic shift in unfolding speech. On the other hand, cognitive processes such as analogy or priming motivate speaker-oriented processes: once a marked alternative becomes routinized (e.g. DOM to mark a topical animate object), it is often extended to other uses that do not need extra morphology for comprehension (e.g. case marking of all direct objects).

In this volume, Holger Diessel has truly managed to 'put the pieces together': he proposes a unified approach to usage-based research by balancing (both traditional and vanguard) notions from linguistics and cognitive psychology, as well as by synthesizing evidence from hundreds of corpus and experimental studies. Thus, the volume is good proof that in the last decade usage-based (and construction-based) research has become much wider in scope, by incorporating ideas and methods from psychology, neuroscience, social science, etc. to the study of evidence from actual language production and perception (see Blumenthal-Dramé 2012; Divjak & Caldwell-Harris 2015; Schmid 2018). This wider scope, which feeds on both old and new findings in (cognitive) linguistic research, inevitably detaches Diessel's novel network approach from certain assumptions of the original constructional view of language. For instance, the network model assumes that the cognitive organization of the lexicon and grammatical structure is parallel, but it also acknowledges a distinction as regards the nature of the symbolic relations that shape lexemes and constructions in the system: the former represent a gateway into encyclopedic knowledge, while the latter provide the processing instructions required for the integration of lexemes within a coherent semantic

representation. Since their meanings do not stem from the exact same cognitive processes in this model, it is more accurate to say that it is linguistic signs (and not just constructions) 'all the way down' (see Goldberg 2006: 18). The distinction between lexemes and constructions is crucial inasmuch as it enables the typology of associations that, as Diessel contends, shape the higher-level design of the network (i.e. lexical, constructional and filler–slot relations). However, this distinction raises some questions as regards the status of pronunciation variants within the model. Although it is not explicitly specified whether the network model acknowledges that language users generalize over pronunciation variants of a single lexeme (see Bürki *et al.* 2011) in the same way that they generalize over different lexemes (to form a word class schema) or over similar structures (to form a syntactic construction), it seems safe to assume that it does. But would then pronunciation variants of a single word constitute lexeme nodes by themselves or lower-level nodes that can also hold symbolic relations (of differing strength) within semantic frames? Or are symbolic associations, instead, reserved to 'more stable' lexeme nodes that combine users' experience of (all) their linked realization variants? Moreover, the clear distinction between lexemes and constructions raises questions as to how the model might account for the peculiarities of multi-word strings: are they to be interpreted as providing either encyclopedic knowledge or processing instructions? Are they stored as a *chunk* (more like a lexeme) or as a frequent sequence (more like a grammatical construction)? With respect to the latter issue, chapter 5 suggests an interpretation of the entrenchment of multi-word sequences where *chunking* becomes the (inevitable) final stage (see Langacker 2000: 278; Bybee 2010). However, entrenchment can also be seen as a form of 'procedure strengthening', i.e. the automatization of a sequence of separate items that is frequently encountered and repeated, and hence becomes predictable (see Blumenthal-Dramé 2012: 68–9; Divjak & Caldwell-Harris 2015: 66–7; Hartsuiker & Moors 2018). In fact, there is recent experimental evidence that listeners may perceive a highly frequent multi-word sequence as either a chunked item or a compositional sequence depending on the properties of the input signal (see Lorenz & Tizón-Couto 2019). Last, the mental representation of multi-word sequences may also come with pronunciation variants, which could also be nodes at yet another (intermediate) level in the network. Some open questions remain then as regards the ramifications that the distinction between lexemes and constructions might have for how the hierarchical architecture of the system might accommodate expressions that are less unequivocally linked to either concept (lexeme or construction).

One of the most innovative distinctions in Diessel's proposal concerns the interpretation of syntactic constituency: phrases can be classified as either 'compound' or 'grammatical' (see chapter 9). The analysis of the distributions of particular word order pairs resulting from the correlations between these two types of phrases shows that there are a number of cognitive factors at play (conceptualization, grammaticalization, analogy, preferences in terms of length, and automatization). The interdependent effects that these processes have on language users' (syntactic) experience allow the network approach to account for both general parallels between

syntactic constituents, such as those highlighted in traditional phrase structure, and the idiosyncrasies that are characteristic of syntactic constituency, which usually emerge from association learning.

Although the network approach introduces some relevant novel distinctions, a general assumption that it shares with previous usage-based proposals is that of dynamicity (see Langacker 2000): the interaction of general mechanisms of social cognition, conceptualization and memory shape fluid structures that are subject to flexible constraints and frequency effects. In this vein, chapter 8 illustrates that specific lexical roots might hold (single or) multiple connections of differing strengths with different phrasal schemas, on the basis of both semantic fit and frequency of occurrence. As a result, these lexical items also become more (or less) central members of an intermediate node (a word class schema). This particular account of word class schemas illustrates dynamicity in grammar, as well as demystifying one of the most obscure issues in traditional grammar: the primitive-concept status of word classes. Likewise, chapter 11 provides an interpretation of grammatical categories (traditionally coded as 'subject' or 'object') as gradient nodes within the network: functions specifying arguments in a clause are essentially analyzed as deriving from the interplay between semantic roles (agent, patient, etc.) and related hierarchies of referential properties (especially agentivity, animacy, definiteness and topicality).

All in all, the most general and powerful notion behind the model is that the nodes (both lexical and structural) that are more strongly represented in language users' minds (i.e. the network) result from their experience, which is directly affected by the competition between the speaker-oriented (automatization) and the hearer-oriented (social cognition) processes involved in actual use. Accordingly, Diessel's proposal throws a strong light on the fact that cognitive-linguistic research aspiring to better explicate this central competition inexorably requires converging evidence from both production and perception (see Schönefeld 2011).

Last, it must be noted that, besides making an outstanding theoretical contribution (with evident methodological implications), this volume also represents a valuable resource for those interested in acquiring specific knowledge on a wide range of methods employed in the usage-based paradigm in the last decade, as well as for those looking for existing gaps in particular areas of cognitive-linguistic research. With respect to current methods, Diessel offers enough detail for readers to grasp the strengths (and weaknesses) behind recent developments such as collostructional analysis (chapter 7), or to get a taste of the ongoing exploration for reliable frequency information measures, such as transitional probability (chapter 5), which has become central to the investigation of language users' ability to store and process multi-word sequences (see Arnon & Snider 2010; Lorenz & Tizón-Couto 2019). With respect to prospective gaps in cognitive-linguistic research, Diessel points readers to worthwhile ongoing debates on the notion of polysemy in cognitive semantics (p. 104), the psychological processes behind the effects of animacy, length and topicality on syntactic structure (p. 193), or the effect that the interplay between speaker- and hearer-oriented processes has in the extension of case markers (p. 245).

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