Construction Grammar and Usage-Based Theory

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Abstract

Construction grammar is a family of approaches to grammatical description that serves as the main theory of grammar in Cognitive Linguistics. This chapter covers the theoretical principles that characterize construction grammar approaches, in the form of three core tenets: (i) grammatical knowledge consists of form-meaning pairs, aka constructions, (ii) constructions can be defined at any level of complexity and generality, and (iii) constructions are linked to each other in a vast network. The chapter then proceeds to relate construction grammar to usage-based theory. It is shown that these core tenets are predicted by some of the domain-general abilities that are argued to be responsible for the emergence of grammar through language use.

Keywords: grammar, constructions, form-meaning pairs, syntax, mental representations, network, generalizations, schematicity, domain-general abilities

1. Introduction

Construction grammar (abbreviated CxG) is the main approach to grammatical description and theory in cognitive linguistics (Fillmore et al. 1988, Fried and Östman 2004, Goldberg 1995; 2006, Hilpert 2014, Hoffmann and Trousdale 2013, Perek 2015). Since its inception, CxG has branched out into several different theoretical frameworks that differ in terms of the notation they use, the emphasis that they put on precise formalization, and the specific domain of application that they were designed for. Hence, the term is now best taken as referring to a family of tightly related approaches rather than one unified theory, though it is important to recognize that the many "flavours" of CxG developed to date largely agree on their core principles.

CxG originally emerged as a response to the limitations of mainstream generative approaches to grammar, especially as it pertains to idiosyncratic patterns and idiomatic expressions. The theoretical motivation for CxG is described in Section 2 of this chapter. There are three main tenets shared by all constructional approaches: (i) linguistic knowledge is best described in terms of direct pairings of form with

meaning (or function), aka *constructions*, (ii) constructions can be defined at any level of generality and complexity, (iii) constructions are linked to each other in a vast network. These three tenets and how they relate to each other are discussed in Section 3.

In addition, many versions of CxG are usage-based, i.e. they assume a fourth tenet whereby grammar emerges through, and is likewise constantly shaped by, actual situated language use, through domain-general cognitive abilities (Beckner et al. 2009, Bybee 2006; 2010; 2013, Dąbrowska 2004; 2017, Diessel 2019, Divjak 2019, Perek 2015, Schmid 2020, Tomasello 2003). In fact, the terms construction grammar and usage-based grammar are sometimes used interchangeably, especially outside the field. However, the two approaches can and should be distinguished as two different aspects of a model of grammar, although they can be shown to be tightly related to each other. As argued in Section 4, the core tenets of CxG can indeed be seen to directly follow from how domain-general cognitive abilities shape the organization of grammar in the course of language use. Therefore, although there are other representations of grammar compatible with usage-based theory besides CxG, and conversely one can adopt a constructional approach without necessarily assuming a usage-based model, construction grammar and usage-based theory have a high degree of affinity and do often go hand in hand.

2. The origins and motivation of construction grammar

Construction grammar emerged primarily from the work of Charles Fillmore and his students and colleagues at the University of California at Berkeley in the early 1980s, as an alternative to mainstream generative grammar (Fillmore et al. 1988, Kay and Fillmore 1999). As explained in more detail below, it initially grew out of dissatisfaction with earlier Chomskyan approaches to grammar and the inadequacy of their theoretical apparatus to account for a wide range of grammatical facts. The approach was influenced by a number of precursor theories, including Fillmore's case grammar (Fillmore 1968), frame semantics (Fillmore 1982, Fillmore and Atkins 1992), and generative semantics, in particular Lakoff's Gestalt grammar (1977). Langacker's (1987, 1991) Cognitive Grammar, with its focus on meaning and conceptualization in grammar, also had a strong impact on the development of CxG. Finally, as it developed within cognitive linguistics, CxG also assimilated key concepts from cognitive psychology, such as prototype categorization, gestalts, and figure-ground organization.

Earlier Chomskyan approaches to grammar impose a strict separation between lexicon and syntax (Chomsky 1957). In these "dictionary plus grammar book" models, as Taylor (2012) calls them, the lexicon (the "dictionary") is a vast list of lexical items organized into syntactic categories, and the syntax (the "grammar book", in Taylor's analogy) consists of rules that capture the grammatical behavior of these lexical items according to their syntactic categories. Such a model is effective at capturing 'core' syntax, i.e. the fully regular and predictable rules of grammatical behavior that govern the common structure of phrases and sentences; for example, the fact that determiners and adjectives precede the head noun in English noun phrases. However, languages are replete with expressions that straddle the border between lexicon and syntax, and thus are typically challenging for a rule-based approach. For instance, many idioms such as *spill the beans* and *pull one's leg* are non-compositional expressions that semantically behave like single lexical items, but syntactically behave like phrases (at least to an extent, cf. Nunberg et al. 1994). They convey a meaning of their own, respectively 'reveal a secret' and 'tease someone', but they are also grammatically complex: they can show internal variability, and to a degree they conform to rule-based grammatical behavior, for example with regards to morphological inflection and various kinds of grammatical processes like passivization. With their partly lexical, partly syntactic behavior, idioms are problematic for a model that strictly separates lexicon and syntax.

Much of the research that laid the groundwork for CxG (e.g., Fillmore et al. 1988, Kay and Fillmore 1999) was focused on the study of expressions that are not adequately captured by a rule-based approach, either because, like idioms, their meaning is non-compositional, or because their form is not predictable from general syntactic rules. Sentences containing the expression *let alone* are an example of the latter (cf. Fillmore et al. 1988). At first blush, *let alone* could be analyzed as a coordinating conjunction in sentences where it seems to link two noun phrases, e.g. *Max won't eat shrimp, let alone squid*.[1] However, it can also be used with remarkable flexibility in syntactic contexts where no other conjunction can be found, for instance *I doubt you could get Fred to eat squid, let alone Louise*, in which the "conjuncts" do not have equal grammatical status: one is the direct object of the embedded verb *eat*, while the other can be analyzed as the subject of an elliptical non-finite clause involving the same verb. In some cases, *let alone* connects strings of words that are not even constituents in the conventional sense, or not constituents of the same kind, e.g., *I doubt you could get Fred to eat shrimp, let alone Louise squid*. This means that the

[1] This and all following examples with *let alone* are from Fillmore et al. (1988).

grammatical behavior of *let alone* is highly idiosyncratic: it follows its own rules of syntactic combination that it does not fully share with other words. Hence, it is more adequately described as a separate unit of grammatical knowledge, rather than a set of general rules.

Another example of such a "constructional idiom" (Jackendoff 2002, Taylor 2012) is the so-called *way*-construction (Jackendoff 1990, Goldberg 1995), as exemplified by such sentences as *The explorers hacked their way through the jungle* and *She talked her way into the club*. There is seemingly nothing remarkable in the syntactic structure of these sentences: they consist of a noun phrase subject, a verb, a possessive determiner, a noun (*way*), and a prepositional phrase. However, both sentences convey the idea that the subject referent undergoes motion (literal or metaphorical), although none of the words (in particular the verb) entail motion on their own. Besides, the motion interpretation does not arise if *way* is replaced by any other word, or if the determiner preceding *way* is anything other than a possessive co-referent with the subject (Goldberg 1995, Perek 2018); for instance, compare *He dug a way out of prison* (no motion entailed) with *He dug his way out of prison* (motion is entailed). Therefore, the meaning of motion can be seen to be conveyed by the syntactic pattern described above. In other words, instances of the *way*-construction are best described in terms of a direct pairing of form with meaning.

Central to the motivation for CxG is the idea that problematic examples such as the ones discussed above should be described in their own right along with 'core' syntax, and not relegated to the 'periphery' or 'appendix'. Construction grammarians take the view that, instead of a separate lexicon and syntax, the grammatical knowledge of speakers should be taken to consist entirely of direct pairings of form with meaning, aka constructions. Importantly, this means that the same descriptive apparatus should be used to characterize the idiosyncratic patterns such as those listed above *as well as* the more regular and predictable ones that are the chief focus of earlier Chomskyan approaches (cf. Fillmore et al. 1988). In the next section, this descriptive apparatus is explained in terms of three core tenets that are shared by virtually all constructional approaches to grammar.

3. The core tenets of Construction Grammar

The constructional approach to grammatical description can be broadly summarized in terms of the following three main tenets:

1. Grammar consists *entirely* of learned pairings of form with meaning (or function), aka constructions;
2. A construction can be defined at any level of complexity and generality;
3. Constructions are linked to each other in a vast network.

Each of these tenets is defined and discussed in more detail below. As will become clear from this discussion, these tenets are inter-related and can be seen to largely depend on each other, so the distinction drawn between them here is somewhat artificial, and largely made for exposition purposes. Conversely, these tenets can certainly be further broken down into more specific aspects of the theory or properties of constructions, and accordingly some sources list more than three principles of CxG (cf. e.g. Hilpert's 2021 ten "basic ideas" of construction grammar). However, I take the three tenets listed above to appropriately capture the main concepts that virtually all CxG scholars broadly agree on, with more specific claims following more or less directly from these tenets.

As mentioned previously, there are different variants of CxG, e.g. Cognitive Construction Grammar (Goldberg 2006), Radical Construction Grammar (Croft 2001), Sign-based Construction Grammar (Sag 2012), Fluid Construction Grammar (Steels 2011), to name only a few. These variants are unified by the fact that they share a common set of theoretical principles. They differ only superficially in their approach to grammatical description and in the form that this description takes, for instance with different emphasis on formalization. Accordingly, Langacker's (1987, 1991) Cognitive Grammar can be considered a sister theory to CxG, if not a variant of CxG itself, as it shares its main theoretical assumptions although it was developed somewhat independently and uses quite a specific descriptive apparatus compared to other constructional frameworks. Some strands of CxG were designed with a specific domain of application in mind, for example language typology for Radical Construction Grammar, and experimental cognitive psychology for Cognitive Construction Grammar. However, one can use construction grammar without subscribing to any of these strands in particular, simply by virtue of following the core tenets of the theory.

Tenet 1: Grammar consists of pairings of form with meaning, aka constructions

As noted earlier, CxG rejects a strict separation of lexis and syntax, in favor of a symbolic approach in which any aspect of linguistic knowledge, both lexical and non-lexical, is described as a pairing of form with meaning, called construction. For example, the *way*-construction mentioned above can be described as a pairing of a syntactic structure containing a subject, a verb, a possessive determiner co-referent

with the subject, the noun *way*, and a prepositional phrase, with the meaning that the subject referent undergoes motion in the direction specified by the prepositional phrase. This form-meaning pair is what allows sentences such as *He dug his way out of prison* to convey both the subject's action (here, digging) and the motion meaning.

Early case studies in CxG, such as the ones discussed in the previous section, showed that constructions are needed to capture expressions that straddle the border between lexicon and syntax. However, constructions are by no means limited to capturing idiosyncratic patterns, and the same exact type of analysis can be applied to structures that are perfectly regular and predictable, such as those described by traditional phrase-structure grammar (cf. Fillmore et al. 1988). A prime example of this idea is Goldberg's (1995, 2006) influential work on argument structure constructions (ASCs), a family of basic clause-level constructions that define how the arguments of verbs are morphosyntactically expressed (see also Boas 2003, Iwata 2008, Perek 2015). For example, the caused-motion construction (Goldberg 1995) pairs the syntactic pattern { Subject – Verb – Object – Locative PP }[2] with the notion that the subject argument causes the object argument to move to a certain location, e.g. *He put the pizza on a plate*. ASCs can be combined more or less flexibly with different verbs, and contribute their own constructional meaning to the sentence, as can be seen for instance when a verb like *sneeze* is used creatively in the caused-motion construction, e.g. *He sneezed the napkin off the table* (Goldberg 1995, p. 9). Examples of this kind are often discussed in terms of *constructional coercion* in the CxG literature, whereby a construction can override the meaning of a lexical item in the case of a mismatch between lexical and constructional meaning (Michaelis 2005, Busso et al. 2020).

Hence, the entirety of grammar is described in the same format, both highly idiosyncratic expressions and fully regular patterns, although, as discussed in the next section, constructions can vary widely as to the kinds of forms and meanings that they pair. Some scholars argue that at least *some* constructions do not convey any meaning at all and should be considered purely formal generalizations, especially the very general building blocks of sentence structure, such as for instance the subject-predicate construction or the subject-auxiliary inversion construction (cf.

[2] These "flat" representations are common in CxG, but they should not be taken at face value. Rather, they should be seen as simplifications of more complex constituent structures including hierarchical relations between components of the construction; for example, the Verb, Object, and Locative PP in the caused-motion construction form a VP. Contrary to a common misconception outside the field, construction grammar does recognize constituency and the hierarchical constituent structure of sentences, but this is often not an area of focus in CxG studies. Similarly, morphosyntactic relations such as subject-verb agreement should be considered part of the formal specifications of the construction, even though they are not explicitly shown.

Fillmore 1999, and Goldberg 2006 for an alternative account). However, even for these patterns, the semantic contribution of the construction can be argued to consist in at least semantic composition, i.e. how the construction semantically combines its components. Single words themselves, as form-meaning pairs, are also technically constructions. This might seem counter-intuitive and at odds with the traditional use of the word 'construction' in grammar, but in practice construction grammarians only rarely use the term in this way. Sentences in a constructional approach are made from the combination of a number of different constructions, in a similar way to unification-based grammars like Head-driven Phrase Structure Grammar (Pollard and Sag 1994). For instance, the sentence *Did you put the cake in the oven?* combines (at least) the polar question construction, the caused-motion construction, the subject-predicate construction, a noun phrase construction (determiner + noun), the prepositional phrase construction, and lexical constructions for each distinct word.

The form of a construction may cover any aspect of its realization in sentences, including syntax (e.g. word order, constituent structure), morphology (e.g. inflections, agreement), or phonology (e.g. prosody). A construction may contain specific words (e.g. *way* in the *way*-construction) or more or less open "slots" (cf. next tenet). For many construction grammarians (e.g. Goldberg 1995, Boas 2003), the meaning component of constructions is captured in terms of the theory of frame semantics (Fillmore 1982, Fillmore and Atkins 1992): it is often described as a scene in which the slots of the construction receive semantic roles like agent, recipient, etc. However, constructional meaning often goes beyond this kind of propositional, descriptive semantics, and is commonly made to include aspects of semantic interpretation that are traditionally considered to belong to the realm of discourse and pragmatics, such as information structure, presuppositions, speaker's attitudes, and information about the context of use (Lambrecht 1994, Michaelis and Lambrecht 1994; 1996, Ruppenhofer and Michaelis 2010). Therefore, the more flexible term "function" is sometimes used when talking about constructional meaning (e.g. Goldberg 2003). In the remainder of this chapter, I will continue to use the term 'meaning', but it should really be understood to cover all these aspects of non-descriptive meaning.

A classic example of a construction with a pragmatic level of meaning is the so-called "What's X doing Y?" construction (WXDY; Kay and Fillmore 1999), as in, e.g., *What's this fly doing in my soup?* and *What was my name doing on that list?* While the construction formally looks like a typical *wh*-question, it is not literally used to ask about the action being carried out by the subject (indeed, a "name" in the second

example cannot literally be "doing" anything). Rather, it is used to convey the incredulity of the speaker towards a situation that they judge incongruous. In a CxG analysis, this pragmatic meaning is conveyed directly by the construction, instead of resulting from a contextual implicature, as would likely be the case in a "dictionary and grammar book" approach.

Tenet 2: Constructions can be defined at any level of complexity and generality

This tenet relates to the range of possible constructions, which is relatively unconstrained, as long as they qualify as form-meaning pairs. Indeed, constructions come in many shapes and sizes. There can be constructions covering words, phrases, sentences, or even entire discourses or parts thereof (Östman 2005). Some constructions are very narrow and specific, such as idioms, while other constructions are very broad and correspond to general patterns of sentence building, such as the caused-motion construction. In general, constructions can be described in terms of two properties: complexity and generality.

Complexity refers to the "size" of a construction, i.e. the number of different components that it is made of. Lexical items (e.g. *napkin*, *bake*, *sweet*) and bound morphemes (e.g. plural *–s*, agentive *-er*) are among the most simple constructions. The fixed compound *bucket list*, the idiom *pull one's leg*, and the caused-motion construction, are constructions of increasing complexity. There is no a priori limit on the kind of linguistic item or structure that a construction can describe; a CxG approach posits constructions for all levels of linguistic description that are traditionally separated, such as morphology, syntax, lexis, etc. (see for instance Booij 2010 for a constructional treatment of morphology).

Generality refers to how open the components of a construction are. Some components are set to a certain form, e.g. *way* in the *way*-construction, while others can be more or less open to variation; in the latter case, the term "slot" is commonly used to describe such a component. For example, the idiom *pull one's leg* can be described as consisting of two fixed parts, the (possibly inflected) verb *pull* and the noun *leg*, and a slot for the possessive determiner. The slots of a construction can vary widely in their degree of openness: they can be restricted to a closed set (e.g., the possessive determiner slot in *pull one's leg*), or open to a wider range of items (e.g. the verb in the *way*-construction, cf. Perek 2018), with many degrees in between. The openness of slots relates to the productivity of a construction (Barðdal 2008, Perek 2016; 2018; 2020, Suttle and Goldberg 2011), i.e. the range of items that can be found in it, and its likelihood to be used creatively with new items.

Constraints on slots should be part of the complete description of a construction. They can often be explained in large part by the semantic contribution of the construction, with which slot fillers are required to be compatible, and thus be captured to an extent by the meaning of the construction alone. For example, the caused-motion construction is compatible with verbs that inherently express a change of location (e.g. *put*, *load*), or any verb whose meaning can be construed as a cause of motion given the right context, e.g. *sneeze*. On the other hand, there are sometimes constraints that are seemingly arbitrary and rule out combinations that should be acceptable on the basis of the constructional meaning alone. For example, the verb *drive* in the resultative construction, e.g. *They drive me crazy*, can only be used with a very restricted set of phrases describing the end result, namely those that refer to a state of insanity (e.g. *crazy*, *mad*, *insane*, *bonkers*, *off the wall*, etc.). A few other negative states are sometimes allowed (e.g. *into a stupor*), but all other kinds, especially positive states, are unacceptable (e.g. **They drive me happy*). Since this is not predicted by the meaning of the construction (including that of the verb *drive*), it would have to be stored in the description of the constructional slot. More towards the open side of the spectrum, slots of constructions can also display 'soft' constraints within the realm of collocations or semantic preference (Stubbs 2001).

To form a thorough description of a language in CxG, constructions of any complexity and generality can thus be posited. Figure 1 illustrates this idea by situating the examples of constructions discussed so far, as well as a few others, along the dimensions of complexity and generality. Note that the above discussion deals with generality in form, i.e. the variability in the form of a construction across different sentences. In addition, constructions can also be described in terms of their generality in meaning, i.e. the range of situations that the construction can be applied to (cf. Perek 2020). Generality in form and meaning often go hand in hand: all other things being equal, a construction with a more general form also tends to have a more general meaning. Finally, also note that the term *schematicity* is sometimes used instead of generality, though this term tends to be slightly more commonly applied to meaning rather than form.

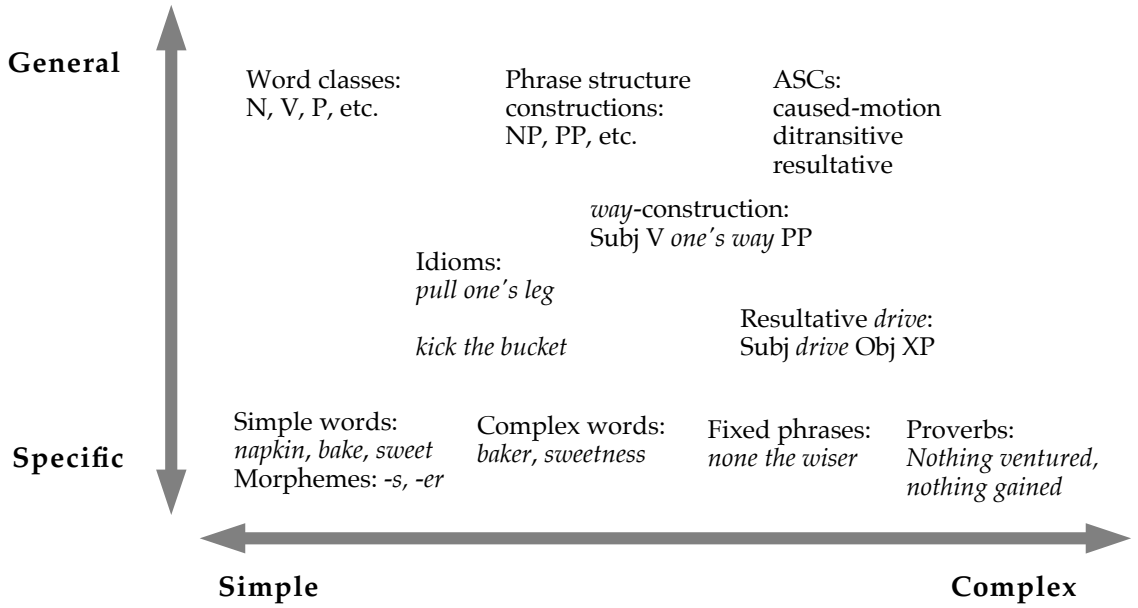

Figure 1: Constructions of varying complexity (X-axis) and generality (Y-axis)

Tenet 3: Constructions are linked to each other in a vast network

As explained in the previous section, constructions can be defined at any level of generality. This also means that constructions can be more specific versions of other constructions. For example, the resultative use of *drive* mentioned earlier (e.g. *They drive me crazy*) can be considered as a more specific version of the resultative construction, which pairs the form "Subj V Obj AdjP/PP" with the meaning 'X causes Y to become Z' (Goldberg 1995). Conversely, the resultative construction can be seen as a generalisation over the use of many other verbs in the same syntactic pattern. This relation between constructions can be captured by establishing inheritance links between the general construction and the more specific ones. Inheritance relations capture generalisations between constructions: when two constructions A and B inherit from the same third construction C, this means that A and B share the form and meaning described by C, while at the same elaborating on some aspects of it. Constructions that inherit from another construction can themselves be elaborated on by further sub-constructions, resulting in a multi-level taxonomic hierarchy, not unlike those of biological classifications. Figure 2 below illustrates this point with an example of an inheritance hierarchy with verbal constructions. "Subj V" and "Subj V Obj" correspond to the intransitive and transitive constructions respectively; they both generalize into the subject-predicate construction "Subj Pred". "Subj SLEEP", "Subj RUN", "Subj KICK Obj", and "Subj KISS Obj" are verb-specific instantiations of these two constructions. At the lowest level, "Subj KICK *the bucket*" and "Subj KICK *the*

habit" are two idioms that inherit their form from "Subj KICK Obj" and are paired with a non-compositional meaning.

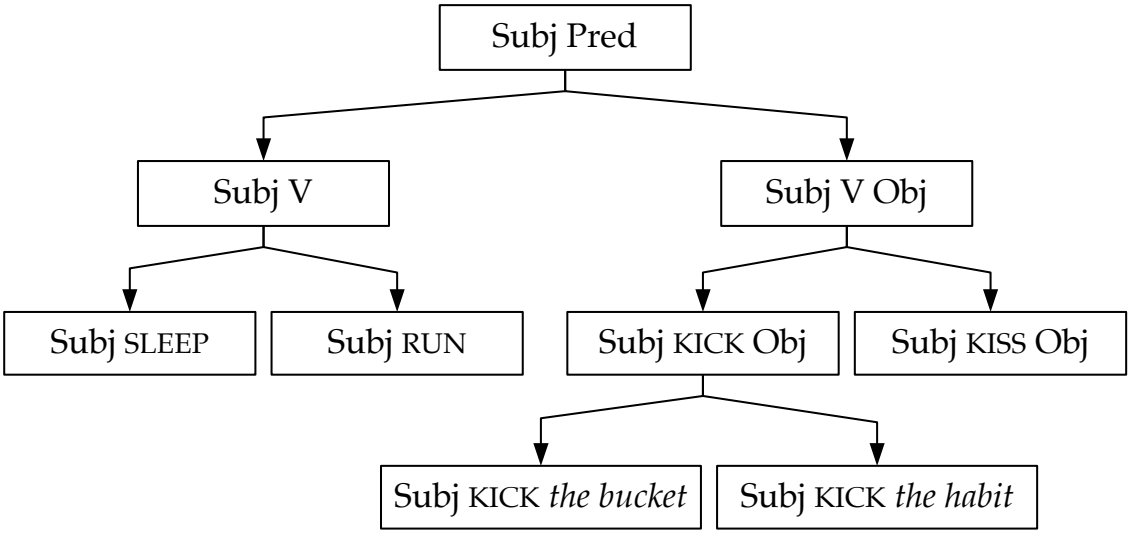

Figure 2: Example of an inheritance hierarchy (adapted from Croft 2001, p. 26)

Constructions can be redundantly defined at any level of the inheritance hierarchy, down to individual instances; instantiations of constructions in actual sentences (also called 'constructs') can themselves be seen to inherit their form and meaning from the constructions they instantiate. This kind of representation allows CxG to simultaneously capture both specific instances and generalisations, and the possible relations between them. This is needed in particular for those sub-constructions that display idiosyncratic behaviour in form or are idiomatic in meaning, such as the resultative *drive* construction (with its constraints on the resultative phrase) or transitive idioms like *pull one's leg* (which inherits at least its form from the transitive construction, although its meaning is not compositional). This network representation is thus part of CxG's response to the dichotomy made by earlier Chomskyan approaches between the 'core', regular grammar and the unruly 'periphery' of idioms and idiosyncratic patterns, in that it aims to reconcile both into a single coherent description.

Importantly, the more specific constructions need not be removed from the inheritance network once a broader generalization is found, even if these constructions are fully predictable from the generalization. The range of constructions to be kept in the hierarchy is not a priori determined by the theory, but is largely an empirical question that may depend on considerations of conventionality and usage (Croft 1998, Langacker 2009, Perek 2015, Diessel 2019, Schmid 2020), *inter alia*. Construction grammar rejects a Chomskyan principle that

Langacker (1987, p. 29) denounces as the "rule/list fallacy": unlike Chomskyan approaches, it does not force one to make a decision between computation, i.e. generation by the application of a rule, and storage, i.e. direct retrieval from memory, as indeed such a decision would be arbitrary in a model that rejects the separation of syntax and the lexicon in favor of form-meaning pairs. In this respect, CxG is often criticized for not being parsimonious, as it potentially leads to redundant representation of the same information. However, this is an irrelevant critique, since parsimony is widely considered not to be a relevant criterion for cognitive adequacy, which is an underlying goal of many constructional approaches (Croft 1998). There is a large body of research showing that such a redundant, multi-level representation is also necessary to fully account for the behavior of many constructions that involve a combination of regularities and idiosyncrasies, and that on balance the lower levels of the inheritance hierarchy might be more important in describing that behavior than highly abstract constructions (cf. Boas 2003; 2008, Croft 2003, Iwata 2008, Perek 2014; 2015).

Inheritance relations are used by all versions of CxG. Single inheritance, whereby constructions only inherit from one construction (whereas one construction can be elaborated on by multiple constructions), is the most commonly described case. In principle, a construction could be considered to inherit from more than one other construction if it shares with them the relevant aspects of form and/or meaning, although multiple inheritance of this kind is not overtly supported by all versions of CxG. Some constructional approaches include other kinds of more specific links that can also be described in terms of inheritance. For example, Goldberg (1995) distinguishes between four types of inheritance: instance, subpart, polysemy, and metaphorical extension (see also Ungerer 2021).

Inheritance relations are also sometimes called vertical relations: of the two constructions they link, one of them has a more important, basic, or primary status than the other. This is contrasted with 'horizontal' relations, in which the two constructions have similar or equal status. For instance, Goldberg (1995) posits a synonymy link between the ditransitive (e.g. *He gave her a pizza*) and the prepositional dative constructions (e.g. *He gave a pizza to her*), to capture the fact that these two constructions have overlapping functions. Despite this early example, horizontal relations have been relatively under-studied compared to inheritance, and have only recently started to receive increasing attention. Many of these studies focus on pairs of constructions that have traditionally been discussed under the label of syntactic alternations, which correspond to alternative ways to encode the same or

a similar meaning (Levin 1993). For instance, the variants of the dative alternation (e.g. *He gave her a pizza* vs. *He gave a pizza to her*) offer two different ways of encoding a transfer event with differences mostly in information structure (Bresnan et al. 2007). The variants of the *spray/load* alternation (e.g. *He loaded hay onto the wagon* vs. *He loaded the wagon with wagon*) involve two different construals of a caused motion event, in which a different argument (theme vs. location) is seen as the primarily affected entity in the event (Iwata 2008, Perek 2015). Some scholars argue that such alternation relations should be captured in some way in a constructional account (Cappelle 2006, Perek 2012; 2015, De Vaere et al. 2020, Diessel 2019, Sommerer and Smirnova 2020). Cappelle (2006) suggests that the variants of alternations should be considered allostructions, i.e. alternative realizations of an underlying constructional representation (called the constructeme), drawing an analogy with allomorphs and allophones. Cappelle (2006), and later Perek (2012, 2015), show how the allostruction model can be implemented with inheritance relations. In this approach, the constructeme is captured as a super-construction with an under-specified form paired with the semantic commonality between the variants of the alternation. The allostructions are described as sub-constructions inheriting from the constructeme, with a more specific form and possibly a more specific meaning if appropriate.

4. Usage-based construction grammar

In a usage-based approach to language, the mental representation of grammar in the mind of individual speakers is taken to emerge from actual language use (Langacker 2000). In this view, grammar is thus not just a static "repository" accessed in language use, but it is itself the product of usage. More specifically, most usage-based models claim that the emergence of linguistic structure directly results from the interaction of domain-general cognitive abilities through mere exposure to language (Beckner et al. 2009, Bybee 2010; 2013, Dąbrowska 2004; 2017, Diessel 2019, Divjak 2019, Goldberg 2019, Schmid 2020, Tomasello 2003). Domain-general means that these abilities are not specific to language but are also found in other areas of human cognitive experience; in other words, these abilities are in and of themselves non-linguistic, but they are taken to collectively give rise to language as an emergent phenomenon. This proposal is the usage-based alternative to the generative view of a language-specific innate endowment: a usage-based approach essentially puts language learning on a par with other forms of learning, and in doing so eschews the need to posit a language-specific "language acquisition device" à la Chomsky (1965).

Many domain-general abilities have been discussed in the literature with regards to their role in how language is acquired, how it is stored and processed in the mind, and how it changes over generations of speakers (Beckner et al. 2009, Bybee 2010; 2013, Dąbrowska 2004, Tomasello 2003). To illustrate this point, I will focus in particular on three abilities identified by Bybee (2013) as especially instrumental to the emergence of language structure: (i) categorization, (ii) cross-modal association, and (iii) chunking (or automation). Categorization consists in classifying distinct experiences and considering them alike in some respect; a trivial example of a non-linguistic task involving categorization would be sorting laundry into whites, colors, delicates etc. Cross-modal association involves forming connections between different aspects of experience, including ideas, events, and sensory information. An example of a non-linguistic cross-modal association would be that between thunder and lightning. Finally, chunking consists in storing and retrieving repeated sequences of elements as a single unit. A non-linguistic example of chunking would be learning how to start a car and drive, which initially is approached as a carefully planned set of actions, and over time coalesces into a single coherent activity whose component parts are barely thought about. It should be emphasized that many other socio-cognitive abilities and processes beyond these three have been claimed to play a role in language, for instance analogy, joint attention, intention-reading, pattern recognition, statistical learning, to name only a few (cf. Goldberg 2019, Schmid 2020, Tomasello 2003), which for reasons of space cannot be fully discussed in this chapter. Arguably, the three listed by Bybee (2013) are particularly important to the architecture of grammar and most closely connected to the core tenets of CxG. Importantly for the present chapter, these abilities are compatible with the tenets of CxG, and conversely, the kind of grammar that emerges from applying these abilities to linguistic data looks like one made of constructions, and one that follows these tenets. Therefore, it is only natural that many constructional approaches are also usage-based.

First, cross-modal association is the basic process that allows the form-meaning pairs of grammar to emerge (or any symbol, for that matter), as associations between auditory or visual cues and aspects of a certain situation. In Bybee's (2013, p. 50) words, "cross-modal association allows humans to match up the phonetic (or manual) form experienced with properties of the context and meaning." As this quote indicates, any aspect of the context of utterance can enter the association, which lines up with the idea that the semantic pole of constructions can include propositional meaning as well as pragmatics, discourse, usage constraints, and other forms of non-referential meaning. Upon repetition, recurring aspects of the context

are reinforced. This is likely how the WXDY construction mentioned earlier came to be, as Kay and Fillmore (1999, p. 5) claim that while it "may have had its origin in conversational implicatures—through situations in which an individual A is clearly up to no good and B asks what A is doing—the semantics of incongruity is now conventionally associated with the special morphosyntax of WXDY constructs."

Categorization plays a major role in forming and shaping constructions. It governs how two different instances of language can be considered similar in some way, and thus be considered to be member of the same category, i.e. a construction. Grouping multiple tokens into the same category also involves extracting commonalities across these tokens, forming the basis for the form and meaning of the construction; this process is also known as schematization (Langacker 2000). It is also through categorization that new instances can be matched to an existing construction, which can potentially affect the mental representation of the construction or create a new, more general construction if a broader generalisation is needed to accommodate the new instance. Hence, categorization also predicts the inheritance network model of constructions, as a by-product of categorizing a growing number of instances at increasing levels of generality.

Finally, chunking accounts for how a sequence of language items can be stored and accessed as a single unit, i.e. a construction, and it also predicts that this can occur for sequences of varying lengths, i.e. there can be constructions of any complexity. Variability within these chunks is detected through categorization (or more specifically, schematization) across multiple instances, and cross-modal association pairs these schemas with meaning. Chunking also predicts that patterns with varying degrees of idiosyncrasy, including non-compositional items like idioms, are stored as form-meaning pairs along with fully regular and compositional patterns, i.e. "sequences of linguistic units that occur together repeatedly tend to be assigned meanings as a whole rather than simply as a sum of the parts" (Bybee 2013, p. 55). This also means that even fully compositional and predictable expressions can be kept as chunks even when a higher-level generalisation that captures them is created, leading to redundant storage, which is commonly taken to depend on frequency. This is explicitly posited as a principle of constructional organisation in several accounts, such as Goldberg's (2006, p. 5):

> Any linguistic pattern is recognized as a construction as long as some aspect of its form or function is not strictly predictable from its component parts or from other constructions recognized to exist. *In addition, patterns are stored as*

> *constructions even if they are fully predictable as long as they occur with sufficient frequency*. (my emphasis)

In sum, in a usage-based construction grammar (UBCxG), grammar results from language use, and its mental representation is naturally in line with the core tenets of the theory. The usage-based tenet of UBCxG can be seen to underlie the other tenets: constructions capture speakers' memories of prior language use, filtered through and shaped by domain-general abilities. In a usage-based approach, grammar is seen as "the cognitive organization of one's experience with language" (Bybee 2006, p. 1), which helps to connect grammatical theory with domain-general cognition.

The view that grammar is shaped by usage opens many avenues to explain and predict many aspects of linguistic structure from usage data. One important contribution of usage-based theory to construction grammar has been to provide the framework with testable hypotheses on the relation between usage and structure, which has driven the paradigm towards more systematic use of empirical methods, notably corpus-linguistic and experimental ones (e.g. Boas 2003, Dąbrowska 2004, Divjak 2019, Ellis et al. 2016, Perek 2015). For example, in UBCxG, the cognitive status of constructions, and especially their degree of entrenchment (Langacker 1987, Divjak 2019, Schmid 2020), is taken to depend in large part on their frequency of use, as documented by language corpora (Perek 2015). Entrenchment in turns determines how strongly constructions are activated in language processing. As alluded to earlier, usage data can be used to inform the structure of the constructional network, with constructions being kept and reinforced if they occur with enough frequency (even fully compositional ones), and other constructions "decaying" when they fall into disuse. The frequency effects documented by many case studies (cf. Diessel 2007, Divjak 2019) can similarly be interpreted in terms of constructional representations. There is also a large body of research investigating the productivity of constructions (e.g. Barðdal 2008, Goldberg 2006; 2019, Perek 2016; 2018, Suttle and Goldberg 2011). These studies tend to show that the prior usage of constructions constrains how freely these constructions are subsequently used by speakers, with the openness of slots as a function of variability in prior usage. Novel instances of constructions are created by analogy with previous instances, through their stored usage-based representation.

5. Conclusion and prospects

Over the years, construction grammar, and in particular UBCxG, has been successfully applied to a wide range of research areas, including first and second

language acquisition (Tomasello 2003, Ellis et al. 2016), language typology (Croft 2001), language change (Hilpert 2013, Traugott and Trousdale 2013), language contact (Boas and Höder 2018; 2021), clinical linguistics (Hatchard 2021), natural language processing (Steels 2011), and language pedagogy (Holme 2010, De Knop and Gilquin 2016). This wide breadth testifies to the adequacy of CxG's theoretical principles for describing and explaining linguistic behavior of any kind.

In recent years, the field has also seen the advent of 'constructicography', the lexicography of constructions (Lyngfelt et al. 2018), which aims to find, describe, and document constructions, and to build constructicons: comprehensive inventories of fully described constructions in a given language, typically stored in electronic form (cf. Fillmore et al. 2012, Perek and Patten 2019). Constructicon research increases the descriptive coverage of construction grammar and provides the approach with wide-scope empirical validation, especially in areas that have been relatively neglected by CxG studies. Hence, the aims of constructicography line up with the commitment by early construction grammarians to "account for the entirety of each language" (Kay and Fillmore 1999, p. 1). In addition, constructicons open new avenues for practical applications, notably in the domain of language teaching (cf. Patten and Perek, accepted for publication).

Finally, the theory of UBCxG itself is not set in stone, and there are still many horizons for further research into the framework itself and the nature of constructions, with three areas in particular that I consider to be especially important. The first one involves the network approach: while there has been typically more focus on the nodes of the network themselves (i.e. the constructions and their properties), the study of the links between nodes has recently attracted more attention, not just between constructions as a whole but also between individual components of different constructions. Some scholars suggest that the links of the network might play a much greater role in constructional generalizations and linguistic processes that has previously been assumed, and how much about constructions can be captured in terms of links alone, which calls for more empirical investigation (Diessel 2019, Hilpert 2021, Schmid 2020, Sommerer and Smirnova 2020). Second, much research in the field assumes a somewhat idealized view of grammar as a unified and homogeneous entity representative of a whole population of speakers, which conflicts with the cognitive basis of UBCxG and its aim to describe grammar as it is 'stored' in the minds of speakers: if grammar is considered a cognitive phenomenon, its investigation needs to take individual minds into account, which calls for research into individual differences in grammar between

speakers. Despite some promising studies in this area (e.g. Dąbrowska 2012, Anthonissen 2020), we have yet to fully understand how individual usage relates to variation and change in the system as a whole, which also calls for a more prominent role of the social aspects of language in usage-based theory (Schmid 2020). Third, as a cognitive-functional theory, UBCxG should take into account not only verbal but also multimodal aspects of communication, such as gestures, and consider how they should be integrated with linguistic constructions. Although there have been valuable contributions to this question over the past few years (e.g. Zima and Bergs 2017), much research is still needed, especially using quantitative methods and/or experimental methods.

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