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English Constructions

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1. Introduction

The concept of "construction" has been at the center of a theory of language known as Construction Grammar (CxG) since the mid-1980s.[1] A construction is understood as a conventional pairing of form with meaning and function, where form includes not only syntactic and morphological aspects, but also aspects such as phonetic and phonological form.[2] In the constructionist view, language consists of a vast network of interrelated constructions, including different types of form-meaning pairings such as morphemes (e.g., *anti-*, *-ment*, etc.), words (e.g., *Monday*, *to persuade*, *blue*, etc.), and frozen idiomatic phrases (e.g. *a perfect storm*, *under the weather*, etc.), to independently existing argument structure constructions such as the ditransitive to more abstract and schematic constructions such as the subject-predicate construction. This paper first provides an overview of how CxG emerged in the 1980s out of research on Frame Semantics, the sister theory of CxG. It then presents the main concepts and methodologies underlying constructional research and it discusses the different varieties of CxG.[3] Finally it shows how the concept of construction has been applied to a variety of linguistic fields and applications in order to broaden our understanding of the nature of language.

2. Case Grammar, Frame Semantics, and Construction Grammar

The approach to investigating language known today as Construction Grammar (CxG) emerged in the 1980s as the result of previous investigations into how form and meaning in language are related to each other. In the 1960s, Charles Fillmore developed a new way of studying how the meaning of words, specifically verbs, might influence the syntactic patterns in which they occur. One major result of this research is Fillmore's seminal 1968 paper *The Case for Case*, in which he proposes a set of so-called universal deep cases (also known as semantic roles), which specify a verb's semantic valency. According to Fillmore, specific sets of semantic roles such as Agent, Patient, Instrument, Benefactive, etc. serve as a blueprint for how verbs realize their arguments in a sentence (i.e., which semantic role would be realized as subject, direct object, indirect object, etc.). Fillmore's seminal paper sparked a plethora of subsequent research, but during the 1970s more and more researchers found problems with Fillmore's deep cases, which eventually led to the abandonment of Fillmore's original idea of case frames (for discussion, see Levin & Rappaport Hovav (2005), Busse (2012), Boas (2014), Boas & Dux (2017)).

[1] I would like to thank my colleagues Lars Hinrichs and Marc Pierce as well as an anonymous reviewer for valuable feedback on an earlier version of this chapter. The usual disclaimers apply.

[2] Meaning and function is to be understood as broadly as possible, i.e. including various levels of semantic and pragmatic information, including contextual functions.

[3] The term "construction" has a long history of use in linguistics see Goldberg & Casenhiser (2006) for its history. It has only been since the 1980s that the term "construction" has been used explicitly as a part of a name of a particular linguistic theory seeking to account for the entirety of language, known as "Construction Grammar" (CxG). CxG is used as a cover term to denote a variety of different yet related constructional approaches. While CxG subscribes to the view that all of language consists of constructions, researchers working on other theoretical paradigms prefer to use the term "constructions" only to refer to "certain grammatical patterns that have unusual quirks in either their formal properties or their semantic interpretation (or both) that make them ill-suited for universal status" (Goldberg & Casenhiser 2006: 344). See also Hoffman & Trousdale (2013b: 2).

During the late 1970s and early 1980s, Fillmore re-visited his original proposals, which, among other things, sought to present an alternative approach to the then prevalent transformational-generative Chomskyan paradigm. Fillmore's new approach to word meaning came to be known as Frame Semantics and built on insights from cognitive and ethnographic semantics. In a series of publications, Fillmore (1975, 1977, 1978) gave up his original idea of universal semantic roles and proposed situation-specific semantic roles (so-called frame elements) that are "relativized to scenes" (1977: 59), rather than defining verb meanings (or "situations") by the semantic roles of their arguments as in earlier research (for details, see Boas & Dux 2017). The main ideas of Fillmore's theory of Frame Semantics, the sister theory of Construction Grammar, are presented in Fillmore (1982, 1985).[4] Here, Fillmore demonstrates how cultural and world knowledge motivates and is embedded in linguistic expressions, emphasizing that solely truth-conditional semantic approaches (such as those proposed within the Chomskyan paradigm (see Davidson 1967) cannot account for these aspects of word meaning and demonstrating the need for a "semantics of understanding" (see also Fillmore, 1975). The core ideas underlying research in Frame Semantics are summarized in the following quote:

> A word's meaning can be understood only with reference to a structured background of experience, beliefs, or practices, constituting a kind of conceptual prerequisite for understanding the meaning. Speakers can be said to know the meaning of the word only by first understanding the background frames that motivate the concept that the word encodes (Fillmore and Atkins 1992, pp. 76-77).

But what does the frame approach to studying meaning have to do with English constructions? There are (at least) three relevant answers. First, the intellectual heritage of both Frame Semantics and Construction Grammar can be directly traced back to Fillmore's original research on case frames in the 1960s. As we will see below, several proposals during the 1980s about the nature of constructions grew directly out of research in Frame Semantics. Second, as discussed in the introduction, the central notion of construction, defined as a conventionalized pairing of form and meaning/function, requires an understanding of what meaning is and how to analyze it. Frame Semantics offers a systematic approach to investigating and analyzing meaning, thereby contributing to our understanding of the nature of constructions. Third, research on so-called Argument Structure Constructions such as the ditransitive construction (e.g. *Joe baked Mary a cake* (Goldberg 1995)) has shown that many types of constructions are meaningful, and the meanings of these constructions can be represented using Frame Semantics. To demonstrate how meaning can be captured using semantic frames, I now turn to a brief discussion of semantic frames and how they can be used to describe lexical meanings. In this context I also show how the description and analysis of meaning in Frame Semantics and Construction Grammar is closely tied to the form and function of how that meaning is realized.

Based on his research on semantic frames during the 1970s and 1980s (Fillmore, 1975, 1977, 1982, 1985), Fillmore founded the FrameNet project at the International Computer Science Institute in Berkeley, California in 1997. FrameNet (http://framenet.icsi.berkeley.edu)

[4] There is not enough room here for a detailed overview of the development of Frame Semantics. For more details on Frame Semantics, see Petruck (1996), Busse (2012), and Ziem (2014).

is an online lexical database that seeks to document a wide variety of frame-semantic and corresponding syntactic information for the English lexicon. Put differently, the FrameNet database can be regarded as an applied implementation of the theory of Frame Semantics (and of Construction Grammar, as demonstrated below).[5] The information contained in FrameNet is the result of a workflow consisting of various steps in which groups of lexicographers define semantic frames based on the words that evoke them, search for corpus evidence in the British National Corpus, annotate extracted corpus data, and compile lexical entries (for details see Boas (2005/2017a), Fillmore & Baker (2010), Ruppenhofer et al. (2017)). Users can search FrameNet by typing in a word such as *to take*, which evokes several different frames, including the the `Taking` frame (as in the example sentence in Figure 1, *Milton took the can of beer out of the refrigerator*), the `Taking_time,` and the `Ride_vehicle` frames. Clicking on the name of a frame such as `Taking` presents the user with a definition of the frame as in Figure 1.

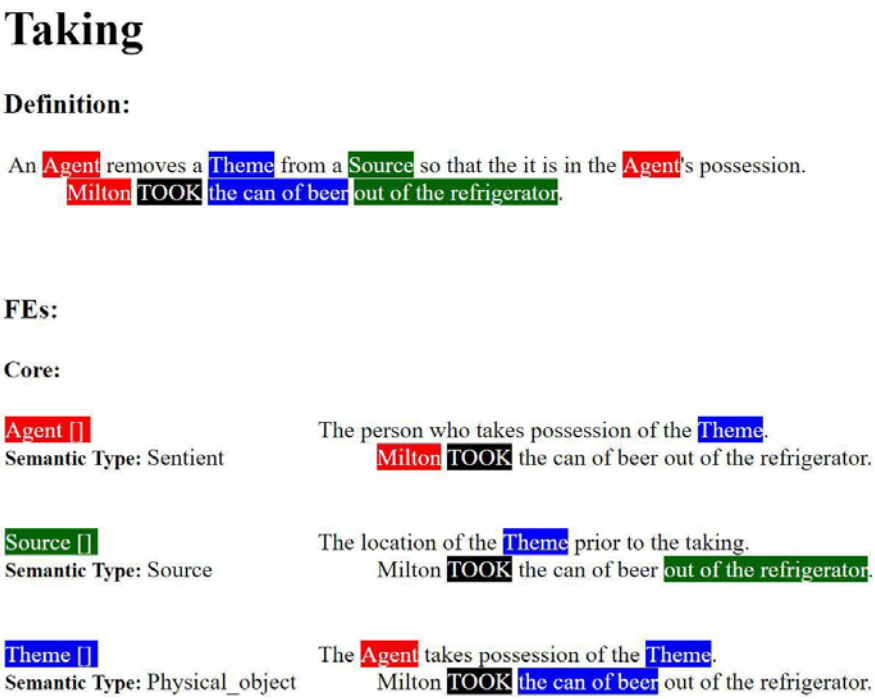


Figure 1. Frame and Frame Element Definitions of `Taking` frame in FrameNet (Boas & Dux, 2017)

At the core of FrameNet's architecture are the concepts of semantic frames, Frame Elements, and lexical units. Frame Elements (FEs) are the participants/roles by which semantic frames are defined, as can be seen in the frame definition in Figure 1. For example, the FEs of the `Taking` frame are AGENT, THEME, and SOURCE, because a taking event minimally requires that some entity (AGENT) takes something (THEME) from somewhere (SOURCE).[6] A distinction is made between these core FEs that are crucial for the understanding of the frame and non-core FEs that do not define the frame but provide additional information such as time, place,

[5] This section is based on Boas (2017a) and Boas & Dux (2017).

[6] Following FrameNet practice, frame labels are in Courier New font and FE labels are in small capital font.

and manner. Lexical units (LUs) are linguistic expressions (including all parts of speech and multi-word units) that evoke a given semantic frame. LUs of the Taking frame, for instance, include specific senses of the verbs *take* and *grab* and the noun *seizure*.[7]

Clicking on one of the LUs evoking a frame leads the user to a new FrameNet page showing how, for a given LU, the semantics of the frame are realized syntactically in terms of phrase type (PT) and grammatical function (GF). For example, clicking on *to take* displays, among other things, the various ways in which combinations of various sets of FEs are realized syntactically. Figure 2 is an excerpt of the valence table of *to take* in the Taking frame, summarizing the results of the frame-semantic annotation of corpus sentences containing the lexical unit.[8]

1 TOTAL	Agent	Place	Source	Theme
(1)	NP Ext	PP[in] Dep	INI --	NP Obj
2 TOTAL	Agent	Source	Theme	
(1)	DNI --	DNI --	NP Obj	
(1)	NP Ext	PP[from] Dep	NP Obj	
1 TOTAL	Agent	Theme		
(1)	NP Ext	NP Obj		

Figure 2. Portion of Valence Patterns for *take* in the Taking frame in FrameNet (Boas & Dux, 2017)

Three combinations of Frame Elements are shown in the table, the first of which includes the core FEs AGENT, SOURCE, and THEME, and the non-core PLACE FE, as in the sentence [<Agent>The Ottomans] *took*[tgt] [<Theme>land] [<Place>in what is now Turkey] [<Source>INI]. The grammatical function and phrase type of each FE is listed below the FE name, e.g. the THEME is a nominal object, the Agent is an external noun phrase, etc. The labels DNI and INI refer to FEs that are null instantiaed, i.e. they are not overtly expressed and are interpreted under definite or indefinite null instantiation, respectively (see Fillmore (1986), Michaelis & Ruppenhofer (2012), Boas (2017b)).

Users can access the types of information in Figures 1 and 2 for each LU in FrameNet, thereby allowing a systematic comparison of how LUs evoking the same frame realize the semantics of the frame differently at the syntactic level. For example, a comparison of the valence tables of the lexical entries of *to take*, *to grab*, and *to seize* shows that the three LUs differ in how they realize the semantics of the Taking frame differently at the syntactic level.

[7] FrameNet deals with polysemy by positing multiple frames for each sense of a word. Frames are related to each other in a large network displaying frame relations such as inheritance (e.g. the Taking frame inherits from a more general Getting frame).

[8] Clicking on a specific frame element configuration leads to the fully annotated examples sentence exemplifying its use in context.

This information is not only relevant for our understanding of how meaning is organized in terms of semantic frames in the lexicon of English. It is also important, because the detailed information about how frame element configurations are realized syntactically can be regarded as a particular type of low-level construction (so-called "mini-construction" (Boas, 2003), i.e. a pairing of form with meaning and function. In other words, each frame element configuration together with its syntactic realization in Figure 2 above can be regarded as a construction of English, because it is a pairing of form and meaning (see also Boas (2010a), Perek (2015), Dux (2016/2018)). With this brief discussion of the relationship between Frame Semantics and Construction Grammar in hand, I now turn to the main ideas and concepts underlying a constructionist view of language.

3. Construction Grammar: Concepts, Data, and Methodology

CxG evolved out of the desire for a comprehensive (ideally full) coverage of linguistic phenomena within a single theoretical framework, which is why it is sometimes called a maximalist approach to grammar (Fried/Östman, 2004, p. 24).[9] CxG aims to account for both peripheral intransparent grammatical phenomena such as partially filled idioms (e.g. *jog <someone's> memory*), semi-productive constructions such as What's X Doing Y? (e.g. *What's that fly doing in my soup?*)(Kay & Fillmore, 1999), and fully regular semantic and syntactic structures such as passives (e.g. Subj Aux VP_{PP} (PP_{by})) (Ackerman & Webelhuth, 1998, Lasch, 2016) in terms of a non-modular and non-derivational architecture of grammar.[10]

One of the core ideas of CxG is that the basic units of language are constructions, i.e. conventional pairings of form and meaning at varying levels of abstraction and complexity that must be learned. This is in contrast to the Chomskyan paradigm, which claims that children are not exposed to rich enough data within their linguistic environments to aqcuire every feature of their language ("poverty of the stimulus") (Chomsky 1988). Research on first and second language acquisition (Diessel, 2013, Ellis, 2013), psycholinguistics (Bencini, 2013), and neurolinguistics (Pulvermueller et al., 2013) also suggests that constructions are organized in terms of a mental network of constructions. If an utterance cannot be licensed based on the existing inventory of constructions (or a combination of existing constructions), then one has to posit a new construction. This idea is captured by Goldberg's (1995) classic definition of a construction:[11]

[9] Parts of this section are based on Boas & Ziem (2018b).

[10] CxG emerged in the 1980s as an alternative theory to the Chomskyan (generative-transformational) paradigm (Chomsky 1965, 1981). For details about the differences between CxG and the Chomskyan paradigm, see Goldberg (1995) and Goldberg (2006).

[11] See Table 1 below for examples of constructions. Goldberg (2006, p. 5) offers an alternative definition that includes the notion of frequency: 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 form 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. For other definitions of constructions, see Croft (2001, pp. 17-21) and Fried & Oestman (2004, pp. 18-23).

> C is a CONSTRUCTION iff$_{def}$ C is a form-meaning pair <F_i, S_i> such that some aspect of F_i or some aspect of S_i is not strictly predictable from C's component parts or from other previously established constructions (Goldberg 1995, p. 4).[12]

Another significant contention in CxG is that the form of a construction is intimately tied to its meaning and function, as can be seen in the schematic representation of a construction in Figure 3 below. Since CxG is a sign-based theory of grammar, form and meaning cannot be separated from one another. In some cases it might make sense to investigate form or meaning aspects in isolation for analytical reasons. However, form and function do not exist on their own, e.g. as autonomous (sub-)modules as is often postulated in other syntactic theories. In CxG, form and meaning rather constitute inseparable parts of a linguistic sign as Figure 3 shows.

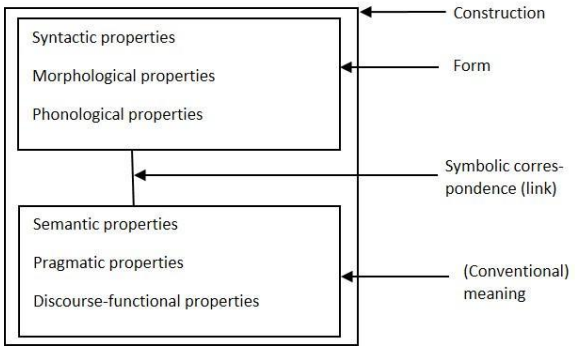


Figure 3. Types of information in constructions (Croft 2001, p. 18)

In the constructionist view, a difference in form typically implies a difference in meaning. For example, the words *pizza* and *spaghetti* are constructions that differ in meaning. Another example are the FrameNet lexical entries discussed in the previous section, where each frame element configuration and its syntactic realization can be regarded as a construction. A difference in form in Figure 2 such as between [NP/Ext, NP/Obj] (e.g. *They took him.*) and [NP/Ext, PP[from]/Dep, NP/Obj] (e.g. *They take the religion away from thousands of Muslims*.) thus indicates a difference in meaning, in this case how the meaning of the underlying frame evoked by the LU *to take* in the `Taking` frame is realized on the form side. This relationship between form and meaning does not only hold at the very specific lexical level, but also at more abstract levels, for example in the constructions listed in Table 1.

Subject-predicate agreement	NP VP-*s* (e.g. *Kim walks*)
Imperative	VP! (e.g. *Go home!*, *Buy that book!*)
Passive	Subj AUX V_{PP} (PP_{by}) (e.g. *The chocolate was eaten by the neighbors*)

[12] Note that CxG also subscribes to the notion of compositionality, see Michaelis (2012).

Ditransitive	e.g. Subj V Obj_1 Obj_2 (e.g. *Lena baked Sophia a pizza*)
Covariational Conditional	e.g. The Xer the Yer (e.g. *the more you run the fitter you get*)
Idiom (partially filled)	e.g. *Pat doesn't like cake, let alone brownies*
Idiom (filled)	e.g. *hit the road, a penny for your thoughts*
Complex word (partially filled)	e.g. [N-s] (for regular plurals)
word	e.g. *pizza, walk, icy, but*
morpheme	e.g. *un-, -able, -ment*

Table 1. Constructions at various levels of size and abstraction (cf. Goldberg, 2006)

Table 1 shows a partial inventory of different types of constructions illustrating the continuum between what has traditionally been characterized as "the lexicon" or "syntax," respectively. The constructions vary in terms of their complexity, schematicity, and abstractness.[13] Some constructions such as morphemes and words are very specific. Consider the verb *to take* as discussed in Section 2 above, which is an example of a very concrete low-level construction.[14] Other types of constructions, such as the *Time-Away* Construction (e.g. *Sam slept the whole trip away*) and the Incredulity Construction (e.g. *Him, a trapeze artist*?!), are more abstract since they are only partially lexically filled (see Goldberg & Casenhiser, 2008), while other constructions such as argument structure constructions, sentence type constructions, or the subject-predicate agreement construction are even more abstract and schematic. Another important aspect in which constructions differ is how meaningful they are. For example, morphemes and words have a very low degree of schematization but clearly express meaning. More complex construction such as the covariational construction or the ditransitive are more schematic and carry less meaning than words and morphemes, while very abstract constructions such as the subject-predicate construction have a very high degree of schematization and carry very little meaning.

CxG offers an alternative to theories such as Chomsky's Government-and-Binding approach (Chomsky, 1981) and Minimalism (Chomsky, 1995**)**, which proposes a strict separation into different linguistic modules (e.g. lexicon / syntax / phonology), by providing empirical evidence for a substantial overlap between lexicon and grammar.[15] In essence, this

[13] Schematicity refers to the degree to which constructions are lexically specified; double-object constructions, for example, are highly schematic, since none of their slots are lexically specified (even though their fillers have to meet a set of form- and meaning-related requirements, see Barðdal (2008), Boas (2008) and (2010b)).

[14] Note that "the verb *to take*" is only a placeholder here for the many different low-level mini-constructions occurring with the various senses of *to take*, each of which evokes a different semantic frame.

[15] Another way in which CxG differs from the Chomskyan paradigm is in that it does not make a distinction between the so-called "core" (phenomena assumed to be regular and worth studying) and "periphery" (exceptional phenomena that are hard to capture within a theory of Universal Grammar) (see Chomsky 1980, 1981). CxG rejects the idea of a principled difference between core and peripheral grammatical phenomena. Rather, both

means that words and syntactic structures do not fall into different categories and consequently do not need to be treated separately in what in the Chomskyan paradigm has been traditionally labeled "the lexicon" and "syntax" (see also Herbst, 2014 on the relationship between lexical valence patterns and constructions). As Goldberg (2006, p. 18) observes: "it's constructions all the way down."

Another important concept informing research in CxG is the notion of productivity (the degree to which speakers employ a particular pattern, rule or construction). Earlier research regarded productivity as an all-or-nothing-phenomenon (for an overview, see Barðdal 2008: 36ff.), but this view ignores that constructions can vary in terms of their syntactic and semantic restrictions. For example, due to its more numerous restrictions on its various slots, the English double-object construction (e.g. *They gave him a cold beer*) is less productive than the *way*-construction (e.g. *She elbowed her way out the door*). CxG views the productivity of constructions on a continuum, ranging from fully productive constructions to semi- and non-productive constructions. It takes the view that productivity has a crucial impact on the way a construction is shaped and related to other constructions in the constructicon. In this view, as Barðdal (2012, p. 467) notes with respect to argument structure constructions, syntactic productivity does not primarily refer to the ability to generate new sentences, but rather to "the interesting question of how case and argument structure constructions are extended to new verbs." In other words, usage-based CxG takes

> the type frequency and the coherence of a schema to determine the actual level of schematicity at which the construction exists in the minds of speakers [...]. This level of schematicity, i.e. a construction's highest level, also determines the construction's productivity. The higher the degree of schematicity, the more productive the construction is, and, conversely, the lower the degree of schematicity, the less productive the construction is (Barðdal 2008, p. 45).

On this view of productivity, certain meaningful argument structure constructions such as the *way*-construction are more productive than other argument structure constructions such as the caused-motion (e.g., *Lena crumbled the chocolate onto the pie*) and resultative constructions (e.g. *Sophia ran herself ragged*). In Goldberg's (1995) account of argument structure constructions, productivity is expressed by the number and types of constraints that regulate the fusion of a verb's lexical entry with a construction. The more constraints that are imposed on the fusion, the less productive the argument structure construction (for an alternative account, see Boas, 2003, 2005b).[16]

Another important aspect of constructionist research concerns the types of data used. While research in many other theoretical paradigms has based its insights primarily on

should be analyzed with the same analytical and methodological tool set, without losing track of either, fully transparent, compositional constructions and opaque, idiomatic structures (Fillmore ,1988, Michaelis, 2012).

[16] This "slot-based" view of productivity concerns the types of items that can occur in the various slots of a construction. But productivity may also relate to semantic variation, that is, to syntactic structures whose (abstract) meanings systematically change depending on the lexical items entering them (e.g., *He gives her a glass* vs. *He gives her a kiss* vs. *He promises her a kiss*). Constructions vary from entirely unproductive to highly productive units depending on type and token frequency. In this view, type and token entrenchment determine the way a grammar is cognitively structured and organized (Clausner/Croft, 1997).

linguistic intuition, CxG takes a usage-based approach.[17] In this view, the mental grammar of speakers is shaped by repeated exposure to specific utterances and domain-general cognitive processes such as categorization play a crucial role in the entrenchment of constructions (see also Stefanowitsch and Flach 2016). More specifically, linguistic knowledge is viewed as emergent and constantly changing (Hopper, 1987, Langacker, 2000, Ziem, 2014). In this view of language, type and token frequency play a crucial role, which means that anything that has been encountered often enough to be accessed as an entire unit is considered a construction, even if it exhibits no idiosyncrasy of form and meaning (Bybee, 2013).

Applying the usage-based approach to linguistic analysis means that constructionists rely on a variety of different data and methods, including introspection, corpus evidence, and experiments. Perhaps the most vibrant infusion of new techniques for collecting and analyzing data comes from the field of corpus linguistics. In this context, Gries (2013) discusses some crucial methodological innovations and techniques for constructionist research, including diverse association measures to quantify if and how much different linguistic elements are attracted to each other. One of the methods, known as collostructional analysis (Stefanowitsch, 2013/2914, Hilpert 2014), offers a unique way to quantify association strengths between different elements in an utterance. Using collocational approaches from corpus linguistics, this method offers different types of methods such as collexeme analysis (Stefanowitsch & Gries, 2003), distinctive collexeme analysis (Gries & Stefanowitsch, 2004), and co-varying collexeme analysis (Stefanowitsch & Gries, 2005) to arrive at rankings of how much words and particular slots of constructions attract each other.

To illustrate this claim, consider Stefanowitsch's (2013, p. 292) discussion of the question of which verbs are strongly attracted to or repelled by the Ditransitive Construction (e.g. *Kim told Pat the news*). According to Stefanowitsch, the Ditransitive Construction occurs 1,842 times in the International Corpus of English (ICE-GB; Nelson et al., 2002). According to his calculations, the frequency of a verb in a construction is assessed against its frequency in the corpus, to see if it occurs more or less often than expected, given its overall frequency. The verbs with the highest rate of attraction in the Ditransitive Construction, according to Stefanowitsch's (2013, p. 293) collexeme analysis include *give*, *tell*, *send*, *ask*, *show*, and *offer*. One of the advantages of applying quantitative corpus-linguistic methods to the investigation of constructions is that the results can be replicated and verified (or falsified). The promising results from more than a decade of collostructional analysis together with emerging research on machine-learning approaches (Chang & Maia, 2001) and experimental approaches (Casenhiser & Goldberg, 2005, Gries, Hampe & Schoenefeld, 2005, Kidd, Lieven & Tomassello, 2010) lead Gries (2013, p. 108) to the following conclusion: "Over time, the trend toward methods that are more rigorous and replicable than introspective judgments has only become stronger."

The chapter to this point has covered the main concepts and ideas underlying constructional research. I now turn to the question of how constructionists actually go about the details of analyzing linguistic data in terms of constructions, i.e. conventional pairings of form and meaning at varying levels of abstraction and complexity. One of the core interests of

[17] For a critique of intuition-based linguistic research, see Sampson (2004) and Hanks (2014).

CxG is to capture both generalizations and constraints on those generalizations that license those and only those expressions that can be found in a given language. In this sense CxG is generative. But in other senses CxG is not generative, especially when compared with the Chomskyan paradigm (Chomsky 1981, 1995), which assumes a modular architecture of language (syntax/semantics/phonology/etc.). CxG does not assume different levels of linguistic organization or modules and thus does not require any transformations or other mechanisms linking different levels of linguistic representation.[18] Instead, CxG focuses on surface forms ("what you see is what you get") and seeks to account for the licensing of utterances by simultaneously recruiting different constructions from a language's inventory of constructions (also known as the "constructicon") and combining them. To illustrate, consider the following sentence.

(1) The pizzas taste yummy.

The intransitive construction licensed by the one-place predicate *to taste* sets out the overall sentence structure, comprising an NP and VP construction, whereby the first is complex in itself such that it consists of a definite pronoun and a noun. Lexical constructions make up the lexical material combined into phrases. Again, lexical constructions may be simple in cases in which the items do not inflect (*the*, *two*, *cold*) or complex (*to taste*, *pizza*). The latter instantiate morphological constructions, such as plural constructions (*pizzas*) or other inflection constructions specifying number, tense and mood (*to taste*).

Types of constructions	Instances
Intransitive construction [[X]$_{NP}$ [Y]$_{V}$]	[[*The pizza*]$_{NP}$ [*taste*]$_{V}$]
VP construction[19] [[X]$_{V}$ ([Y] $_{NP}$) ([Z]$_{PP}$)]	*taste*
AdvP construction [[x]$_{Adv}$ ([y]$_{Adv}$)]	*yummy*
NP construction	[[*the*]$_{def\text{-}Pr.}$ [*pizza*]$_{N}$]
Plural construction [[X]$_{N\text{-}root\text{-}morph}$ [-y]$_{infl\text{-}morph}$]]	[[pizza]$_{root\text{-}morph}$ [-s]$_{infl\text{-}morph}$]

[18] Since CxG subscribes to the view that constructions are learned and shaped in language use, rather than being derived from each other (as proposed by the Chomskyan paradigm), it also abstrains from assuming empty categories, traces and invisible derivation processes, which are empirically difficult to verify.

[19] Even though we are dealing here with an intransitive construction, the VP construction offers options for licensing direct and indirect object NPs in cases involving transitive and ditransitive verbs.

Verb-inflection construction[20] [[X] V-root-morph [Y]Infl]	[*taste*] [-*Ø*]]
Lexical constructions	[*taste*], [*the*], [*pizza*], [*yummy*]

Table 2: Constructions instantiated by *The pizzas taste yummy.*

4. Varieties of Construction Grammar

The discussion so far might have suggested that CxG is a monolithic research enterprise with one person or a small group of people at the top determining the goals of the research program and thereby determining the methods, ideas, and data to be investigated. However, this is not the case, as shown in this section, which first addresses the early stages of development of CxG and then shows how different varieties of CxG have emerged that pursue different goals while still remaining compatible with each other.[21]

As discussed in Section 2, CxG has its intellectual roots in Fillmore's early research on Case Grammar in the 1960s and his later research on Frame Semantics in the 1970s and 1980s. It is important to be aware of this important connection, because of the intimate relationship between meaning and form that is one of the basic ideas behind a construction as a linguistic sign. The "early" constructional research during the 1980s as carried out by Charles Fillmore, Paul Kay, and George Lakoff was primarily concerned with semi-idiomatic constructions of English that exhibited some regular grammatical properties, yet at the same time also showed some other properties that did not fit the regular grammatical patterns of the language. As Fillmore (1988, p. 36) put it:

> Our reasons for concerning ourselves with otherwise neglected domains of grammar are not so that we can be left alone, by claiming territory that nobody else wants, but specifically because we believe that insights into the mechanics of the grammar as a whole can be brought out most clearly by the work of factoring out the constituent elements of the most complex constructions.

Fillmore's (1988) proposal to investigate both the neglected domains of grammar and the most complex constructions is displayed in one of the early in-depth analyses in the emerging CxG framework of the 1980s, namely Fillmore et al. (1988). Focusing on the so-called *let alone* construction, which basically functions like a coordinating conjunction (*Shrimp Moishe won't eat, let alone, squid*), while at the same time not licensing the same syntactic arrangements (**Shrimp let alone squid Moishe won't eat*), Fillmore et al. (1988, pp. 515-516) argue that idioms should be seen as units of syntactic representation that are associated with unique semantic and pragmatic properties. Adding to the complexity of the let alone construction, according to Fillmore et al. (1988, pp. 516-517), is that it shares some contexts with comparative *than* (*John hardly speaks Russian let alone Bulgarian*), but it does not license VP

[20] The verb-inflection construction will need to access a subject-predicate agreement construction that licenses the verb's proper inflectional ending.

[21] Parts of this section are based on Boas (2013a).

ellipsis like *than* does (**Max won't eat shrimp let alone Minnie will*). Besides its intricate syntactic properties, Fillmore et al. (1988) point out that the proper use and interpretation of *let alone* requires a complex set of semantic and pragmatic knowledge that is particular just to *let alone*. Croft and Cruse (2004, p. 239) summarize the set of interpretative mechanisms required for *let alone* as follows:

> First the interpreter must recognize or construct a semantic proposition in the fragmentary second conjunct that is parallel to the proposition in the first full conjunct . More specifically … [t]he interpreter must construct a scalar model, which ranks propositions on a scale - for example, the distastefulness for eating seafood … the initial, full conjunct denotes the proposition that is stronger or more informative on the scale … This whole semantic apparatus is required for the interpretation of the let alone construction and is not necessary (as a whole) for other constructions.

Constructional research during the 1980s as carried out in Berkeley was in the early stages mainly concerned with discovering and examining the syntactic, semantic, and pragmatic properties of selected non-canonical patterns of English such as the *Let alone* Construction, the deictic *There* Construction (*There goes the bell now!* [Lakoff, 1987]), syntactic amalgams (*There was a farmer had a dog* [Lambrecht, 1988]), *Mad Magazine Constructions* (*Him, a doctor?* [Lambrecht ,1990]). During the late 1980s and early 1990s, Charles Fillmore and Paul Kay started developing a more comprehensive approach towards covering the entire grammar of a language (in this case English) in terms of grammatical constructions, "the rules that unite formal and semantic information into various kinds of linguistic objects, together with the principles that constrain and connect them." (Fillmore 2013, p. 112)

This emerging framework eventually came to be known as Berkeley Construction Grammar (BCG) and sought to account for well-formed linguistic entities of English in terms of an assembly of the constructions that jointly license them. As discussed in the example in Table 2 above, constructions are only partial descriptions of well-formed linguistic entities that they license, and the "main operation is (naive) unification, so the grammar has no deep structure, no transformations, and no empty categories. What you see is what you get." (Fillmore 2013, p. 112) In contrast to research in other linguistic theories, BCG uses a "boxes within boxes" notation similar to phrase structure grammars whose nodes are complex features. Using attribute value matrices for capturing different types of linguistic information, ranging from syntactic to morphological, lexical, semantic, and pragmatic information, BCG aims to arrive at as complete a description of all the constructions of English as possible using the "boxes within boxes" notation (see Fillmore & Kay, 1993, Kay & Fillmore, 1999, and Fillmore, 2013 for an in-depth overview).

Starting in the 1990s, CxG evolved into a broader paradigm interested in a variety of different methods, approaches, and goals. It is important to remember that at a fundamental level, the different varieties of CxG still all share the same basic set of concepts discussed in Section 3 above. This means that insights in one variety (or flavor) of CxG is in principle compatible with and transferable to other varieties of CxG, as we will see below. What is known today as CxG more generally thus subsumes a family of related constructional approaches to language including, besides BCG, the following:

Cognitive Construction Grammar, which is perhaps best known for its novel thesis that

patterns of argument structure exist independently of lexical argument-taking predicates. In this view, proposed by Goldberg (1995), constructions such as Ditransitive and Caused-Motion are capable of supplying a verb's semantics with additional arguments. This step allows Goldberg to avoid claiming that the syntax and semantics of a clause is exclusively projected from the specifications of the main verb, thereby avoiding implausible verb senses as in *They urged the poor guy out of the room* or *Sally baked Kim a cake*, where one would not want to posit extra (transfer) senses for the verbs *to urge* or *to bake*. Instead, the transfer meaning of *Sally baked Kim a* cake and its related argument is provided by independently existing argument structure constructions (see Boas 2003/2005b for an alternative account that argues for lower-level constructions instead of abstract argument structure constructions). One of the central goals of Cognitive Construction Grammar is to offer a psychologically realistic account of language by determining how different more general cognitive principles serve to structure the inventories of constructions. In contrast to BCG, which seeks a more formalized account of the constructional inventory of a language without paying too much attention to cognitive principles of linguistic organization, Cognitive Construction Grammar explicitly subscribes to incorporating a set of common principles of interaction that are argued to have influenced grammatical structures, such as iconicity (Haiman, 1983), reasoning through metaphor and metonymy (Lakoff, 1987), categorization in terms of prototypes (Lakoff 1987), categorization based on basic experiential patterns (Johnson, 1987), and the perception of figure and ground (Talmy, 2000) (see Lakoff, 1987, Goldberg, 2006, and Boas, 2013 for more details). To capture the various linguistic insights and analyses, Cognitive Construction Grammar uses relatively informal boxed notations (when compared to Sign-based Construction Grammar or Berkeley Construction Grammar) to indicate the relationships between different types of constructions.

In contrast to Cognitive Construction Grammar, Sign-based Construction Grammar (SBCG) (Sag, 2010, 2012) offers a rigorous formalism that allows researchers to arrive at very precise statements about the various phonological, syntactic, semantic, and pragmatic specifications of a construction and how it interacts with other constructions. Growing out of related research in BCG (Fillmore & Kay, 1993) and Head-driven Phrase Structure Grammar, SBCG is focused on finding maximal generalizations without any redundancy. At the same time, SBCG practitioners are not that interested in offering a psychologically plausible account of language by determining how various general cognitive principles serve to structure the inventories of constructions or how frequency influences the status of item-specific instances (see Sag, 2010, Boas and Sag, 2012, and Michaelis, 2013 for details).

Other varieties of CxG are focused on yet other goals. For example, Embodied Construction Grammar (ECG) is not only interested in using insights into how people use grammar meaningfully and functionally, but it is aims to provide an empirically driven, computationally implemented, predictive theory of language use (Bergen & Chang, 2013). Fluid Construction Grammar (FCG) is another variety of CxG that aims to provide computational implementations in terms of language processing based on insights from techniques now common in formal and computational linguistics.[22] Finally, Radical Construction Grammar (Croft, 2001, 2013) grew out of typological research. This radical

[22] For an overview of the differences between ECG and FCG see van Trijp (2014), for a computational implementation of FCG see http://www.fcg-net.org).

approach to CxG rejects grammatical categories such as subject and object independent of the constructions that define them, which essentially frees it from any representational commitment, except for the symbolic unit (the construction). According to Croft (2001, p. 6), constructions are the basic units of syntactic representation and constructions themselves are language specific. This proposal is quite radical, because it means in effect that the categories and building block labels used to analyze one language should not and cannot be used to describe other languages. For example, on Croft's view the category "adjective" in English should not be applied to other languages such as French and German, because the corresponding words have different properties such as inflecting for case, number, and gender.

Although the different varieties of CxG differ somewhat in their methods of investigation, the types of phenomena they are interested in, the degree of formalization, the role of cognitive principles of linguistic organization, and some more general philosophical commitments to what a theory of language should accomplish, they all embrace the view that what has traditionally been regarded as lexicon and grammar essentially consists of constructions, i.e. non-compositional (and compositional) form-meaning pairings of varying abstractness and syntagmatic complexity organized on a continuum.

5. English Constructions and their Applications

Over the past two decades, CxG has evolved into an influential paradigm in linguistic research. Besides developing a psychologically plausible theory of human language, constructionist (and frame semantic) insights have been applied to a variety of different subfields of linguistics that go beyond synchronic analyses of constructional phenomena in the areas traditionally thought of as syntax, semantics/pragmatics, morphology, and the lexicon. These include first and second language acquisition (Diessel, 2013, Ellis, 2013), psycholinguistics (Bencini, 2013), neurolinguistics (Pulvermüller et al., 2013), historical linguistics (Fried, 2013, Hilpert, 2013), language variation (Hollmann, 2013), and language contact (Boas & Höder 2018).

One of the crucial points when determining the status and influence of a linguistic paradigm is the question of whether and how its theoretical principles and ideas can be applied and implemented. To this end, there are a number of interesting applications of constructional (and by extension frame-semantic) insights in a variety of domains. First, consider computational linguistics, where the application of Frame Semantics (and CxG) has enriched the fields of Automatic Semantic Role Labeling (Gildea & Jurafsky, 2002), Das et al., 2010, Ruppenhofer et al. ,2013), Semantic Parsing (Baker et al., 2007), and Sentiment Analysis (Ruppenhofer & Rehbein, 2012). This research is made possible, among other things, because of the vast array of frame-semantic and constructional information contained in FrameNet. In other words, this research crucially relies on one of the central constructional concepts, namely the construction as a pairing of form with meaning/function. Related computational research can be found in Fluid Construction Grammar (FCG) (Steels 2013) and Embodied Construction Grammar (ECG) (Bergen & Chang, 2013). FCG has been developing a formalism that allows researchers to take constructional insights and formulate them in a precise way that allows for the testing of hypotheses in the context of parsing, production, and learning. Similarly, ECG

aims to model the cognitive and neural mechanisms that underlie human linguistic behavior computationally. By focusing on the important role of simulation, research in ECG is aiming to determine the role of constructional knowledge and how it can be best represented and implemented in a computational infrastructure.

Another field benefiting from constructional (and frame-semantic) research is second language acquisition and foreign language pedagogy. The newly emerging field of Pedagogic Construction Grammar (Herbst, 2016) adopts the key insights and concepts from CxG in order to propose a new methodology for teaching English grammatical constructions to speakers of German. At the heart of Pedagogic Construction Grammar is the proposal that foreign language students can greatly benefit from a more systematic presentation of different types of grammatical constructions. On this view, explicitly using the concept of form-meaning pairing helps students with learning grammar in the foreign language classroom more easily. Similarly, Atzler (2011), Heppin & Gronostaj (2012), Boas & Dux (2013), Boas et al. (2016), Cappelle and Grabar (2016), and Loenheim et al. (2016) apply frame-semantic and constructional principles to the design and implementation of online learners' dictionaries and grammars for English, German, and Swedish.

More recently, some researchers have also applied constructional insights to the analysis of oral poetics. This newly emerging field, also known as Cognitive Oral Poetics, seeks to connect CxG and Frame Semantics to the central tenets of oral poetics, mainly the research tradition on oral formulaic style originated by the Parry-Lord theory of composition in performance. One of the goals of this effort is to systematically overcome the interpretative speculation of literary studies and to infuse a good deal of empirical rigor into the study of oral poetry while still maintaining interest in artistic value, cultural tradition, and particularities of style, or poetic effects (Antovic & Pagan Canovas 2016a, p. 9). To this end, Antovic & Pagan Canovas (2016b) discuss the similarities between formulas and constructions, the central theoretical concepts of the Barry-Lord theory of composition and of cognitive grammar, arguing that both concepts are based on the same view of linguistic knowledge as a result of instance-based generalizations (which can be expressed in terms of constructions). Similarly, Boas (2016) demonstrates how semantic frames and grammatical constructions can be applied to the study of oral poetics in order to systematically describe and analyze the forms and meanings communicated by oral poets during their performances. Going beyond the traditional method of close reading to interpret a text, Boas (2016) proposes that the analytical tool sets of Construction Grammar and Frame Semantics, together with empirical data (in the case of oral poetics this would be transcripts of oral performances), allows linguists to systematically identify constructions with their slots and fillers. This approach makes it possible to systematically assign meanings to constructions as well as their slots and fillers (typically words evoking semantic frames), resulting in a kind of full-text analysis that provides an empirical basis for determining the different layers of meaning in a text and allowing for a coherent strategy for arriving at possibly different interpretations given the context (see also Ziem et al., 2014).

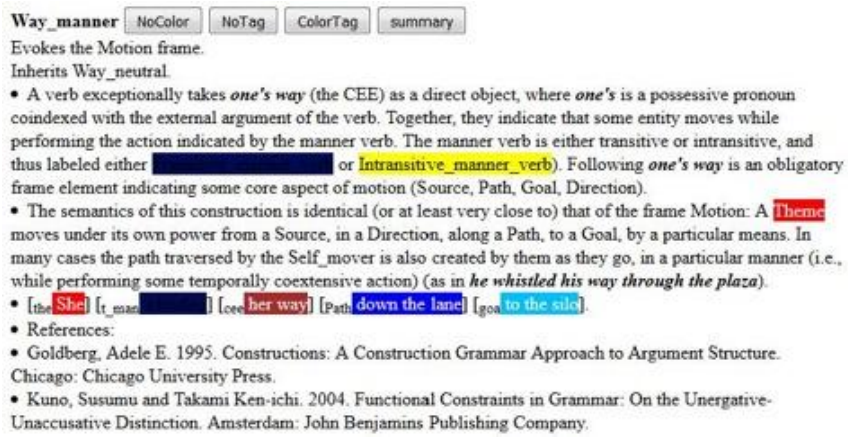
Finally, constructional insights form the basis for the field of constructicography (parallel to lexicography) (Lyngfelt et al. ,2018), more specifically for compiling an electronic

database consisting of entries for English constructions.[23] This database, also known as the constructicon of English, is parallel in design and implementation to the more lexically-oriented English FrameNet discussed in Section 2 above. The main idea behind the constructicon was already articulated by Fillmore more than three decades ago in his writing about the interconnectedness of the meaning of words and the constructions in which they may occur, as the following quote illustrates:

> If new-style lexical entries for content words were to be seen instead as constructions capable of occupying particular higher-phrase positions in sentences and included both the needed semantic role and the needed specifications of structural requirements (…), we could see such structures as providing expansions of their existing categories (Fillmore 1985b, p. 84).

Fillmore (2008) reports about the first prototype of an English constructicon (consisting of 73 entries) as an extension of the lexical FrameNet database. Using a modified FN database and annotation software enabled FN researchers to identify, analyze, and annotate English constructions in a very similar way as LUs (see Section 2 above). This is because LUs, too, are (lexical) constructions whose form pole is one or more word-forms, and whose meaning pole is usually represented as a specific semantic frame. Similarly, non-lexical constructions such as the passive, relative clause, or *way*-construction are also form-meaning pairings in which there is a clear form side of the construction. They differ, however, from lexical constructions in that the meaning evoked is less specific (cf. Baker 2012). Using a corpus-based workflow similar to that of FN, researchers compile construction entries that are stored in the constructicon database.

Each construction entry consists of a construction description, together with definitions of the CEs, and a list of annotated example sentences with summary tables highlighting the different ways that a construction's CEs are realized. To illustrate, consider a sentence such as *She elbowed her way into the meeting*, in which the verb *to elbow* appears with a possessive pronoun and the noun *way* (Goldberg, 1995). The construction entry for the English `Way_manner` construction consists of three parts. The first part provides a prose description of the construction, including its meaning and function, together with the information that it evokes the `Motion` frame and that it inherits information from the `Way_neutral` construction (see Figure 4).


Way_manner NoColor NoTag ColorTag summary

Evokes the Motion frame.
Inherits Way_neutral.

- A verb exceptionally takes ***one's way*** (the CEE) as a direct object, where ***one's*** is a possessive pronoun coindexed with the external argument of the verb. Together, they indicate that some entity moves while performing the action indicated by the manner verb. The manner verb is either transitive or intransitive, and thus labeled either [redacted] or Intransitive_manner_verb). Following ***one's way*** is an obligatory frame element indicating some core aspect of motion (Source, Path, Goal, Direction).
- The semantics of this construction is identical (or at least very close to) that of the frame Motion: A Theme moves under its own power from a Source, in a Direction, along a Path, to a Goal, by a particular means. In many cases the path traversed by the Self_mover is also created by them as they go, in a particular manner (i.e., while performing some temporally coextensive action) (as in ***he whistled his way through the plaza***).
- [the She] [t_man [redacted]] [cee her way] [Path down the lane] [goa to the silo].
- References:
- Goldberg, Adele E. 1995. Constructions: A Construction Grammar Approach to Argument Structure. Chicago: Chicago University Press.
- Kuno, Susumu and Takami Ken-ichi. 2004. Functional Constraints in Grammar: On the Unergative-Unaccusative Distinction. Amsterdam: John Benjamins Publishing Company.

Figure 4. First part of `Way_manner` construction entry (Boas 2017a)

[23] This section is based on Fillmore (2008), Fillmore et al. (2012), and Boas (2017).

The second part of the construction's entry lists the construction evoking elements (CEEs) (if there are any) and the construction elements (CEs, similar to FEs). The entry of an (semi-)idiomatic construction such as the *Way_manner* construction lists a specific CEE, in this case the noun phrase *one's way*, where *one's* is considered the Theme FE. One special feature of the *Way_manner* construction is the fact that its CEs are directly linked to the FEs of the Motion frame. The third part of a construction entry provides a summary of how the construction's CEs are realized syntactically (parallel to the valence tables in lexical FN). This summary is based on the annotated example sentences that accompany each construction entry. While the types and granularity of information displayed differs from construction to construction, they are still parallel to the valence tables found in the FN lexical entries.

More recently, there is an effort underway to compile a much larger constructicon for English that goes beyond the Berkeley prototype. Perek & Patten (2018) report about their efforts at the University of Birmingham to combine the COBUILD grammar patterns (Francis, 1993) with the semantic frames of FrameNet. More specifically, they are developing scripts that match the valency information contained in FrameNet entries with the verb patterns of COBUILD, in order to identify the frames that each pattern is associated with. While the automatic matching procedure produces many matches, it also involves a great deal of manual annotation. The resulting entries form the basis of a larger-scale English constructicon.

6. Beyond English constructions

CxG is rooted in analyzing English constructions in order to develop a research paradigm whose goal it is to arrive at a complete inventory of all constructions of English. This is in contrast to other generative linguistic theories, such as Minimalism (Chomsky, 1995), which make explicit claims about universal aspect of human language. Proposing the existence of "Universal Grammar" (an innate language faculty), Chomskyan approaches regard constructions only as epiphenomena, i.e. collections of structures that are the results of the interaction of universal principles and parameter settings (Chomsky 1995, p. 129). Constructional research makes no a priori claims about the existence of an innate language faculty with universal principles. Instead, it has kept its focus primarily on analyzing individual languages such as English. The reason for this methodological choice becomes clear in the following quote from Fillmore & Kay (1993, pp. 4-5):

> We will be satisfied with the technical resources at our disposal, and with our use of them, if they allow us to represent, in a perspicuous way, everything that we consider to be part of the conventions of the grammar of the first language we work with. We will be happy if we find that a framework that seemed to work for the first language we examine also performs well in representing grammatical knowledge in other languages.

While some researchers such as Croft (2001) propose that all constructions are language specific and that therefore it is probably difficult to arrive at constructional generalizations across languages, other researchers have shown that depending on the type of languages it is indeed possible to come up with constructional generalizations across pairs (and possibly larger groups) of languages. For example, the contributions in Boas (2010b) discuss a variety of linguistic phenomena by comparing English constructions with their counterparts in other languages such as German, Swedish, Spanish, Russian, Finnish, Japanese, and Thai. More recently, other groups of researchers have focused on investigating specific sets of constructions within particular language families such as Romance (see Boas & Gonzalvez

Garcia, 2014) or within particular languages other than English (see Boas & Ziem, 2018). This contrastive constructional research has also inspired the creation of several FrameNets and constructicons for other languages, including French, German, Japanese, Brazilian Portuguese, Spanish, and Swedish (see Boas, 2002/2009, Ohara et al., 2009, Borin et al., 2010, Lyngfelt, 2012, Torrent et al., 2014, Lyngfelt et al., 2018). This contrastive line of research has shown that most of the constructional and frame-semantic concepts and ideas developed on the basis of English are also applicable to the description and analysis of other languages, while at the same time paying attention to language-specific typological differences.

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