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DOMAIN-GENERAL PROCESSES AS THE BASIS FOR GRAMMAR

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55.1 INTRODUCTION

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An emerging view of grammar sees it as evolving from the application of domain-general processes over many instances of language use; this has profound implications for an investigation into the evolution of language. While the generative theory of grammar, with its postulation of certain innate language structures, has been most visible to observers outside the field of linguistics, long-term research traditions in typology, discourse analysis, historical linguistics, and corpus linguistics have converged on a view of grammar, termed 'usage-based', that explains the properties of human languages as a product of the way cognitive mechanisms apply to a language-user's experience with language in context.

   In this chapter I present this view of grammar and its implication for language evolution. I focus primarily on what is known about the dynamic processes that create grammar, as documented in many studies of language change; it follows that processes of language evolution which can be documented in the present should guide our proposals about the past. I demonstrate that many aspects of grammar can be derived

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from domain-general cognitive processes, especially those of neuromotor automation, chunking, categorization, inference-making, and cross-modal association (Bybee 2010).

55.2 CONSTRUCTIONS AS THE BASIC UNIT OF GRAMMAR

Rather than conceiving of the syntax of a language as being generated by abstract rules with no connection to meaning (as proposed in the transformational-generative tradition), Construction Grammar (Fillmore et al. 1988; Goldberg 1995, 2006) posits a direct connection between the conventionalized constructions of a language and their meanings. According to Goldberg (1995, 2006) all form-meaning pairings are constructions. This includes single morphemes, words, morphological formations such as VERB + PAST, idioms, and word sequences with schematic slots. This chapter concentrates especially on the latter type of construction.

Examples of constructions that include groups of words or morphemes with schematic positions can be both very specific and very general. On the specific end of the spectrum we find constructions such as (1) and (2); here, the verb *drive* is used with a category of adjective (roughly synonymous with *crazy*) in a range of tenses and with an animate object and a wide range of subjects. (Examples (1)–(4) are from the Corpus of Contemporary American English.)

(1)   It's been <u>driving me crazy</u>.

(2)   For one thing, the isolation here <u>drives men mad</u>.

A more general or abstract construction is the ditransitive construction, as in:

(3)   I'm gonna <u>give you</u> an option.

(4)   Hey, Jimmy, Mac, <u>throw me</u> the ball.

This construction can be used instead of the *to*-dative (as in . . . *throw the ball to me*) with some main verbs (Goldberg 1995). Note that almost all constructions have some *specific* lexical or grammatical material in them. It is rare to find a well-documented construction that is purely abstract and schematic, consisting only of categories such as noun phrase or verb phrase; instead, specific nouns, verbs, prepositions, pronouns, and inflections occur in constructions. Construction grammar, then, emphasizes the interaction of the lexicon with the syntax (Langacker 1987).

The two constructions exemplified above have well-defined meanings, partially independent of the particular items that participate in them. We know this because

the schematic slots of constructions are productive: a new item can be inserted and the meaning still comes through. For examples *bananas* (in the sense of 'crazy') can be substituted for *crazy* in (1) and *fax* or *text* can be substituted for *give* in (3). Thus we conclude that the conventionalized sequence of words has meaning attached directly to it via the domain-general process of cross-modal association—the ability of humans to associate temporally contiguous percepts from different modalities with one another. Having experienced utterances such as (1) and (2) in circumstances where their meaning can be inferred, one learns the meaning of this particular construction.

The other domain-general processes involved in construction formation and use are sequential processing and categorization. Sequential processing or chunking is the process by which repeated sequences of experience (words or other events) come to be grouped together in memory as a unit that can be accessed directly (Anderson 1993; Ellis 1996). Thus *drive* X *crazy* may become a sequential unit in memory (despite the interruption of the schematic slot for the object of *drive*). We know that such processing occurs independently of meaning from experiments in which infants and adults hear sequences of nonsense syllables and learn to recognize recurrent three-syllable sequences (Saffran et al. 1996; Graf-Estes, this volume).

Categorization is necessary to the cognitive representations of constructions in several ways. First, categorization is necessary for the recognition that an element or sequence is the same as one previously experienced. Second, categorization is used to develop the schematic slots of constructions; semantic similarity to *crazy* is a criterion for an adjective to occur in the *drive someone* ADJ construction. In the ditransitive construction, several semantic classes of verbs appear: related to *give* are *hand* and *pass* and related to *throw* are *toss* and *flip*. Thus the productivity and creativity of language derive from the use of the conventionalized form-meaning associations with novel elements chosen for their ability to fit in certain categories.

55.3 WHERE DO CONSTRUCTIONS COME FROM?

55.3.1 Grammaticalization

Constructions are created through the repetition and thus conventionalization of useful sequences of elements; their meanings arise from associations with the context and implications that are present. The most pervasive process by which new constructions are created is grammaticalization, in which a new construction is created along with a new grammatical morpheme; the latter evolves from a lexical morpheme or combinations of grammatical and lexical morphemes (see Heine and Kuteva, this volume). An accessible example is the periphrastic future in

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English, SUBJECT *be going to* VERB. The source of this construction is evident from the morphemes that compose it, but the meaning 'intention to do something' or 'future' is not directly derivable from the meanings of the components. At the same time, there is considerable phonetic reduction of *going to*, often produced as *gonna*. Thus, a new grammatical morpheme—a future marker—arises; instructively, cross-linguistic evidence confirms that the same factors are involved in the development of almost all grammatical morphemes.

Four centuries ago, when Shakespeare was writing, *be going to* VERB was just an ordinary instance of a more general purposive construction used with motion verbs (and perhaps other verbs), as in (5):

(5)   . . . the kings
       and the princes, our kindred, <u>are going to</u> see the queen's picture.
       (*Winter's Tale V.2*)

As *go* is a frequent verb with a very general meaning, instances of this construction with *go* occurred more often than with other verbs. As with other highly practised behaviour, repetition leads to certain changes. First, sequences of words repeated together tend to form chunks that can be accessed directly. Second, inside such chunks phonetic reduction is more likely, as the sequences of articulatory gestures composing such chunks tend to overlap and reduce. Third, higher frequency words and phrases are easier to access, and thus their frequency spurs even more repetition, leading to a snowball effect. Finally, certain meaning shifts within contexts of use can occur if inferences from the context are repeated with the construction.

An illustration of how meaning change via inference-making occurs in language use can be found in the following dialogue from Shakespeare (Hopper and Traugott 2003):

(6)   <u>Duke</u>   Sir Valentine, whither away so fast?
       <u>Val.</u>   Please it your grace, there is a messenger
                That stays in to bear my letters to my
                friends,
                And I <u>am going to</u> deliver them.
       <u>Duke</u>   Be they of much import?
       (1595, Shakespeare, *Two Gentlemen of Verona III.i.*51)

This dialogue is interesting because the Duke asks Valentine where he is going (*whither* means 'to where') but Valentine does not actually say where he is going; rather he says what he is intending to do. This response seems appropriate in the context—apparently that is what the Duke wanted to know anyway, especially given his next line, which is about the letters, not about the location Valentine is headed to. Thus the *be going to* construction, which is on the surface about movement in space, is used in contexts in which there is a strong implication of the subject's intention to complete the action described by the following verb. If such inferences occur commonly, they can become part of the meaning of the

construction (Bybee et al. 1994; Traugott and Dasher 2002). Thus one important use of *be going to* in contemporary English is to signal intention, as in this example.

(7)   <u>I'm going to</u> do everything I can to pay off that obligation.

It is this intention meaning that eventually gives rise to the future meaning, again by inference.

Other changes can also be related to the increased frequency of use of the phrase *be going to*. As a grammaticalizing phrase becomes more frequent and more frequently accessed as a chunk, the parts from which it was originally composed become less identifiable (Haiman 1994). This has not happened completely with *gonna*, but it can be seen in a grammaticalized sequence such as *would have*, where the second component is sometimes misidentified as *of* (Boyland 1996). Related to the loss of analysability is the loss of internal constituent structure. Rather than functioning like a main verb with a complement, *be going to* now functions more like an auxiliary with the verb following it functioning as the main verb, as evidenced by the fact that restrictions on what can be the subject are determined by that second verb rather than by *go*. Thus, in *it's going to rain, it* is the subject of *rain* and no movement is implied. Loss of constituent structure also occurs in complex prepositions that become simple ones: *before* and *behind* each consisted of a older preposition *be* and a noun, *fore* 'front' and *hind* 'back', but they have become simple prepositions with no internal structure.

A final important point is that grammaticalizing elements often move from being separate words to being attached to other items as affixes. For example, the subject agreement suffixes on verbs in the Altaic language Buriat are clearly derived from personal pronouns (Poppe 1960). Compare the suffixes in (8) to the first and second person subject pronouns in (9). The third person singular has no suffix and the third plural is derived from a demonstrative.

(8)   jaba- 'go' + -na- Present Tense
      1s jabana-b   1p jabana-bdi
      2s jabana-s   2p jabana-t
      3s jabana   3p jabana-d (cf. ede 'these')

(9)   Personal pronouns, nominative case
      1s bi   1p bide
      2s si   2p ta

There is only space here for these few examples, but recent research shows that these same mechanisms of change operate in other grammatical domains than tense, including modality, aspect, definiteness, voice and so on. Moreover, grammaticalization occurs in all languages. In fact, the paths of change in unrelated languages are remarkably similar to one another (Bybee et al. 1994; Heine and Kuteva 2002b, this volume). The following just sample the many cross-

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linguistically verified paths of grammaticalization ((10)–(13) from Bybee et al. 1994; (14)–(16) from Heine and Kuteva 2002b):

(10) Future from movement verbs ('go': Margi, Cocama, Maung, Atchin, Abipon, Krongo, Mano, Bari, Zuni and Nung; 'come': Margi, Tucuno, Guaymí, Danish, Krongo, Mwera, Tem, Mano, Tojolabal, and Cantonese)

(11) Progressives from locative constructions (Basque, Island Carib, Cocama, Jívaro, Alyawarra, Tahitian, Motu, O'odham, Abkhaz, Baluchi, Mwera, Ngambay, Shuswap, Haka, Lahu, Cantonese, Dakota, and Tok Pisin)

(12) Perfects from 'have' or 'be' auxiliaries plus non-finite form of the verb (Basque, Tigre, Maithili, Baluchi, Modern Greek, Danish, English, Spanish, Mano, and Buriat)

(13) Perfects from 'finish' (Bongu, Temne, Lao, American Sign Language, Tok Pisin, Palaung, and Sango)

(14) Definite articles from demonstratives (Romance and Germanic languages, Bizkaian Basque, Vai, Hungarian, Haitian Creole)

(15) Indefinite articles from the numeral 'one' (English, Albanian, Turkish, Hungarian, Greek, Lezgian, Easter Island, Tamil)

(16) Middle and passive voice from reflexive (Oneida, South !Xun, North !Xun, Danish, Spanish, Teso, Russian)

This is only a small sample of grammaticalization changes found cross-linguistically. The fact that grammaticalization occurs in all languages at all stages indicates that grammaticalization is the main process by which grammar evolves. Note further that the process is directional—lexical items become grammatical but rarely does the opposite occur. Thus, there is good reason to suppose that whatever the 'original' grammar of human language was, it evolved in the same way (see Bybee 1998; Heine and Kuteva 2007, this volume).

Grammaticalization, then, creates a new construction with a new grammatical morpheme in it. As mentioned, the domain-general processes at work are sequential processing, neuromotor automatization, categorization and inference-making. Historical evidence shows that grammatical constructions and complex words are formed by composition—the fusion of two elements that frequently occur side-by-side, not by the decomposition of complex items, as in the speculations of Wray 2000 and Kirby (this volume).

55.3.2 New constructions without grammaticalization

Every language has thousands, perhaps tens of thousands, of specific constructions that are concatenated and overlapped one on another to produce fluent speech.

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These constructions also arise out of other, more general constructions and take on special meanings because of use in specific, repeated circumstances (Bybee 2006b). Some of the same mechanisms apply to the creation of these constructions as apply in grammaticalization, but these constructions do not create a new grammatical morpheme—no particular lexical item undergoes the phonetic and semantic/pragmatic changes characterized above. The difference is that some constructions do not reach the frequency levels necessary for extreme phonetic reduction and semantic change. A good example is the construction discussed above, exemplified by *drive someone crazy*. The essential components of this construction are all lexical items, though pronouns can occur in the object position and the verb can be inflected.

Despite being very specific, this construction is part of the general grammatical repertoire of native speakers. It apparently arose in the 19th century: the first attestation of *drive* with an adjective listed by the Oxford English Dictionary is in 1813. It is used there with the adjective phrase *raving mad*. This usage was apparently an extension of the already metaphorical use of *drive* with a prepositional phrase attested since the 14TH century, in phrases such as *drive to scorn, driven into dumpes of doubtfulnesse*, and *to drive one out of his senses*. In these uses, what one is driven into is rather negative, so the appearance of *drive mad* could be based on semantic similarity to one of these prepositional phrases. The combination *drive mad* has apparently spawned a new productive construction. In the Time Magazine Corpus, which begins in 1923 and covers all issues of the magazine to the present, *drive* was used in the 1920s with *mad* and *insane* and one other more creative adjective, *rumour-frantic*. It appears with *crazy* in the 1930s and begins a steep increase in frequency. The construction changes from expressing literal meaning of *mad* or *crazy* 'clinically insane', to more hyperbolic uses; it also expands to a wider range of adjectives, including *nuts, batty, wild, loony*, and *half-mad* (Bybee 2010).

Languages are full of such conventional pairings that show productivity. Just as in grammaticalization, the processes that create them are sequential processing, repetition leading to chunking and conventionalization, and categorization, which creates a set of adjectives that can be used in the schematic slot. In this case we also see how closely the word choice is associated with the particular grammar of the construction.

55.4 IMPLICATIONS FOR A THEORY OF GRAMMAR

The evidence from language change and from current variation indicates that grammar is emergent, not static (Hopper 1998). As just demonstrated, the

mechanisms used in everyday interaction make subtle changes in the language that can be conventionalized and expanded with repetition. These facts point to a rich memory representation for language as language users keep track of the range of variation in the phonetics, semantics, and form of the utterances they process. In a rich memory (or exemplar) representation, each instance of language use has an impact on cognitive representations (Pierrehumbert 2001; Bybee 2006b, 2010). The specificity of memory for language means that what makes a language a language is not just the abstract patterns but also (or perhaps instead) the very specific word combinations or constructions that are conventionalized; these specific word sequences increase fluency as several words can be accessed at once (Pawley and Syder 1983; Erman and Warren 2000; Wray 2002).

In this view, language is a complex adaptive system: no structure is given in advance, but various mechanisms applying iteratively as language is used give rise to structure (Ellis and Larsen-Freeman 2009). The similarities and differences among languages arise because the same dynamic processes occur during usage in all languages (Greenberg 1969). That is why the same grammaticalization paths are repeated across languages and why it is easier to identify cross-linguistic patterns of change than to find cross-linguistic similarities in synchronic states.

The present discussion of change has emphasized that change takes place during language use; that is, change can occur in adult grammars. I emphasize this because there is a general misconception among linguists and others that language change takes place during language acquisition, or 'cultural transmission' (Lightfoot 1979; Kirby, this volume; Janda 2001). However, the empirical record is completely clear on two points: (1) the types of innovation found in child language are missing from the record of language change and (2) the social status of children makes them unlikely to exert sufficient influence on adults as to change language (Croft 2000; Bybee 2010). Even in those cases where an adult model is not available, as in the recently-formed Nicaraguan Sign Language (Senghas et al. 2004) and Al-Sayyid Bedouin Sign Language (Sandler et al. 2005), the variability among age cohorts or generations of speakers is consistent with change taking place during language use.

55.5 Implications for evolution

As a general research strategy, it is preferable to assume that the ability to acquire and process language is based on domain-general abilities and to postulate abilities specific to language only when domain-general abilities cannot be identified. Thus I have identified here at least some of the abilities necessary for the construction of a grammar, where I take grammar to mean the cognitive representation of

language. To review, in the previous discussion I have identified the roles of neuromotor automation, chunking, categorization, inference-making, and cross-modal association. All of these abilities are present in non-human primates and many other mammals as well, although to be sure, the human cognate capacities are much richer, both in detail as well as degrees of abstractness. Thus the human capacity for fine motor control, as well as complexity of units that can be processed together, far exceeds that of other primates. At the same time, the levels of categorization and the abstractness of inference-making also are well beyond the abilities of non-humans.

Other abilities that are prerequisites for language, such as complex imitation (Bates et al. 1991; Arbib 2003) joint attention, and social learning (Tomasello 1999) are apparently special to humans, but note that these are domain-general abilities that are applied to language as well as other types of learning and cultural activity. Thus I would argue that the acquisition and evolution of grammar is not based on special skills necessarily, but rather depends in large part on many domain-general capacities. Only after a thorough examination of domain-general abilities should we consider that the acquisition and use of human language requires abilities specific to language.

Thus, a plausible scenario for language evolution begins with the assignment of meaning to certain vocal and/or manual gestures through cross-modal association. These meaningful gestures are in essence 'words'. Using these words in sequence is an important step that increases the power of communication but also sets up the prerequisites for the development of grammar. Once two words can be strung together, the process of grammar creation can begin. When one word is used in combination with other words yielding a set meaning, a construction is born. The frequent use of the construction can lead to the development of a grammatical morpheme, as described here. The conclusion of this chapter agrees with Heine and Kuteva—the earliest language was one of words only; grammatical morphemes and grammatical constructions developed in much the same way as we can observe them developing today. Moreover, grammaticalization relies heavily on domain-general processes.