A Functionalist Approach to Grammar and its Evolution

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1. Theories of grammar

In considering the question of how the human capacity to learn and use grammar could have evolved, a great deal depends on the characterization of the nature of grammar. In recent years the debate has been dominated by those who believe that grammar consists of rigid, categorical rules and structures of such a remove from the spoken language that children could not learn them from the input available in the environment (Pinker and Bloom 1990; Chomsky 1975). Led by Chomsky, linguists at MIT, and those associated with them, have accepted the view that abstract grammatical principles are lodged in an innate Language Acquisition Device, a module of the mind that supplies the child with the basic principles of grammar. This device, containing as it does, all the principles of Universal Grammar, is meant to explain how children acquire their language rapidly and without formal instruction, and in addition, it is meant to encapsulate the core features that all languages have in common (Bickerton 1981; Chomsky 1965; Pinker 1994).

In this view, grammar is highly abstract knowledge which is autonomous and not reducible to concepts outside the system (Newmeyer 1990). This means that grammar does not relate directly to meaning or function or indeed to the uses to which language is put, but rather it constitutes a purely abstract system. Possession of this innate system makes language acquisition possible for *homo sapiens*, while the lack of such a device precludes language acquisition by our close relatives in the great ape family.

Given this theory of grammar, the question for evolution is how such a specialized device could have evolved, since as far as we know, none of our

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relatives possesses anything even remotely resembling this device. Chomsky suggests that random mutation and natural selection are not likely to have produced such a device, and that the ability to learn a grammar "may well have arisen as a concomitant of structural properties of the brain that developed for other reasons" (1982:321). In contrast, Bickerton (1981) and Pinker and Bloom (1990) argue that there is a selective advantage to more and better linguistic ability, and that such an innate device could have indeed evolved by continuous and gradual adaptation.

An entirely different perspective on the debate is taken by Lieberman (1984) and Bates et al. (1991), who view the evolution of such a specialized device for acquiring language as implausible, and therefore an argument against the Chomskian theory of grammar. Bates et al. argue on the basis of current research that children are able to learn language with exposure to rich environmental stimulation and with recourse to cognitive abilities which are not necessarily language specific, and that no innate rules of grammar are necessary (see also Tomasello 1990).

Indeed, as this debate continues, new research within linguistics is developing a strong case for a different theory of grammar, one that views grammar not as the product of a specialized mental device, but rather as the product of more general cognitive abilities that are also used in non-linguistic activities (Givón 1979; Lakoff 1987; Langacker 1987). Many of these abilities necessary for language also exist in a much less developed form in our homonid relatives. Given this theory of grammar, aspects of which I will outline in more detail below, there is no question of the plausibility of a continuous, gradual series of adaptations leading to human language in its current form.

A particularly important aspect of this new research is the discovery of how living languages create new grammar. Research in the last fifteen years encompassing many unrelated languages at many different time periods clearly shows that grammar arises spontaneously out of pre-existing lexical material as language is used. Grammar is not static and rigid, as predicted by the innatist position. Rather grammar is constantly changing: old grammatical constructions are constantly being replaced by newly-formed constructions. There is every reason to believe that all existing grammar came about in just the way we observe in the documented cases at our disposal, and that we can put to use what we have learned about this process in trying to understand how the

human communicative system comes to be structured grammatically.[1]

Both functionalist (Givón 1979; Hopper and Thompson 1980, 1984, etc.) and cognitivist (Lakoff 1987; Langacker 1987) theories of language hold that grammar is not independent of meaning and use. Rather these theories attempt to explain the general and specific properties of grammar in terms of concepts and phenomena outside of grammar, such as the more general cognitive abilities to create mental representations, to categorize, to generalize and to form inferences, the tendency to communicate by mentioning known information before new information, and the tendency to understand abstract properties of our experience in terms of the spatial orientation of the human body, just to mention a few.

In this view the acquisition of grammar by children is based on the input available in the environment: the language acquisition environment is seen as sufficiently rich to ensure that children internalize the system around them, given their general cognitive abilities (such as those mentioned above), their ability to imitate, and the strong inclination to conform to cultural patterns (Tomasello 1990).

"Universals" of grammar — the cross-linguistic patterns observable across genetically unrelated languages — are also explained with reference to cognitive and communicative factors outside of grammar.[2] Here functionalists are on particularly strong ground, as most of the cross-linguistic work using large databases have been done by functionalists. A prominent theory among such researchers is 'diachronic typology', a theory that postulates that cross-linguistic

1. For many decades it has been asserted by linguists that languages spoken in cultures of varying types (in small hunter-gatherer groups versus large urban groups) did not differ in complexity or type. This assertion is used by Pinker and Bloom (1990) as one of many arguments that grammar is innate. However, Perkins (1992) has shown a significant correlation between the level of cultural complexity and the inflectional expression of deixis, showing that language change is sensitive to cultural and communicative situations.

2. There are really very few true language universals — properties that all natural languages share. Some uncontroversial examples are: all languages have word classes that can be designated as 'noun' and 'verb'; all languages have classes of sounds that can be designated as 'vowels' and 'consonants.' Even the latter generalization is not true for signed languages. There are, however, many patterns of phonology, morphology, syntax and semantics that occur independently in unrelated languages and should be explained by a general theory of language.

patterns are best explained as the result of certain very strong tendencies for languages to change in certain specified and constrained ways (Bybee 1988; Bybee and Dahl 1989; Greenberg 1978; Croft 1990). These patterns of change result in both the creation of new grammar and the loss of old grammar. The findings of research into this process, termed 'grammaticization', are directly applicable to the issue of concern here: the evolution of grammar.

2. GRAMMATICIZATION

In the process of grammaticization, a frequently used stretch of speech becomes automated as a single processing unit and through further frequent use, takes on a generalized and abstract function. As the examples below will show, grammaticization usually occurs as lexical items develop into grammatical morphemes, with concomitant changes in phonological and grammatical form, as well as in meaning or function. As mentioned above, given the spontaneity with which grammaticization is observed to occur in documented cases, in unrelated languages, and across all documented time periods, there is every reason to believe that it was precisely this process which was operable in creating the grammar of the earliest forms of human language. The goal of this section is to exemplify this process and present evidence that the process is indeed common to all languages and to all time periods. In subsequent sections, we will examine the mechanisms involved in this process in order to identify the cognitive prerequisites to the creation of grammar.

The grammaticization process relies on a distinction posited in all theories of grammar and found in all natural languages, the distinction between vocabulary or lexical items on the one hand, and a very constrained set of grammatical units and structures on the other. The lexical items include all the nouns and verbs of a language, classes that are potentially open-ended, since all languages have ways of forming new nouns and verbs as the need arises.[3] The grammatical structures include word order patterns (such as in English, the fact that, with only very well-defined exceptions, the subject appears before the verb), and a set of units known as grammatical morphemes.

3. Lexical items also include adjectives and adverbs in those languages that have them.

'Morpheme' is the general term for the minimal meaning-bearing units of language (including lexical items such as *elephant*, as well as prefixes such as *un-* or *pre-* and suffixes such as *-ing* and *-ness*); 'grammatical morpheme' refers to the small closed set of function words and affixes that provide the grammatical frame for the expression of ideas. Examples of grammatical morphemes in English are the articles, *the* and *a/an*, the auxiliary verbs (e.g. *may, can* and *will*), all affixes (e.g. *-ed, -s, -ing, -ly, -ity*) all prepositions (e.g. *to, for, before* and *after*), and so on. Grammatical morphemes, which all languages have, are characterized by relatively abstract meaning, often expressing the relations among other linguistic items, and by fairly strict rules governing their occurrence in clauses.

Research into the way grammatical morphemes develop over time reveals that the distinction between lexicon and grammar is not so strict: in the process of grammaticization, lexical items (words) frequently used in particular constructions develop into grammatical morphemes. For instance, since English began to appear in writing some 1200 years ago, we can document the development of the definite article, *the*, out of the demonstrative, *that*, and the development of the indefinite article *a/an* out of the numeral *one*. The function of articles such as *the* and *a* is to distinguish between nouns that the hearer can identify as already known in the discourse or conversational context and those that are being introduced for the first time. (For example, *I met a man at the bank...* where this is the first mention of *a man* vs. *The man I met at the bank...* which refers back to some previous mention.) Old English (as documented in manuscripts from about 800–1100 AD) used no articles at all, but rather could change the position of nouns to show which were new and which were previously mentioned.

Similarly, the English modal auxiliaries, which express grammatical distinctions within the categories of tense (future *will*) and modalities such as possibility (*can* and *may*), all developed from verbs. *Will*, which now indicates future tense, developed from a verb, *willan*, which meant 'to want'; *can* came from a verb, *cunnan*, meaning 'to be acquainted with or to know how to'; *may* came from a verb, *magan*, meaning 'to be able to, to have the power'. *Could* and *might* developed from the past tense forms of *cunnan* and *magan* respectively.

More complex phrases can also coalesce into grammatical markers, as when the phrase *be going to*, which in Shakespeare's English still described actual movement in space, fuses into *gonna* and comes to be used for future time reference. (For more details, see below.)

Even affixes derive from full words. For instance, the English suffix *-ly* derived from a noun, which in Old English was *liç*, meaning 'body'. The compound *mann-liç* originally meant 'having the body or appearance of a man' whence it generalized to 'having the characteristics of a man', the modern sense of *manly*.

These facts of English are interesting enough as isolated facts about one language, but they develop a profound importance with the discovery that all around the world, in languages that are not related genetically or geographically, we find analogous examples: definite articles developing from demonstratives, indefinite articles from the numeral 'one', future tenses from verbs meaning 'want' or 'go to' and auxiliaries indicating possibility and permission from verbs meaning 'know' and 'be able'.

For instance, in many European languages, an indefinite article has developed out of the numeral 'one': English *a/an*, German *ein*, French *un/une* and Spanish *un/una*, Modern Greek *ena*. While these are all Indo-European languages, in each case, this development occurred after these languages had differentiated from one another and speakers were no longer in contact. In other, unrelated languages the same development occurs: in Moré, a Gur language of the Upper Volta, *a yérmé* 'one' becomes the indefinite article (Heine et al. 1993). Examples of demonstratives becoming definite articles are also common: Latin *ille, illa* 'that' became French definite articles *le, la* and Spanish *el, la;* in Vai (a Mande language of Liberia and Sierra Leone) the demonstrative *mɛ* 'this' becomes a suffixed definite article (Heine et al. 1993).

Parallel to English *will*, a verb meaning 'want' becomes a future marker in Bulgarian, Rumanian and Serbo-Croatian, as well as in the Bantu languages of Africa — Mabiha, Omyene and Swahili (Bybee and Pagliuca 1987; Heine et al. 1993). Parallel to English *can* from 'to know', Baluchi (Indo-Iranian), Danish (Germanic), Motu (Papua Austronesian), Mwera (Bantu) and Nung (Tibeto-Burman) use a verb meaning 'know' for the expression of ability (Bybee, Perkins and Pagliuca 1994). Tok Pisin, a creole language of New Guinea, uses *kæn* (from English *can*) for ability and also *savi* from the Portuguese *save* 'he knows' for ability. Latin **potere* or *possum* 'to be able' gives French *pouvoir* and Spanish *poder*, both meaning 'can' as auxiliaries and 'power' as nouns. These words parallel English *may* (and past tense *might*), which earlier meant 'have the physical power to do something'. Verbs or phrases indicating movement towards a goal (comparable to English *be going to*) frequently become future markers around the world, found in languages such as French and Spanish but also in languages spoken in Africa, the Americas, Asia and the Pacific (Bybee and Pagliuca 1987; Bybee et al. 1994).

Of course, not all grammaticization paths can be illustrated with English examples. There are also common developments that do not happen to occur in English. For instance, a completive or perfect marker (meaning 'have [just] done') develops from a verb meaning 'finish' in Bantu languages, as well as in languages as diverse as Cocama and Tucano (both Andean-Equatorial), Koho (Mon-Khmer), Buli (Malayo-Polynesian), Tem and Engenni (both Niger-Congo), Lao (Kam-Tai), Haka and Lahu (Tibeto-Burman), Cantonese and Tok Pisin (Bybee et al. 1994; Heine and Reh 1984). In addition, the same development from the verb 'finish' has been recorded for American Sign Language, showing that grammaticization takes place in signed languages the same way as it does in spoken languages (Janzen 1995).

For several of these developments I have cited the creole language, Tok Pisin, formerly known as Melanesian Pidgin English, and now the official language of Papua New Guinea.

Pidgin languages are originally trade or plantation languages which develop in situations where speakers of several different languages must interact, though they share no common language. At first, pidgins have no grammatical constructions or categories, but as they are used in wider contexts and by more people more often, they begin to develop grammar. Once such languages come to be used by children as their first language, and thus are designated as creole languages, the development of grammar flowers even more. The fact that the grammars of pidgin and creole languages are very similar in form, even among pidgins that developed in geographically distant places by speakers of diverse languages, has been taken by Bickerton (1981) to be strong evidence for innate language universals. However, studies of the way in which grammar develops in such languages reveals that the process is the same as the grammaticization process in more established languages (Romaine 1995; Sankoff 1990).[4]

4. Jourdan and Keesing (1997) argue that creolization is not nativization per se, indicating that adults who use a pidgin as a second language are instrumental in elaborating the language based on their experience and social interaction. As such, their research suggests, again, that an innate structure in the brain is not responsible for the creation of grammar

3. PATHS OF CHANGE AND SYNCHRONIC PATTERNS

The picture that emerges from the examination of these and the numerous other documented cases of grammaticization is that there are several highly constrained and specifiable *grammaticization paths* which lead to the development of new grammatical constructions. Such paths are universal in the sense that development along them occurs independently in unrelated languages. For instance, the two most common paths for the development of future tense morphemes in the languages of the world are the following:

(1) The Movement Path

movement towards a goal > intention > future

(2) The Volition Path

volition or desire > intention > future

New developments along such paths may begin at any time in a language's history. In any language we look at, we find old constructions that are near the end of such a path, as well as new constructions that are just beginning their evolution and constructions midway along. Grammar is constantly being created and lost along such specifiable and universal trajectories.

Development along the Movement Path begins when a verb or phrase meaning 'movement towards a goal' comes to be used with a verb: as in *They are going to Windsor to see the King.* At first, the meaning is primarily spatial, but a strong inference of intention is also present. (*Why are they going to Windsor? To see the King.*) The intention meaning can become primary and from that one can infer future actions: *He's going to (gonna) buy a house* can state an intention or make a prediction about future actions.

Such developments are slow and gradual, and a grammaticizing construction on such a path will span a portion of it at any given time. Thus, English *be going to* in Shakespeare's time could express both the 'change of location' sense and the 'intention' sense. In Modern English, the intention sense is still present, but the future sense is also possible, with no intention or movement

since the Language Acquisition Device which holds the substance of Universal Grammar is believed to be active only in children.

implied (*That tree is going to lose its leaves*). As a result of the gradualness of change, and the fact that in any particular language, a future morpheme might be anywhere on one of these paths, there is considerable cross-linguistic variation in the meaning and range of use of a future morpheme at any particular synchronic period.

Considering just synchronic states, then, it is extremely difficult to formulate universals of tense, or even to give a universal meaning to 'future' that would be valid across all languages. Indeed in the 1950's and 1960's it was common for linguists to exclaim that any attempt to find universals of grammatical meaning would be futile and ethnocentric (Chomsky 1957; Weinreich 1963). Now there are attempts to formulate the innate universals of tense and aspect (Smith 1991), but it is very difficult to find a small set of features that accommodate all the cross-linguistic variation in the area of tense and aspect.

Diachronic typologists maintain that comparing grammatical categories across languages from only a synchronic perspective is something like comparing an acorn to an oak tree: they appear to have distinct and unrelated properties. Only when we observe these entities across the temporal dimension do we see the relationship between them. Similarly with grammatical categories and constructions: new relationships are observable when we take into account where particular grammatical constructions and categories come from and where they are going.

The success of the approach that postulates continuous variation along grammaticization paths implies that the categories of grammar are not innately given. If they were, they would be both more discrete and more similar across languages and they would be more resistant to change.

The examination of the grammaticization process across many grammatical domains and many different languages makes it clear that the true language universals are universals of change. At one level, these universals can be stated as paths of change, such as those in (1) and (2). To understand grammar more fully, however, we must look behind these paths of change to the actual mechanisms that cause change, and then seek to understand these mechanisms in terms of more basic cognitive and interactive processes. If we are successful, we will begin to understand how human language acquires grammar.

4. CONCEPTUAL SOURCES FOR GRAMMATICAL MATERIAL

The examples discussed in the preceding section showed lexical items entering into the grammaticization process. One of the major cross-linguistic similarities noted in the previous section is that the same or very similar lexical meanings tend to grammaticize in unrelated languages. Of all the tens of thousands of words in a language, only a small set are candidates for participation in the grammaticization process. Are there any generalizations that could be made concerning the members of this set?

Researchers in this area have made some interesting observations about the lexical items that are candidates for grammaticization. Heine, Claudi and Hünnemeyer (1991) have observed that the terms in this set are largely culturally independent, that is, universal to human experience. Furthermore, they represent concrete and basic aspects of the human relation with the environment, with a strong emphasis on the spatial environment, including parts of the human body. Thus we find terms for movement in space, such as 'come' and 'go' in future constructions, postures such as 'sit', 'stand' and 'lie' in progressive constructions, and extensive use of human body part terms in relational constructions, with 'head' used for the relation 'on top of' and 'back' used in the relation 'in back of'. Less concrete, but nonetheless basic and culturally independent, are notions such as volition and obligation, which also enter into the grammaticization process.

Another important observation about the lexical items found in grammaticizing constructions is that they are themselves already highly generalized in meaning. Thus among motion verbs, 'go' and 'come' are the most general in meaning, incorporating only movement and directionality and not manner (that is, the more specific, 'saunter', 'waddle' or 'run' do not grammaticize, though in some cases the most basic form of human locomotion 'walk' does grammaticize). Among stative verbs, it is 'be' and 'have' that grammaticize, and for active verbs, the most generalized, 'do' (Bybee et al. 1994).

A brief overview of the meanings of lexical items that enter into grammaticization follows. The list is heavily dominated by terms referring to spatial orientation, notably and most usually, the orientation of the human body or body parts in space.

Spatial orientation

Movement: movement towards or away from the speaker's position includes the frequently grammaticized 'go to' and 'come from', which give rise to the future and past tenses respectively, as well as the simple directionals 'to' and 'from' which are the sources for some case markers.

Posture: verbs indicating postures of the human body, such as 'sit', 'stand' and 'lie' provide sources for progressive aspect.

Location: a verb indicating that the subject is located (somewhere) gives rise to progressive aspect.

Spatial relations: the relationship in space between one object and another is frequently expressed in terms of a human body part's relation to the rest of the body. Thus the noun for 'head' evolves into a preposition meaning 'on top of', 'top' or 'on'. 'Back' is used for 'in back of' (English provides an example of this derivation), 'face' for 'in front of', 'buttock' or 'anus' for 'under', and 'belly' or 'stomach' for 'in' (Heine et al. 1991:126–131). In a survey of such relational terms in 125 African languages, Heine et al. found that more than three quarters of the terms whose etymology was known were derived from human body parts. Svorou (1993), using a sample representative of all the language families of the world, also finds human body parts to be the most frequent sources of relational terms.[5]

Other concepts

While spatial relations and orientation constitute the single largest category of source concepts, the remaining, more miscellaneous set consists of concepts that are equally basic to the human experience. As mentioned above, the basic internal state expressed by 'want' or 'need' develops into a future marker, and a verb describing another internal state, 'know' or 'be acquainted with', can become a modal of ability or possibility. Another basic experience related to actions or activities, expressed by 'finish', can develop into a completive, perfect or past tense.

5. The other frequent sources for relational terms are the body parts of livestock and landmarks.

The relation between locational terms and abstract grammatical concepts has been recognized for several decades. Anderson (1971) proposes a theory of grammatical cases (nominative, accusative, dative, etc.) based on spatial relations. Thus a relational term meaning 'towards' further develops to mean 'to' whence it can become a dative marker (*I gave the book to John)* or can even further develop into an accusative (as in Spanish: *Vi a Juan* 'I saw John'). Or, 'to' with a verb can signal purpose and eventually generalize to an infinitive marker (Haspelmath 1989). Thus even the most abstract of grammatical notions can be traced back to a very concrete, often physical or locational concept involving the movement and orientation of the human body in space.

The claim here is not that the abstract concepts are forever linked to the more concrete, only that they have their diachronic source in the very concrete physical experience. Grammatical constructions and the concepts they represent become emancipated from the concrete (see Section 7) and come to express purely abstract notions, such as tense, case relations, definiteness, etc. It is important to note, however, that the sources for grammar are concepts and words drawn from the most concrete and basic aspects of human experience. For the evolution of language this means that the source for grammar would become available as soon as words for these basic concepts become available. That is, the raw material for the creation of grammar resembling that present in contemporaneous languages was present at the point at which human language contained only a few hundred basic vocabulary items.

5. CHANGES IN GRAMMATICIZATION

How do grammatical constructions arise out of and differentiate from lexical material? Examining the details of this process will help us understand what the neuropsychological prerequisites are for grammar. Some characteristics of the grammaticization process are the following:

(1) Words and phrases undergoing grammaticization are phonetically reduced, with reductions, assimilations and deletions of consonants and vowels producing sequences that require less muscular effort. For example, *going to* [goiŋt^{h}uw] becomes *gonna* [gənə] and even reduces further in some contexts [ənə] as in *I'm (g)onna* [aimənə].

(2) Specific, concrete meanings entering into the process become generalized and more abstract, and as a result, appropriate in a growing range of contexts, as for example, the uses of *be going to* in sentences (3) through (5). The literal meaning in (3) was the only possible interpretation in Shakespeare's English, but now uses such as those shown in (4) and (5) are common.

(3) movement: *We are going to Windsor to see the King*

(4) intention: *We are going to get married in June.*

(5) future: *These trees are going to lose their leaves.*

(3) A grammaticizing construction's frequency of use increases drammatically as it develops. One source of the increased frequency is an increase in the types of contexts in which the new construction is possible. Thus when *be going to* had only its literal meaning (as in [3]) it could only be used in contexts where movement was to take place, with subjects that were volitional and mobile. Now it can be used even in (5), where no movement in space on the part of the subject is implied, or indeed possible. As the *gonna* construction becomes appropriate with more types of subjects and verbs, it occurs more frequently in texts.

(4) Changes in grammaticization take place very gradually and are accompanied by much variation in both form and function. I have already illustrated the variation in form with *be going to* and *gonna.* Variation in function can be seen in the three examples above, of 'movement', 'intention' and 'future', all of which are still possible uses in Modern English.

Given these characteristics, most studies of grammaticization conclude that these changes are the result of language use. The questions that then arise concern the aspects of language use that lead to the development of grammar.

6. GRAMMATICIZATION AS AUTOMATIZATION

Some recent studies of grammaticization have emphasized the point that grammaticization is the process of automatization of frequently-occurring sequences of linguistic elements (Boyland 1996; Haiman 1994; Bybee to appear). Boyland (1996) points out that the changes in form that occur in the grammaticization process closely resemble changes that occur as non-linguistic skills are

practiced and become automatized. With repetition, sequences of units that were previously independent come to be processed as a single unit or chunk. This repackaging has two consequences: the identity of the component units is gradually lost, and the whole chunk begins to reduce in form. These basic principles of automatization apply to all kinds of motor activities: playing a musical instrument, playing a sport, stirring pancake batter. They also apply to grammaticization. A phrase such as *(I'm) going to (verb)* which has been frequently used over the last couple of centuries, has been repackaged as a single processing unit. The identity of the component parts is lost (children are often surprised to see that *gonna* is actually spelled *going to*), and the form is substantially reduced. The same applies to all cases of grammaticization.[6]

It follows then that grammatical constructions of all types are automatized motor routines and subroutines that can be strung together or embedded in one another to produce fluent speech. This conclusion, arrived at from the study of linguistic data, is similar to the proposal of Kimura (1979, 1993), who argues on the basis of neuropsychological data, for a strong association between grammar and motor skill (see also Lieberman 1984). However, grammar is not just motor activity, but motor activity appropriate to, and meaningful in, specific contexts. Thus it is important to pursue the question of how motor activities and meaning associate to make grammar.

Haiman (1994, 1998) notes that the chunking and reduction features of the grammaticization process bear a resemblance to non-linguistic ritualized behavior, citing rituals in both human and non-human species which show chunking and reduction in form. In addition, Haiman cites two other characteristics of ritualized behavior that apply to grammaticization. First, repeated practices lead to *habituation*, the process by which an organism ceases to respond at the same level to a repeated stimulus. A repeated word or phrase tends to lose much of its semantic force (consider the loss of the power of the *f*-word when it is used very frequently). Thus habituation helps to bring about the generalization or bleaching of semantic content that occurs in grammaticization. Second, repeated practices can also change their function, through the

6. Bybee, Pagliuca and Perkins (1991) and Bybee, Perkins and Pagliuca (1994) demonstrate for a large cross-linguistic sample a significant relationship between degree of grammaticization in semantic terms and formal reduction.

process of *emancipation*, by which the original instrumental function of the practice takes on a symbolic function inferred from the context in which it occurs. These two processes and other related processes are crucial to the understanding of how grammatical meaning develops.

7. EMANCIPATION AND HABITUATION IN THE CREATION OF GRAMMATICAL MEANING

The phrase 'grammatical meaning' refers to the type of meaning conveyed by grammatical morphemes and grammatical constructions. This type of meaning is often contrasted with 'lexical meaning' which is the meaning of nouns, verbs and adjectives. The study of grammaticization makes it clear that there is no discrete cut-off point between the two types of meaning, but rather a continuum from one to the other. However, we can still note the properties of the polar types. Lexical meaning is specific and concrete, with nouns referring to physical entities and their parts, and abstract notions of cultural import. The lexical meaning of verbs describes perceived events and relations among entities, events that often have concrete physical results. The specificity of lexical meaning is shown by the large number of contrasts that can be made, i.e. in the number of names for species of trees (*oak, elm, fir, pine, willow,* etc.) or the number of designations for ways to move through space (*walk, swim, climb, run, hop, trot,* etc.). The more specific the meaning of a lexical item, the more stable it remains across differing contexts.

Grammatical meaning, on the other hand, is typically abstract, referring to large, abstract domains such as time or modality, or referring to abstract grammatical relations such as 'subject of the verb', or abstract relations among clauses, such as 'although'. It is also highly general, being applicable to a large number of contexts. For instance, every English sentence has a grammatical designation of tense, showing that tense is general enough to apply to any verb in the language. It is this type of meaning, so typical of human language, that is responsible for the great versatility of language, making it applicable to any human communicative context. It is also this type of meaning that is the most difficult to describe or explain.

Another important difference between lexical and grammatical meaning concerns the extent to which language users have conscious access to the

meaning of units. Speakers can often report directly and accurately on the meanings of nouns, verbs and adjectives, much as they can report pieces of propositional or declarative knowledge (such as 'Washington, D. C. is the capitol of the US'). However, grammatical meaning is much less accessible, and if speakers can report on uses of grammatical constructions, they often seem aware only of the most concrete of these uses. In this way, grammatical knowledge resembles procedural knowledge or skilled ability (Boyland 1996), providing further evidence that grammatical constructions are automated procedures.

The approach that studies the way grammatical meaning evolves out of lexical meaning has a great deal to contribute to the general understanding of grammar and its meaning. Some of the mechanisms for semantic change in grammaticization have been identified and will be discussed briefly here.

7.1 *Emancipation*

Examples of emancipation in animal communication are well-known in both wild and domestic animals. For example, my border collie at times, for reasons unknown to me, he simply does not want to go outside when I want him to. In those cases, I originally solved the problem by getting his leash, putting it on him and leading him outside. Soon it was possible to simply get the leash and show it to him and he would go outside. After repetitions of this routine, one day I had only completed the step of opening the drawer where the leash is kept and he dutifully went out the door. Now opening the drawer is sufficient to get him to exit. Emancipation has occurred in this case because the originally instrumental act of opening the drawer (to get the leash) now signals to him that he must go outside. For him the first in a sequence of events has come to signal the whole situation and he proceeds to the result. It is perhaps not total emancipation, since opening the drawer still could have a concrete sequential relation to going outside, but he has at least let one step in the procedure come to stand for the whole procedure.

Emancipation in ritualistic language is also common in *homo sapiens*. Polite expressions of concern about a person's well being in mutual greetings, such as *how are you*, reduce to simple greetings that require no substantive response, such as *hi*. In some varieties of Black English *hi* is still answered with *fine*, reflecting its source in a question, but in most dialects it is answered with *hi*. A string of words that originally had literal meaning or instrumental

function, has lost its instrumental function and become a symbol for the situation itself due to repetition in a particular context — in this case the greeting situation.

The change from a lexical to a grammatical function in grammaticization involves a process that is quite parallel and could also be considered emancipation. As I mentioned above, in Shakespeare's English *be going to* had its literal meaning of movement in space towards some goal. However, given an apparent interest by human beings in goals and purposes, even in Shakespeare's English, the information value of *be going to* was less about movement in space and more about purpose. Consider example (6):

(6) *Duke* Sir Valentine, whither away so fast?
Val. Please it your grace, there is a messenger
That stays in to bear my letters to my friends,
And I am going to deliver them.

(1595, Shakespeare, *Two Gentlemen of Verona* III.i.51)
(Hopper and Traugott 1993)

Note that even though the Duke asks about movement ("Where are you going so fast?"), what he really wants to know is Valentine's intention or purpose. Note also that although Valentine answers in terms of movement, he also includes the appropriate information about his intention.

The frequent association of *be going to* with contexts in which the intentions of the subject are also being revealed leads to its gradual emancipation from the earlier meaning of movement in space. The new function of expressing a goal or intention also gradually becomes the main function of the construction.

7.2 *Pragmatic inference*

In the grammaticization literature, the mechanism of change in this example has been called pragmatic inference (Traugott 1989; Hopper and Traugott 1993). It is widely accepted that an important feature of the communication process is the ability to make inferences: the hearer must fill in details not supplied by the speaker, and the speaker must be able to judge which details the hearer can supply and formulate his/her utterances accordingly. The hearer is constantly asking 'why is s/he asking me or telling me this?' In the example above, Valentine

knew that the Duke's question was not just about movement in space but also about intention and answered appropriately. When the same pattern of inferences occurs frequently with a particular grammatical construction, those inferences can become part of the meaning of the construction. If *be going to* is frequently used to talk about intentions, it begins to have intention as part of its meaning. The literature on grammaticization is full of such instances (Traugott 1989; Bybee et al. 1994).

Traugott has identified several important patterns of inferencing that create semantic change in grammaticization and lead to the expression of more abstract grammatical meaning. She argues that more concrete propositional (lexical) meaning, describing external situations, such as spatial movement or location, is regularly inferred to have meanings that describe internal (evaluative, perceptual or cognitive) situations, such as intention. A second trend which she posits is that both external and internal meanings can be reinterpreted as having meanings based in the textual situation, such as meanings that place the described situation in time before or after the moment of speech, i.e. tense. A third trend infers the speaker's subjective beliefs or attitudes from the other two types of meaning. The claim is that the abstract meanings of grammatical constructions arise from common patterns of inference. The types of meanings that arise in this way suggest that hearers are commonly working to infer as much as possible about the relations of narrated descriptions to the current speech situation and to the speaker's subjective evaluation of it. The content of grammar, then, is directly related to and arises from the very act of communication. It is not autonomous from the meanings it conveys or the purposes it serves.

7.3 *Generalization or bleaching as habituation*

Another important mechanism of change in grammaticization is related to habituation. Repetition itself diminishes the force of a word, phrase or construction. Examples are legion. *Iterate* doesn't seem to mean 'repeat' quite strongly enough, so we tend to add *re-;* with repetition the strength of that fades and we have to say *reiterate again. You guys* generalizes to include females and the word *guy* now can be used in colloquial speech even for inanimate objects. In grammaticization, the generalization or bleaching of the meaning of a construction is caused by frequency, but it also contributes to additional frequency, since a generalized construction can be used in more contexts,

leading to an almost inexorable movement along a grammaticization path.

Constructions that have been bleached of their more specific lexical meaning are more likely to pick up inferential meaning from the context, that is, grammatical meaning (Bybee et al. 1994). The French negative phrase *ne (verb) pas* originally contained both a negative element *ne* and the noun *pas* meaning 'step' and was used only with motion verbs, with the sense 'not (go) a step'. Now *pas* has lost all of its independent meaning in the construction and has absorbed the negative meaning from the construction. As *ne* is gradually being deleted, *pas* becomes the sole negative marker.

7.4 *Categorization*

An important feature of generalization is the expansion of contexts in which a construction can occur. For instance, the French construction *ne (verb) pas* was originally restricted to use with motion verbs. The verb slot in this construction gradually expanded to include all verbs. The *be going to* construction in English originally required human subjects and active, agentive verbs, but now its use has expanded to all types of subjects and verbs.

Constructions always contain a variable slot (otherwise we consider them set phrases) and the variable slot is restricted to items of a certain category. These categories are usually defined semantically, with terms such as 'human', 'volitional', 'change of state' and so on. Some constructions require quite specific categories. For instance, the construction typified by the phrase *to wend one's way* allows a verb of motion, or a verb construable as describing movement or the creation of a path (*swiggled his way, made our way, cut their way*). The position after the verb requires a pronoun that is coreferential with the subject.

The various positions in a construction, then, require categorization. These categories are based on the experience one has with the construction, just as the categories we create for classifying cultural and natural objects are based on our experience with the world (Rosch 1978; Lakoff 1987). Linguistic categories, both those based on form and those based on meaning, have a prototype structure. They cannot be defined adequately as a series of necessary and sufficient conditions, but rather must be characterized in terms of more central and more peripheral members (Rosch 1978, Lakoff 1987, Taylor 1989). The possibility of adding new peripheral members to a category allows productivity and change. New items can be used in a construction if they are perceived as similar in some

way to existing members. Accumulated change in membership will lead to change in what is considered central and what is considered peripheral.

The productive use of constructions, or automated subroutines, is what allows speakers to generate new utterances, as speech consists of these routines concatenated and embedded in one another. Through practice one's fluency in manipulating and stringing together constructions increases. Linguistic categorization determines the appropriateness of particular combinations of constructions and takes the same form as categorization for non-linguistic percepts. Note that all the component processes that lead to the development of new grammatical constructions come out of language use in context and they involve cognitive skills and strategies that are also used in non-linguistic tasks. Thus we have no reason to suggest that any rules of grammar are innately given.

8. ABSTRACT RULES OF GRAMMAR

The view presented here of grammar as a set of automated neuromotor subroutines, built up from experience with language in particular contexts is very different from the Chomskian view of grammar as a set of very abstract symbolic rules that are not derivable from one's experience with language. What of these highly abstract rules proposed by Chomsky and others, such as rules that specify the structure of S (sentence) as composed of NP + VP (noun phrase + verb phrase)? What of these categories, NP and VP? Are they viable categories for users of the language, or are they epiphenomenal — apparent in the analysis of linguists, but not actually used by speakers? Some truth lies in both of these positions.

We have already mentioned the ability of humans to categorize both linguistic and nonlinguistic objects. Categorization depends upon grading the properties of objects for similarity and difference. This process can be applied at many different levels of abstraction. For example, there might be a very specific constructional schema for a frequently used phrase such as *NP_i made PRO_i's way home*, in addition to the more general schema *NP_i (motion verb) PRO_i's way (directional adverb)*. Furthermore, these two schemas can also be

covered by the more general schema *NP V NP Adverb*, or even the maximally general *NP VP*.[7]

(7) Schemas at different levels of abstraction or generality

most specific	1.	*NP_i*	made	*PRO_i*'s way	home
	2.	*NP_i*	*(motion verb)*	*PRO_i*'s way	*(directional adverb)*
	3.	*NP*	*V*	*NP*	*Adverb*
most general	4.	*NP*	*VP*		

In order to be able to produce speech, constructions of the level of (1) are necessary; in order to be able to expand to new contexts, constructions at the level of (2) are necessary. It is not clear whether schemas at the levels of (3) or (4) are necessary as production routines, or whether they are emergent from experience with many different more specific schemas.

The evidence for a category of NP is rather strong: NPs have the same structure whether they are serving as the subject or object of the verb, or as the object of a preposition. The analysis of conversation reveals evidence for the unit NP, as NPs can be used in isolation. The category of NP, however, does not have to be innate, since it can be learned from experience. The distributional evidence just mentioned is also available to the child learning a language. Recent experiments have shown that human infants can identify units in a continuous speech stream by tracking what sequences are repeated more often (Saffran, Aslin and Newport 1996). This ability, combined with the ability to categorize, can lead to the discovery of a syntactic unit such as NP.

However, I hasten to add, that the notion of NP as formulated in transformational grammar is probably too general for most languages. The category includes phrases such as *a dog, some cats, information, a flat surface* but it also includes the non-lexical and non-phrasal elements, pronouns. Syntactically, pronouns behave very differently from lexical nouns, since they do not usually have articles (**the she*), they do not usually take adjectives (?*the fat her*), nor

7. PRO stands for pronoun and the subscript indicates that it must refer to the same entity as the subject.

other types of modifiers, such as relative clauses.[8] In conversation, one sees pronouns behaving very differently from full NPs. Most spoken colloquial utterances contain only one full NP per clause, while there is no restriction on the number of pronouns in a clause (DuBois 1985).

The same can be said about other categories of grammar: those categories that are supported by their occurrence as units in speech tend to be probabilistic categories rather than discrete, Aristotlean categories. For instance, the clause is identifiable in speech because it is one of the units commonly corresponding to an intonation unit (Croft 1995). However, the generative rule S→NP VP is only an approximate statement of the sequence of units actually found in speech. Clauses that do not follow this rule are imperatives (*Come in*), which lack an expressed subject, and questions, where the auxiliary, a part of the VP, occurs before the NP (*May I come in?*). The generative approach to these issues is to say that the rule stated above only applies at the level of deep structure and that subsequent transformations change the structures. From our perspective, however, we see that imperatives and questions represent different neuromotor subroutines, and these do not necessarily conform to the generalization that S→NP VP. Still, this generalization does fit the large majority of clauses. Thus our question is whether this is an abstract schema formulated by speakers or whether it is purely epiphenomenal. We await empirical evidence to decide this issue.

Another set of observations that make it seem unlikely that humans need abstract rules such as those given above to use language effectively comes from Pawley and Syder (1983). These authors observe that naturally-occurring discourse in no way makes use of the enormous potential afforded by the abstract rules of grammar which are said to underlie linguistic abilities. Instead, natural speech is characterized by the high use of formulaic expressions appropriate to the particular context. For instance, the waitress in a restaurant says *Have you decided?* Or *What will you have?* But not, *Please tell me what you would like to eat so that I can write it down.* The latter utterance is perfectly grammatical and would be just as effective as the former two, but it would be

8. The fact that pronouns can occasionally be used in full NPs, such as *the new me* is an argument against the rule for NP as formulated in transformational grammar. This rule strictly separates lexical nouns from pronouns and would call *the new me* ungrammatical because the rules are categorical rather than stochastic.

decidedly odd and suggest that the waitress was perhaps not a native speaker of English. As we all know from trying to learn a second or third language, a perfect grasp of the grammatical rules of a language and a large vocabulary are not enough to make one effective in using a language. To fit into a culture, one must learn, not just what are the grammatical sentences, but which formulae are used in which context. If the abstract rules of grammar were indeed the essence of grammar, it is difficult to explain why speakers do not make use of more of the possibilities generated by these rules. On the other hand, if grammar consists of a large number of automated routines that are associated with particular contexts, then this high use of formulaic expressions is to be expected.

9. PREREQUISITES FOR GRAMMAR

According to the view outlined here, grammar is a set of automated neuromotor subroutines stored in associative memory in such a way that facilitates their concatenation and embedding. These routines are highly associated with experiential contexts that yield categories of meaning which determine their further use. These routines correspond to what we traditionally call words, such as *dog, table, information,* or constructions, as the *be going to* construction or the *way* construction (*make one's way home*).

By defining grammar in terms of motor routines, I ally myself with those researchers who have stressed the importance of left hemisphere dominance for both motor control and language (Armstrong, Stokoe and Wilcox 1995; Corballis 1989; Kimura 1979, 1993) and other continuity theorists who see language as a special use of more general abilities (Donald 1991). By showing how grammar evolves in documented cases, I have countered the position of Bickerton (1981) and Pinker and Bloom (1990), who argue that "Universal Grammar cannot be accounted for by any known feature of human serial motor behavior, and must therefore be produced by a preprogrammed language module built right into the human brain" (Donald 1998:46). We do in fact know how the features of universal grammar are created and recreated in languages, both living and dead.

No account of human language can be strictly neuromotor, of course. I have already indicated that lexical knowledge is more like propositional knowledge and the use of language involves an elaborate intertwining of the two

types of knowledge. In addition, grammaticization requires reference to the whole human context, for the source for grammatical meaning and its subsequent developments. Words for the human body and its spatial relations provide an important source for grammatical material, and interactions between individuals within a cultural context are the means by which inference and generalization of categories bring about the changes that produce grammar.

However, the importance of the neuromotor component in the automaticity and obligatoriness of grammar means that grammar is not explanable purely in terms of high-level cognition, such as that associated with abstract reasoning, but is grounded in more primitive systems that humans share with other primates and with other mammals. Donald (1991) argues for a gradual evolution of language that makes use of skills and abilities that are possible at an earlier stage of evolution and adds to them the augmented skills of later stages. The following list of abilities necessary for human language that have been highlighted in the preceding discussion primarily contains abilities shared with other species, but augmented or increased in humans. The following list is not in any way exhaustive. It would take a much longer treatment to specify all the abilities necessary for human language as we know it today. (See the treatment in Donald 1991 and 1998.)

Fine motor control: The fine motor control necessary for fluent speech or signing is apparently not available even to our closest relatives. The coordination and sequencing of skilled actions that is necessary for speech and signing, however, is not restricted to linguistic uses, but is also applied to activities as diverse as manufacturing objects and playing musical instruments or dancing. Of course, all species of animals have motor control, it is just that humans exhibit a particularly exquisite refinement in this area. Moreover, in humans, neuromotor control of sequenced actions is a left-hemisphere function, just as language is. Kimura (1993) argues for a strong connection between motor control and language on the basis of the fact that damage to the left hemisphere produces not only disorders of language, but more generally, apraxias, that is, disorders of purposeful movement.

An adaptation that is specifically associated with language is the development of the vocal tract that makes possible the articulation of a large number of distinct sounds, and the associated refinement of motor control in the muscles used for speech. However, signed languages, which have all the other properties

of natural languages, bypass this system entirely and make use of the fine motor control of the arms, hands and fingers. That is why I am stressing motor control in general, and not specifically motor control of the organs of the vocal tract.

Imitation: The view of language outlined here emphasizes the importance of imitation as part of the learning strategy for children exposed to language. Indeed, children are excellent at imitation, acquiring the phonetic structure of spoken language and the manual shapes and movements of signed languages in perfect detail. The child ends up speaking exactly (not approximately) like those in his/her immediate environment. Thus we can identify regional and social dialects and foreign accents on the basis of very subtle differences in vowels, consonants, rhythm or intonation. The imitative ability of apes and monkeys is quite minimal compared to that of humans (Bates et al. 1991; Tomasello et al. 1993).

Associative memory: If grammar consists of a large number of rather specific constructions which act as processing units, as well as a very large vocabulary, it is necessary to have an enormous associative memory and an excellent accessing system. The number of words and constructions in a language may range into the hundreds of thousands (Pawley and Syder 1983). The processing units are stored in a complex network with many associations to one another as well as to non-linguistic context. The associations make accessing possible.

Productivity: Related to access is the ability to combine processing units in fluent speech to produce new utterances. This process is similar to the process by which non-linguistic motor routines are coordinated and combined to produce new sequences.

Inferencing: The elements of language never produce an entirely explicit communication; rather, the hearer is expected to use his/her knowledge of the world and the situation at hand to infer the meaning intended by the speaker. At the same time, the speaker must construct a model of the hearer's knowledge and keep track of what the hearer is likely to infer from what the speaker imparts. While other animals are able to make inferences from the context, these usually relate to sequences of events expected on the basis of prior experience and do not extend to inferences about other beings' knowledge or belief systems.

Categorization: The ability to categorize entities in the environment is recognizable in all sorts of animals, in their ability to respond to predators, food sources and one another. While this basic sort of categorization is constantly in use in humans, the nature of human language also points to a highly elaborated event perception, the ability to perceive complex, usually moving, clusters and patterns of stimuli as a unit (Donald 1991:153). A highly developed ability to categorize entities and events is necessary to learn and store thousands of nouns and verbs, and to construct accounts of events in terms of clauses. In addition, categorization applies to the units of language. It is the basis of the ability to recognize the same word uttered twice; the ability to find similar morphemes in different instances of the same construction and thereby to recognize constructions.

Other important requirements for language are treated in Donald (1991, 1997) and include the ability to construct a mental model of the world and oneself, the ability to carry out multiple tasks simultaneously, as in producing and monitoring speech while continuing to access the store of constructions and lexical items, and auto-cuing, or the ability to call up memories at will (necessary for lexical and grammatical access).

10. CONCLUSIONS

The purpose of this paper has been to show that an account of the evolution of language depends heavily upon what one considers the essential components of language to be. The literature has been dominated lately by linguists who believe that grammar consists of highly abstract rules that are innate. This paper presents a version of the functionalist perspective on the nature of grammar, and argues that the default assumption — that grammar is too abstract to learn, therefore must be innate — is not by any means a necessary conclusion. In fact, work in functionalist linguistics in the last few decades has been very successful in identifying the way grammar is created and recreated in languages that are currently spoken, a process which no doubt has been repeated countless times in the past. This process, which occurs because of language use, requires some considerable cognitive and motor ability, but all of the components of this process have counterparts in the non-linguistic abilities of human beings, and many exist in a less developed form in other hominids and mammals.

REFERENCES

Anderson, John M. (1971). *The grammar of case: towards a localist theory.* London: Cambridge University Press.

Armstrong, David, Stokoe, William, & Wilcox, Sherman. (1995). *Gesture and the nature of language.* Cambridge: Cambridge University Press.

Bates, Elizabeth, Thal, Donna & Marchman, Virginia. (1991). Symbols and syntax: a Darwinian approach to language development. In Norman Krasnegor, Duane M. Rumbaugh, Richard L. Schiefelbusch & Michael Studdert-Kennedy (eds.), *Biological and behavioral determinants of language development* (pp. 29–65). Hillsdale, NJ: Lawrence Erlbaum.

Bickerton, Derek. (1981). *Roots of language.* Ann Arbor: Karoma.

Boyland, Joyce Tang. (1996). *Morphosyntactic Change in Progress: A Psycholinguistic Approach.* Dissertation, University of California at Berkeley.

Bybee, Joan L. (1988). The diachronic dimension in explanation. In John Hawkins (ed.) *Explaining Language Universals* (pp. 350–379). Oxford: Basil Blackwell.

Bybee, Joan L. (to appear). *Mechanisms of change in grammaticization: the role of repetition.* In R. Janda and B. Joseph. *Handbook of Historical Linguistics.* Oxford: Blackwell

Bybee, Joan L., & Dahl, Östen. (1989).The creation of tense and aspect systems in the languages of the world. *Studies in Language, 13* (1), 51–103.

Bybee, J. L., & Pagliuca, W. (1987). The evolution of future meaning. In A. G. Ramat, O. Carruba & G. Bernini (eds.), *Papers from the VIIth International Conference on Historical Linguistics* (pp. 109–22). Amsterdam & Philadelphia: John Benjamins.

Bybee, J., Perkins, R., & Pagliuca, W. (1991). Back to the future. In Traugott, E. C., & Heine, B. (eds.), *Approaches to Grammaticalization* (pp. 17–58). Amsterdam & Philadelphia: John Benjamins.

Bybee, Joan, Pagliuca, William, & Perkins, Revere. (1994). *The Evolution of Grammar: Tense, Aspect and Modality in the Languages of the World.* Chicago: University of Chicago Press.

Chomsky, Noam. (1957). *Syntactic Structures.* The Hague: Mouton.

Chomsky, Noam. (1965). *Aspects of the theory of syntax.* Cambridge, MA: MIT Press.

Chomsky, Noam. (1975). *Reflections on language.* New York: Pantheon Books.

Chomsky, Noam. (1982). Discussion of Putnam's comments. In M. Piatelli-Palmarini (ed.) *The debate between Jean Piaget and Noam Chomsky.* Harvard University Press.

Corballis, Michael C. (1989). Laterality and human evolution. *Psychological Review, 96,* 492–505.

Croft, William. (1990). *Typology and universals.* Cambridge: Cambridge University Press.

Croft, William. (1995). Intonation units and grammatical structure. *Linguistics, 33,* 839–882.

Donald, Merlin. (1991). *Origins of the modern mind.* Cambridge, MA: Harvard University Press.

Donald, Merlin. (1998). *Mimesis and the Executive Suite: missing links in language evolution.* In James Hurford, Michael Studdert-Kennedy & Chris Knight (eds.), *Approaches to the evolution of language.* Cambridge: Cambridge University Press, 44–67.

DuBois, John. (1985). Competing motivations. In John Haiman (ed.), *Iconicity in syntax* (pp. 343–365). Amsterdam & Philadelphia : John Benjamins.

Givón, Talmy. (1979). *On Understanding Grammar.* New York: Academic Press.

Greenberg, Joseph. (1978). How does a grammar acquire gender markers? In Joseph Greenberg, Charles Ferguson & Edith Moravcsik (eds.), *Universals of human language, Vol. 3* (pp. 47–82). Stanford: Stanford University Press.

Haiman, John. (1994). Ritualization and the Development of Language. In Wm. Pagliuca (ed.), *Perspectives on Grammaticalization* (pp. 3–28). Amsterdam & Philadelphia: John Benjamins.

Haiman, John. (1998). *Talk is cheap: sarcasm, alienation, and the evolution of language.* New York: Oxford University Press.

Haspelmath, Martin. (1989). From purposive to infinitive: A universal path of grammaticization. *Folia Linguistica Historica, 10,* 287–310.

Heine, Bernd, Güldemann, Tom, Kilian-Hatz, Christa, Lessau, Donald A., Roberg, Heinz, Schladt, Mathias & Stolz, Thomas. (1993). Conceptual shift: a lexicon of grammaticalization processes in African languages. *Afrikanistische Arbetispapier, 34/35.* University of Cologne.

Heine, Bernd, & Reh, Mechtild. (1984). *Grammaticalization and reanalysis in African languages.* Hamburg: Helmut Buske Verlag.

Heine, Bernd, Claudi, Ulrike & Hünnemeyer, Frederike. (1991). From cognition to grammar: evidence from African languages. In Elizabeth Traugott & Bernd Heine (eds.) *Approaches to Grammaticalization, Vol 1* (pp. 149–187). Amsterdam & Philadelphia: John Benjamins.

Hopper, Paul J., & Thompson, Sandra A. (1980). Transitivity in grammar and discourse. *Language, 56,* 251–99.

Hopper, Paul J., & Thompson, Sandra A. (1984). The discourse basis for lexical categories in universal grammar. *Language, 60,* 703–52.

Hopper, Paul J., & Traugott, Elizabeth. (1993). *Grammaticalization.* Cambridge: Cambridge University Press.

Janzen, Terry. (1995). *The polygrammaticalization of FINISH in ASL.* Ms, University of Manitoba.

Kimura, Doreen. (1979). Neuromotor mechanisms in the evolution of human communication. In H.D. Steklis & M.J. Raleigh (eds.), *Neurobiology of social communication in primates* (pp. 197–218) San Diego: Academic Press.

Kimura, Doreen. (1993). *Neuromotor mechanisms in human communication.* Oxford: Oxford University Press.

Lakoff, George. (1987). *Women, fire and dangerous things.* Chicago: University of Chicago Press.

Langacker, Ronald. (1987). *Foundations of Cognitive Grammar, Vol. 1. Theoretical Prerequisites.* Stanford: Stanford University Press.

Lieberman, Phillip. (1984). *Biology and the evolution of language.* Cambridge, MA: Harvard University Press.

Newmeyer, Fritz. (1990). Natural selection and the autonomy of syntax. *Brain and behavioral sciences, 13,* 745–746.

Pawley, Andrew & Hodgetts Syder, Frances. (1983). Two puzzles for linguistic theory:Nativelike selection and nativelike fluency. In Jack C. Richards & Richard W. Smith (eds.), *Language and Communication* (pp. 191–225). London & New York: Longmans.

Perkins, Revere D. (1992). *Deixis, grammar and culture.* Amsterdam & Philadelphia: John Benjamins.

Pinker, Steven. (1994). *The language instinct.* New York: William Morrow.

Pinker, Steven & Bloom, Paul. (1990). Natural language and natural selection. *Brain and behavioral sciences, 13,* 707–784.

Romaine, Susan. (1995). The grammaticalization of irrealis in Tok Pisin. In Joan Bybee & Suzanne Fleischman (eds.), *Modality in grammar and discourse* (pp. 389–427). Amsterdam & Philadelphia: John Benjamins.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B.B. Lloyd (eds.), *Cognition and categorization.* Hillsdale, NJ: Erlbaum.

Sankoff, Gillian. (1990). The grammaticalization of tense and aspect in Tok Pisin and Sranan. *Language variation and change, 2,* 295–312.

Saffran, Jenny R., Aslin, Richard N., & Newport, Elissa L. (1996). Statistical learning by 8-month-old infants. *Science, 274,* 1926–28.

Smith, Carlota S. (1991). *The parameter of aspect.* Dordrecht & Boston: Kluwer Academic Publishers.

Svorou, Soteria. (1993). *The grammar of space.* Amsterdam & Philadelphia: John Benjamins.

Taylor, John R. (1989). *Linguistic categorization: Prototypes in linguistic theory.* Oxford: Clarendon Press.

Tomasello, Michael. (1990). Grammar yes, generative grammar no. *Brain and behavioral sciences, 13,* 759–760.

Tomasello, Michael, Kruger, A.C., & Ratner, H.H. (1993). Cultural learning. *Brain and behavioral sciences, 16,* 495–552.

Traugott, E.C. (1989). On the rise of epistemic meanings in English: an example of subjectification in semantic change. *Language,* 65, 31–55.

Weinreich, Uriel. 1963. On the Semantic Structure of Language. In Joseph Greenberg (ed.), *Universals of Language* (pp. 114–171). Cambridge, MA: MIT Press.