CHAPTER 36

DIACHRONIC LINGUISTICS

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1. INTRODUCTION

This chapter deals with recent advances in the understanding of linguistic change as these derive from or relate to the new perspectives afforded by Cognitive Linguistics. Traditionally, the study of language change has been divided into the areas of sound change, analogy, morphosyntactic change, and semantic change. This organization will be followed in the present chapter, since significant recent developments have occurred in all of these areas. In particular, the last two areas, which have traditionally been less studied, have come under close scrutiny in recent years (as part of grammaticalization research) and are considered an important part of the development of Cognitive Linguistics. Comparative and internal reconstruction will not be dealt with, though the consequences of the findings discussed here for reconstruction are considerable. In particular, the unidirectionality of change in various domains places strong constraints on reconstruction.

As language is viewed less as a structured, tight-knit system and more as a variable, negotiated set of social and cognitive behaviors, the importance of the study of language change increases. Language change provides evidence for the nature of linguistic representation and processing, and thus provides a window on synchronic mental representation and the forces that create grammar. Moreover, since all synchronic states are the result of a long chain of diachronic developments, the construction of complete explanations for linguistic structures requires attention to the diachronic dimension.

Recent developments in cognitive and usage-based linguistics have afforded new perspectives on language change at all levels. In particular, the view that language is embodied (See Rohrer, this volume, chapter 2) supports the view that change in articulatory gestures is a prominent basis of sound change; the discovery that many of the lexical sources for grammaticization of relational terms such as adpositions are body-part terms also contributes to the notion of embodiment. The rejection of the rule/list fallacy in favor of usage-based exemplar storage as proposed in the work of Langacker provides a grammar that is more compatible with the lexical and phonetic gradualness of change, including not just sound change, but also analogical change, grammaticization, and syntactic change. Taking into account frequency of use also provides explanations for the direction of the lexical diffusion of change, again, not just sound change, but analogical change and morphosyntactic change. With regard to semantic change, prototypicality turns out to be important in the understanding of change in lexical semantics and also in the creation of constructions. Finally, the role of metaphor and metonymy in the semantic changes found in grammaticization has been brought to light in the cognitive framework.

2. A Usage-Based Approach to Sound Change

Phonological production is a neuromotor procedure that becomes more highly automated and more fluent with repetition. As with other highly practiced neuromotor behaviors, there is a tendency toward the greater compression and reduction of the gestures involved. It is this tendency that accounts for the fact that sound change occurs so frequently in the history of languages. In this view, then, sound change is a natural outcome of language use and the embodied nature of language. It is possible, furthermore, that given a greater understanding of the effects of repetition on neuromotor behavior, a theory could eventually be developed to predict the class of possible sound changes. The view that sound change results from the natural effects that repetition has on neuromotor behavior is supported by the fact that in the lexical diffusion of a sound change, high-frequency words are affected before low-frequency words in most cases.

2.1. Specifying the Class of Sound Changes

A theory of sound change requires first a typology of changes involving phonology, since not all changes that involve sounds are technically "sound changes." Mowrey and Pagliuca (1995) propose a set of restrictions that delineates a class of changes that constitute sound changes. First, these have to be actually attested and not

reconstructed changes. Second, they must affect the core vocabulary, including frequent lexical material. Third, they are most easily observed in relatively unmonitored speech, and fourth, the changes take place in a phonetically gradual manner. (Note that these last two criteria are those that determine the natural processes of Stampe's 1973 Natural Phonology.) Excluded are changes due to language contact, analogical changes, and hypercorrections. Of course, some problems exist for maintaining this distinction; it is sometimes a matter of dispute whether the origin of a change is physical or social, whether a change is purely internal or due to contact. Nevertheless, an attempt must be made to delimit the set of changes that constitute sound change.

2.2. Gestures and the Nature of Sound Change

While the usual alphabetic notation makes it appear as though one segment is changing into another—for example, [p]>[f] or [u] > [ü]—it is important to remember that this is just a shorthand and the speech stream is a continuous flow of muscular activity, with some gestures overlapping others. Even distinctive features are usually associated with specific segments, which further encourages us to think of the speech stream as a sequence of consonants and vowels. In dealing with sound change, the fluid and continuous nature of the speech stream must be borne in mind.

It is thus useful in trying to explain sound change to consider the articulatory gesture as the basic unit for phonological description. According to the theory being developed by Browman and Goldstein (1990, 1992, 1995), "Gestures are events that unfold during speech production and whose consequences can be observed in the movement of the speech articulators" (1992: 156). A typical utterance is composed of multiple gestures overlapping or sequenced with respect to one another. An individual gesture is produced by groups of muscles that act in concert, sometimes ranging over more than one articulator: for instance, constricting lip aperture involves the action of the upper lip, the lower lip, and the jaw, but such a constriction is considered one gesture.

In sound change, then, gestures are changed. Given that the great majority of sound changes, as defined by Mowrey and Pagliuca (1995), are assimilatory or reductive in nature, there is some hope of developing a predictive theory of sound change with reference to the gesture. Pagliuca and Mowrey (1987) and Mowrey and Pagliuca (1995) propose that sound change is due to either substantive reduction or temporal reduction, and in most cases, both. Substantive reduction refers to the reduction in the magnitude of a muscular gesture, such as occurs in the change of a stop to a fricative ([d] > [ð]) or the centralization of a vowel to [ə]. Temporal reduction refers to the compression of gestures, either by a single articulator, as when [si] changes to [ʃi], or by multiple independent articulators, as when VN [vowel + nasal consonant] becomes ṼN. The term "temporal reduction" entails a reduction in the duration of the whole sequence of gestures. Pagliuca and Mowrey (1987) and Mowrey and Pagliuca (1995) claim that constellations of gestures in

a linguistic string tend to get shorter over time, as well as reduced in the amount of articulatory energy required for the production of the individual gestures.

Browman and Goldstein (1990, 1992) put forward a very similar proposal. They hypothesize that all examples of casual speech alterations are the result of gestures having decreased magnitudes (both in space and in time) and increased temporal overlap. Browman and Goldstein restrict their hypothesis to casual speech alterations. This restriction has the advantage of defining an empirically verifiable sample of alterations. Mowrey and Pagliuca (1995) wish to address all sound change but with the restrictions stated above. Given these definitions, it is not controversial to claim that the great majority of attested sound changes have an articulatory etiology and in particular involve assimilation (retiming) or reduction. The controversial issue is whether or not it is accurate to take the further step of proposing that *all* sound changes are reductions and retimings and further that all changes are articulatory in their motivation and gradual in their implementation, a question I will return to in sections 2.7 and 2.10.

One goal of gestural research, then, is to demonstrate that attested changes are better explained in a gestural model than in a model using binary features, segments, or acoustic features. In addition, it is important to demonstrate that apparent strengthenings (such as the addition of a segment) and apparent acoustically motivated changes can be seen in gestural terms as instances of substantive or temporal reduction (see also Pagliuca 1982). Let us now consider how some common sound changes would be described in a gestural model.

2.3. Assimilation

Consider first the traditional conceptualization of assimilation, perhaps the most common of all phonological processes. As an illustration of a gestural rather than a segmental approach, Pagliuca and Mowrey (1987) discuss the palatalization of [s] before [i], as, for example, occurs in Japanese. A segmental characterization that represents the change as gradual might be given as (1).

(1) [si] > [s^{j}i] > [ʃi]

The segmental representation which shows the [s] as first palatalized and then transformed into an alveopalatal would be described in distinctive features by saying that the [s] first changes the value of [high] from minus to plus. This would be explained on the basis of the [+high] specification for [i] spreading to the preceding segment. In the next step, the value for [anterior] will be changed from plus to minus. The first step changes one feature of [s] to be the same as one feature of [i]. The second step has no clear assimilatory explanation.

Many problems with this form of description could be pointed out, such as the fact that there is nothing to predict that it would be the feature [high] that would change its value rather than some other feature that differs between the two segments, such as [syllabic]. Nor is there any natural way to explain or predict the

change in the feature [anterior]. Related to this lack of predictability is the more fundamental fact that this feature-and-segment analysis does not give a very accurate picture of what is really happening in a language with this process.

Pagliuca and Mowrey (1987) argue that it is not a feature or property of [s] that has changed to be more like [i], but rather the formerly sequential gestures producing the [s] and the [i] have gradually been compressed so that first the transition between the [s] and the [i] is highly affected by the position of the tongue for [i]. A further and later development is that the two gestures come to overlap to such an extent that the whole articulation of the fricative is affected by the domed-tongue gesture of the [i], increasing the area of the point of constriction. This analysis is confirmed in Zsiga (1995), whose electropalatographic data show that in productive palatalization of [s + j] across word boundaries (as in *miss you*), the contact of the tongue with the palate is just what one would expect if the [s] and the [j] were articulated at the same time.

A consequence of this analysis is the view that this assimilation process is actually a temporal reduction: two previously sequential gestures are now simultaneous for at least part of their articulation. Other examples of assimilation that can be explained in this way include vowel nasalization, which takes place preferentially when a vowel is followed by a nasal consonant in the same syllable. In this case, the gesture that opens the velum for nasalization is anticipated; it is retimed to occur during the articulation of the vowel. The view of this change as a modification in timing makes it possible to relate articulatory processes of speech to modifications made in other well-rehearsed motor events, where repetition increases efficiency or fluency because sequences of events can be anticipated and one event can begin before the preceding one is totally completed.

2.4. Other Retiming Changes

Temporal factors are also involved in what has previously been viewed as the insertion and deletion of segments. Insertion of consonants is not very common, and when it does occur, it is clear that the articulatory gestures that compose the consonant were all present before the consonant appeared. An interesting diachronic example occurred in a set of future tense verbs of Spanish, when the grammaticalizing auxiliary *haber* suffixed to the infinitive form of the verb with which it formed a construction. Subsequently, some high frequency second and third conjugation verbs lost the vowel preceding the stressed suffix and developed an excrescent [d] between the [n] of the root and the [r] of the erstwhile infinitive:

(2) *venir + he > veniré > venré > vendré* 'I will come'
tener + he > teneré > tenré > tender 'I will have'
poner + he > poneré > ponré > pondré 'I will put'

Note first that it is a coronal stop that develops here, in other words, one at the same point of articulation as surrounding consonants, rather than a labial or velar.

Secondly, it is voiced, as are the surrounding consonants. To explain [nr] developing into [ndr], a straightforward gestural analysis is possible. The velic opening corresponding to the [n] is retimed such that the velum is reclosed before the stop gesture at the alveolar ridge is complete. The result is a period of stop closure without nasality, or, in other words, a [d]. Note that the loss of the vowel in the auxiliary *haberé* > *habré* does not lead to an "excrescent" [d], but the loss of the vowel in *saliré* > *saldré*, where alveolar gestures are present, does.

2.5. Reductive Processes

Besides changes in the relative timing of gestures, there can also be reduction in the magnitude of the gestures in casual speech or in sound change. Such reduction in consonants will usually fall into the class of lenitions or weakenings. The reduction of a consonant, such as [p], along a path which is cross-linguistically common, that is, [p] > [Φ]/[f] > [h] > ϕ is characterized as a successive decrease and loss of muscular activity. The production of [p] requires muscular activity of both the upper and lower lips, which act to bring them together, as well as the activity required to open the glottis. The production of [f] requires less or no activity in the muscles of the upper lip, but continued activity in the lower lip and glottis. The sound [h] is produced with no activity in the labial muscles at all, but requires the opening of the glottis. Total deletion involves the loss of all the muscular events that were associated with the original consonant (Mowrey and Pagliuca 1995: 81–83).

In addition to the reduction of a consonant to zero, another path of reduction for consonants yields a more sonorous or vowel-like consonant. Such changes are most notable in syllable-final position or postvocalic position. For example, the change of a syllable-final [l] to a back unrounded glide [ɯ] involves the loss of the tongue tip gesture. This change occurs in American English pronunciations of words such as *milk* as [mɪɯk].

Temporal reduction of a stop is another possibility. The English alveolar flap found in words such as *latter* and *ladder* is significantly shorter than the [t] or [d] that occurs preceding a stressed vowel (Zue and Laferriere 1979). The medial stops in *upper* and *trucker* are also shorter than their counterparts preceding the stress, but this difference is not as salient (Hoard 1971).

Vowels reduce by lessening the magnitude of the gesture as well. In unstressed syllables, reduction can be manifest in various changes in the gestures, some of which may co-occur. Laxing of vowels usually refers to a decrease in muscular activity involving a lowered articulation for high vowels and more central articulation for peripheral vowels, and even a shortening compared to vowels in stressed syllables. Centralization is the result of a lessening of the magnitude of gestures that move the articulators to peripheral positions. Shortening involves a loss of temporal duration of muscular activity. When reduction leads to complete deletion, both temporal and substantive reduction have occurred.

2.6. Acoustic-Perceptual Aspects of Phonological Processes and Change

Analyzing phonological processes in terms of gestures does not imply that there is not also an acoustic-perceptual component to these processes. Any change in gestures or their timing produces an acoustic-perceptual change. In fact, for a gestural change to proceed and become conventionalized as part of the language, its perceptual effects must be registered in storage.

The remarkable degree to which speakers of the same dialect achieve similarity in the details of their phonetic output attests to the exquisite attunement of the perceptual system to fine detail. Therefore, it is unlikely that a hearer who has already acquired the phonetics of his or her dialect would misperceive already acquired words to the extent that that might cause a sound change. However, there are two roles for perception in change. First, it is likely that in certain cases a change can occur because children fail to perceive and acquire a relatively difficult phonetic configuration (such as front rounded vowels, see section 2.10 for an example and discussion). Second, where contextual change has already occurred for articulatory reasons, a perceptual reanalysis could extend a change that has already begun (Ohala 1981). For instance, in a situation in which the vowel in a VN sequence is nasalized, if the nasal consonant is also weakening, then the nasalization could be attributed to the vowel rather than to the consonant, thereby contributing to the continuation of the change toward having just a nasalized vowel with a deleted consonant. Ohala (2003) refers to this as a change in the normalization process.

2.7. Strengthenings

Two types of counterexamples to the strong claims about sound change made by Mowrey and Pagliuca (1995) need to be noted and discussed. First, I will discuss some cases of apparent strengthenings which appear to be well attested; in the next section, I will discuss the possibility of perceptually based changes and a proposal for distinguishing them from articulatorily based changes.

Recall that some apparent strengthenings, such as the insertion of an obstruent into certain sequences of consonants, have already been dealt with in section 2.4. Diphthongization, which is viewed by some as a strengthening, can also be analyzed as a retiming since one can hypothesize that diphthongs are produced by sequencing vowel gestures that were formerly simultaneous. The crucial question would be whether or not the resulting diphthong has a greater temporal duration than the simple vowel from which it arose. Similarly, vowel lengthening needs to be studied in this context to determine whether over time a vowel can increase its length, and it needs to be determined whether or not consonant "insertions" such as shown in (2) above affect the overall length of the consonant cluster. Finally, vowel insertions that break consonant clusters (e.g., Dutch *melk* [melək] 'milk', *Delft* [deləft] 'Delft (place name)') are potential counterexamples as well. They could be considered

retiming changes, but they need to be studied to see if the change results in an overall lengthening of the word.

In addition, Pagliuca and Mowrey (1987: 462) suggest that affrication of voiceless stops, as occurred in the High German Consonant Shift ([p] > [pf] > [f], [t] > [ts] > [s], [k] > [kx] > [x]), is due to "the erosion of stop closure integrity, which has, as an aerodynamic consequence, an increase in acoustic energy" and not a fortition as some assume. Evidence that the general path of change which includes the stop-to-affricate step is a general lenition, or weakening, is that the subsequent step that yields a fricative is uncontroversially a weakening.

However, at least some major challenges to the reduction theory remain: the well-attested case in Spanish of the strengthening of a glide in syllable-initial position to a fricative, stop, or affricate. This change has occurred in several dialects of Latin America, yielding voiced or even voiceless fricatives or affricates in words such as *yo* 'I', *oye* 'listen', and *hielo* 'ice' (Lipski 1994). Such cases need to be examined in detail to determine their implications for the reduction theory.

2.8. Lexical Diffusion of Sound Change

Lexical diffusion refers to the way a sound change affects the lexicon: if sound change is lexically abrupt, all the words of a language are affected by the sound change at the same rate. If a sound change is lexically gradual, individual words undergo the change at different rates or different times. Whether sound changes exhibit gradual or abrupt lexical diffusion is a topic of some recent concern (see references below). One early contribution to this debate by Schuchardt (1885) is the observation that high-frequency words are affected by sound change earlier and to a greater extent than low-frequency words.

William Labov (1981, 1994) also deals with the issue, availing himself of the data from his numerous studies of sound change in progress. His proposal is that there are two types of sound change: "regular sound change," which is gradual, phonetically motivated, and occurs without lexical or grammatical conditioning or social awareness, and "lexical diffusion change" such as those studied by Wang (1969, 1977), which are "the result of the abrupt substitution of one phoneme for another in words that contain that phoneme" (Labov 1994: 542). He observes this type of change most often in "the late stages of internal change that has been differentiated by lexical and grammatical conditioning" (542). Labov even goes so far as to propose that certain changes, such as the deletion of glides and schwa, will be regular changes, while the deletion of obstruents will show lexical diffusion.

A number of researchers have challenged this position. Phillips (1984) has presented evidence that even low-level sound changes exhibit gradual lexical diffusion. Oliveira (1991) argues also that it is likely that gradual lexical diffusion occurs even in changes that turn out to be regular. Krishnamurti (1998) demonstrates that the change of [s] > [h] > Ø in Gondi exhibits gradual lexical diffusion but still goes through to completion in some dialects.

Table 36.1. Rate of [t]/[d]-deletion for entire corpus by word frequency

	Deletion	*Nondeletion*	*% deletion*
High frequency	898	752	54.4%
Low frequency	137	262	34.3%

Chi-squared = 41.67; $p < .001$; df = 1

In many of these case studies, high-frequency words are affected earlier and to a greater extent than low-frequency words (Hooper 1976b). In Bybee (2000b) I show that American English [t]/[d]-deletion occurs more often in words of high frequency than in words of low frequency. In a corpus of some 2,000 tokens divided somewhat arbitrarily into two groups according to their frequency in the Francis and Kucera (1982) word count (with words of a frequency of 35 or less classified as low frequency and words with a frequency of more than 35 classified as high), a significant difference in the rate of deletion was found, as shown in table 36.1.

Similarly, in Bybee (2002b) I report that the rate of deletion of Spanish intervocalic [ð] in New Mexican Spanish is significantly affected by word frequency. As table 36.2 shows, higher-frequency words are more likely to undergo deletion of [ð] than lower-frequency words. The frequency count used in this case is the 1.1-million-word *Corpus oral de referencia del Español contemporáneo* (COREC 1992). (The figures in table 36.2 exclude the past participle morpheme because it is known to have a higher rate of deletion than average.)

In addition to consonant reduction, another type of change that shows robust word frequency effects is vowel reduction and deletion. Fidelholtz (1975) demonstrates that the essential difference between words that do reduce a prestress vowel, such as *astronomy*, *mistake*, and *abstain*, and phonetically similar words that do not, such as *gastronomy*, *mistook*, and *abstemious*, is word frequency. Van Bergem (1995) finds that reduction of a prestress vowel in Dutch also is highly conditioned by frequency. The high-frequency words *minuut* 'minute', *vakantie* 'vacation', and *patat* 'chips/French fries' are more likely to have a schwa in the first syllable than the phonetically similar low-frequency words, *miniem* 'marginal', *vacante* 'vacant', and *patent* 'patent'.

Table 36.2. Rate of deletion of [ð] according to token frequency for all non past participle tokens in the New Mexican corpus using the COREC as a measure of frequency

	Low (0–99)	*High (100+)*	*Total*
Retention	243 (91.4%)	287 (78.6%)	530 (84.0%)
Deletion	23 (8.6%)	78 (21.4%)	101 (16.0%)
Total	266	365	631

Chi-square = 17.3; $p < .001$; $N = 631$; df = 1

It is not quite clear whether the same pattern can be found in vowel shift changes. Labov searches for, but does not find, robust evidence for lexical diffusion in his data. The cases he does note are the raising of short [æ], which affects the adjectives ending in [d] *mad*, *glad*, and *bad*, but not *sad*. In this same shift, some evidence for lexical diffusion by frequency is cited: Labov (1994: 506) notes that when word-initial short [æ] "occurs before a voiceless fricative, only the more common, monosyllabic words are tensed: tense *ass* and *ask*; lax *ascot*, *aspirin*, *astronauts*, *aspect*, *athletic*, *after*, *African*, *Afghan*."

In Moonwomon's (1992) study of the centralization of /æ/ in San Francisco English, she finds that in the environment before a fricative this vowel is more centralized than before a nonfricative; it is also more centralized after [l]. The most commonly used word with this pair of phonetic environments is *class*. *Class* shows more centralization than the other words with these two environments, such as *glass*, *laugh*, and so on.

Moonwomon also studies the fronting of /ɔ/ in the same speakers. Here a following /t/ or /d/ conditions more fronting than other consonants. Of the words in the corpus ending in final /t/, *got* is the most frequently occurring. Moonwomon also shows that the fronting in *got* is significantly more advanced than in other words ending in alveolars, such as *not*, *god*, *body*, *forgot*, *pot*, and so on.

It appears, then, that some evidence that high-frequency words undergo vowel shifts before low-frequency words can be found. The lack of stronger evidence may be due to a greater difficulty in discerning frequency effects in vowel shifts because of the effects of the preceding and following environments, which narrow each phonetic class to a small number of words.

2.9. Theoretical Consequences of Lexically and Phonetically Gradual Sound Change

Both Wang's and Labov's views of lexical diffusion assume that a change that diffuses gradually through the lexicon must be phonetically abrupt. This is a necessary assumption if one accepts a synchronic phonological theory that has phonemic underlying representations. Words can change one by one only if the change is a substitution of phonemes in such a theory. The discovery that sound change can be both phonetically gradual and lexically gradual forces a different view of the mental representation of the phonology of words (Hooper 1981; Bybee 2000b). If subphonemic detail or ranges of variation can be associated with particular words, an accurate model of phonological representation must allow phonetic detail in the cognitive representation of words.

A recent proposal is that the cognitive representation of a word can be made up of the set of exemplars of that word that have been experienced by the speaker/hearer. Thus, all phonetic variants of a word are stored in memory and organized into a cluster in which exemplars that are more similar are closer to one another than the ones that are dissimilar, and moreover, exemplars that are frequently occurring are

stronger than less frequent ones (Johnson 1997; Bybee 2000a, 2001; Pierrehumbert 2001). These exemplar clusters change as experience with language changes: repeated exemplars grow stronger, and less used ones may fade over time, as other memories do.

Changes in the phonetic range of the exemplar cluster may also take place as language is used and new tokens of words are experienced. Thus, the range of phonetic variation of a word can gradually change over time, allowing a phonetically gradual sound change to affect different words at different rates. Given a tendency for online reduction, the phonetic representation of a word will gradually accrue more exemplars that are reduced, and these exemplars will become more likely to be chosen for production where they may undergo further reduction, gradually moving the words of the language in a consistent direction. The more frequent words will have more chances to undergo online reduction and thus will change more rapidly. Words that are more predictable in context (which are often also the more frequent ones) will have a greater chance of having their reduced version chosen, given an appropriate context, and thus will also advance the reductive change more rapidly.

The exemplar model in principle allows every word of a language to have a distinct set of phonetic gestures and an unlimited range of variation. The reason languages do not avail themselves of this possibility is because categorization of the components of words into a small set of gestural constellations is necessary given the size of the vocabulary of natural languages. In order to organize the lexicon and automate production and perception, it is necessary to reuse the same gestures in large numbers of lexical items. Evidence from sound change also shows that the range of variation for a single word tends to narrow as change goes to completion and that this narrowing tends to be consistent across lexical items, with very high frequency items being the only exceptions (Bybee 2000b, 2001). The sets of gestures that are reused across the lexicon are roughly equivalent to phonemes.

2.10. Perceptually Motivated Change

Less commonly, sound change may be motivated by misperceptions, especially on the part of learners (Ohala 1992), or reanalysis. In these cases, the pattern of lexical diffusion should proceed from low-frequency words to high-frequency words. Thus, patterns of lexical diffusion can be used as diagnostics of the motivations for sound change (Bybee 2001). For instance, as we will see in section 3.1, analogical leveling affects low-frequency words before high-frequency words.

Phillips (1984) found a similar pattern of diffusion for some sound changes. For instance, the Old English diphthong <eo> monophthongized to a mid front rounded vowel /ö/, with both a long and a short version in the eleventh to twelfth centuries. In some dialects, these front rounded vowels were maintained into the fourteenth century, but in Lincolnshire, they quickly unrounded and merged with /e(:)/. A text written around 1200 AD, the *Ormulum*, captures this change in progress. The author was interested in spelling reform, and so, rather than regularizing the spelling, he represented the variation, using two spellings for the same word in

many cases (e.g., *deop*, *dep* 'deep'). Phillips found that within the class of nouns and verbs, the low-frequency words are more likely to have the spelling that represents the unrounded vowel.

If this were a phonetically motivated reduction that facilitates production, we would expect the high-frequency words to change first. Indeed, the frequent adverbs and function words have changed, suggesting they might be yielding to production pressures, but the fact that nouns and verbs show more change in low-frequency items suggests a different motivation for the change. Phillips proposes that a constraint against front rounded vowels is operating to remove these vowels, but how would such a constraint manifest itself, and why would it allow front rounded vowels for a time, only to obliterate them later? In Bybee (2001) I argue that, like other changes affecting low-frequency items first, this change might be caused by imperfect learning. Front rounded vowels are difficult to discriminate perceptually, and children acquire them later than unrounded vowels. Gilbert and Wyman (1975) found that French children confused [ö] and [ɛ] more often than any other nonnasal vowels they tested. A possible explanation for the Middle English change is that children correctly acquired the front rounded vowels in high-frequency words that were highly available in the input but tended toward merger with the unrounded version in words that were less familiar.

2.11. Suprasegmental Changes

Changes in stress patterns are not like the segmental changes discussed so far, as they seem to be based on generalizations that speakers have made over existing forms and are perhaps more like analogy, which I will treat in section 3. For instance, stress changes in Spanish verb forms indicate a change from a system in which stress is reckoned from the end of the word (as in Latin) to a system in which, for verbs at least, stress is a morphological marker. Thus, indicative and subjunctive imperfective verb forms shifted stress away from the penultimate syllable in first- and second-person plural to the antepenultimate. The result is a consistent stress pattern for this aspect: the stress falls on the first syllable of the suffix.

(3)

	Old Spanish		Modern Spanish	
	Indicative	Subjunctive	Indicative	Subjunctive
1SG	*cantába*	*cantára*	*cantába*	*cantára*
2SG	*cantábas*	*cantáras*	*cantábas*	*cantáras*
3SG	*cantába*	*cantára*	*cantába*	*cantára*
1PL	*cantabámos*	*cantarámos*	*cantábamos*	*cantáramos*
2PL	*cantabáis*	*cantaráis*	*cantábais*	*cantárais*
3PL	*cantában*	*cantáran*	*cantában*	*cantáran*

Stress shifts also exhibit lexical diffusion. Phillips (1984, 1998) has studied the lexical diffusion of an English stress shift that moves the stress to the first syllable of nouns, creating diatones, that is, noun/verb pairs that differ only in stress placement.

such as *pérmit* (noun) and *permít* (verb). This shift affects low-frequency words earlier than high-frequency words. Thus, while *ánnex* and *annéx* are diatones, *amóunt* is not; compare also *cómpress/compréss* and *commánd*, and so on. The stress shift appears to affect the noun, by giving it initial stress, and thus seems to be based on a generalization about the lexicon that nouns tend to have initial stress, while verbs have no such restriction. The more frequent nouns with aberrant stress can resist the tendency to change, while the less frequent ones bow to the more general schema. This type of change, then, resembles analogical change, which I discuss in section 3.

2.12. Life Cycle of Phonological Alternations

As sound change produces permanent effects on the words of a language, in cases of morphological complexity, there is a potential for the development of alternations in paradigms. These alternations become morphologized, that is, they lose their phonetic conditioning and take on morphological or lexical conditioning. The diachronic trajectory shown in (4) is both universal and unidirectional (Kiparsky 1971; Vennemann 1972; Hooper 1976a; Dressler 1977, 1985; Bybee 2001).

(4) phonetic process > morpholexical alternation

Thus, for example, a phonetic process of voicing of intervocalic fricatives in Old English produced the alternating pairs *wife/wives*; *leaf/leaves*; *house/hou*[z]*es*; *bath/ba*[ðz]. Today, however, the alternation is morphologized, in the sense that it applies only in the plural of nouns (not in possessive form, e.g., *wife's*), and it is lexicalized in the sense that it applies only to a certain set of nouns (not, e.g., to *chief* or *class*). Once an alternation becomes morphologized or lexicalized, it is then subject to further changes which are generally designated as analogical changes. These will be treated in section 3.

2.13. Conclusions about Sound Change

The view presented here is that sound change is largely the result of the automatization of articulatory gestures with the reduction and temporal compression of gestures accounting for most changes. It is a usage-based phenomenon and as such affects high-frequency words and phrases in advance of the lower-frequency items. Being both lexically and phonetically gradual, sound change shows lexical effects, which suggest that phonetic detail is stored in the lexicon.

Often it is difficult to establish the causes and mechanisms of phonological changes, but I have argued here that recent findings on lexical diffusion are promising resources for diagnostics of the cause of change. Sound change due to automatization will proceed from high-frequency words to low-frequency words, but phonological changes based on analogy to existing patterns will proceed in the opposite direction. Thus, where lexical diffusion data are available, we have evidence for the mechanism involved.

3. Analogical Change

Analogical change has traditionally referred to morphophonological change, in particular the loss or leveling of paradigm-internal alternations or the extension of alternations from one paradigm to another. Analogy is usually treated as if it were of secondary importance to sound change, as little more than a way of accounting for exceptions to sound changes. Indeed, analogy has been regarded as irregular and thus possibly unpredictable, as in Sturtevant's famous paradox: sound change is regular and creates irregularities (in the morphology); analogy is irregular and creates regularity.

In the last few decades, great strides have been made in our understanding of the mechanisms and the pathways of analogical change and their psycholinguistic basis. In this section, I will present these findings as they relate to analogical leveling or regularization in sections 3.1 to 3.3 and to analogical extension in section 3.4.

One popular model of analogy introduced in textbooks is the proportional model in which it is claimed that analogical change occurs as a result of the comparison of surface forms on the model of 'X is to X_1 as Y is to Y_1'. I will argue that while this model produces a description of what may be obtained in this type of change in some cases, it does not work in all cases and does not represent the actual psycholinguistic mechanism that applies in creating analogical changes.

3.1. Analogical Leveling

In analogical leveling, a paradigm that exhibits an alternation loses that alternation and thus becomes regularized. Examples in English are the changes of *weep/wept* to *weep/weeped*, *hou*[s]*e/hou*[z]*es* to *hou*[s]*e/hou*[s]*es*, *roof/rooves* to *roof/roofs*. Three important tendencies in analogical leveling help us understand the mechanism involved.

a. Leveling affects the least frequent paradigms first, leaving alternations in the more frequent paradigms.
b. The alternate that survives after leveling is the alternate of the more basic, unmarked, or more frequent member of the category.
c. Leveling is more likely among forms that are more closely related to one another.

Given the robust experimental finding that high-frequency forms are easier to access than low-frequency forms, we assume that high frequency adds to the strength of the lexical representation of a form (Bybee 1985). Leveling occurs when a lower-frequency form is difficult to access, but a related higher-frequency form is accessible. The latter form is used to create a new form on the basis of a productive pattern or one that applies to a larger number of forms. Thus, if *weep* is easier to access than *wept*, a speaker searching for a past may use *weep* and the regular past

suffix to create the new form *weeped*. Thus, analogical leveling is not change in an old form, but the creation of a new form. This explains why alternate forms, such as *wept* and *weeped*, can coexist in a language.

The greater accessibility or strength of forms with high token frequency also explains why low-frequency forms are more prone to leveling than high-frequency forms. High-frequency forms resist leveling because of their greater availability in the experience of the speaker, which affords them a greater lexical strength (Bybee 1985). Thus, it is normal for irregularities among nouns, verbs, and adjectives to be found primarily in the most frequent paradigms (those whose words have high token frequency), such as, *man/men*, *child/children*; *go/went*, *have/had*; *good/better/best*. Of course, it should be added that some languages maintain multiple patterns or irregularities throughout their systems, for example, Greek verb paradigms, Hausa noun pluralization, so there is no necessity to have only one productive pattern or to level alternations.

3.2. The Direction of Analogical Leveling

A question that has generated some interest in the study of historical linguistics is the question of which alternate survives when leveling occurs. Or, to put the question in the terms of the discussion above, which form serves as the base for the creation of the new form. I have already stated above that it is the more accessible or the more frequent form, but given that other proposals have been made, it is important to examine the evidence for this claim.

Kuryłowicz (1949) proposed that morphologically related pairs consist of base forms (*formes de fondation*) and derived forms (*formes fondées*) and that the analogy proceeds from the base form to the derived one. This would mean that the variant found in the base form would survive in the leveling process, as the new form is constructed from it. Kuryłowicz further explains that the base form is the one with the more general distribution; the one that can be used when no contrast is needed. The base form, then, seems equivalent to the unmarked form in Jakobson's (1957) theory of markedness. Indeed, Kuryłowicz uses the same type of examples as Jakobson, saying that the masculine adjective in French is basic because the feminine is constructed from it and the masculine can be used in cases where both genders are included. Kuryłowicz also hastens to add that it is not a matter of frequency, but rather of distribution.

Kiparsky (1988) and others have taken Kuryłowicz's reference to basic and derived forms as similar to underlying and surface forms. In this formulation, leveling would occur when the underlying form surfaces unchanged, without the application of a phonological rule. Thus, leveling would be represented formally as rule loss, or in some cases, rule reordering (Kiparsky 1971, 1988). Of course, the embarrassment for this theory is the fact that leveling occurs item-by-item, with some paradigms "losing" the rule while others retain it. Since rules by their very nature should apply equally to all items, the gradual lexical diffusion of leveling

suggests that the alternations in question are not rule-governed after all, a conclusion that connectionist research supports (Rumelhart and McClelland 1986).

Mańczak (1958a, 1958b) replied to Kuryłowicz's principles for predicting analogy with hypotheses of his own that made reference not to theoretical constructs such as "base form," but to specific features of words, such as their length or their grammatical category. Thus, he noted that the indicative triggered changes in other moods more than vice versa and that the present triggered changes in other tenses more than vice versa. In Mańczak (1978, 1980), he pulled together a set of such predictions under the generalization that more frequent forms were more likely to be maintained in the language than less frequent forms, more likely to retain an archaic character, more likely to trigger changes in less frequent forms, and more likely to replace them.

These predictions fit well with the approach to markedness introduced in Greenberg's (1966) monograph *Language Universals,* where it is demonstrated that unmarked members of categories have a higher token frequency than marked members. Then the question arises as to whether it is the higher token frequency that makes inflected forms less susceptible to change and more likely to serve as the basis of change, or whether it is the more abstract notion of conceptual markedness.

Tiersma (1982) contributes to this debate by showing that analogical leveling does not always cause the reformation of the marked member on the basis of the unmarked one, but rather in certain cases of singular/plural pairs where the plural is more frequent because the noun refers to entities that occur more often in pairs or groups (such as horns, tears, arms, stockings, teeth), a reformation of the singular is possible in analogical leveling. Thus, it is not the abstract marking relations of the grammatical category that determine the direction of leveling, but the local patterns of frequency of use. This constitutes, then, another case in which the way language is used determines the direction of change.

3.3. The Domain of Analogical Leveling

A paradigm (the set of inflected forms sharing the same stem) can be highly complex in languages that have inflections for person and number, tense, mood, and aspect. In such languages, some alternations are more likely to level than others. In Bybee (1985) I present the hypothesis that some inflectional categories create greater meaning differences than others. For instance, the difference in aspect between perfective and imperfective creates a greater semantic distinction than the difference between forms such as first person versus third person. It is also more common cross-linguistically to find formal variants corresponding to aspectual differences across person/number lines than to person/number differences across aspectual lines. Thus, Spanish has perfective/imperfective forms with stem changes, such as *supe/sabía* and *quise/quería*, but no stem allomorphy within these aspects that corresponds to person/number distinctions. We can thus predict that analogical leveling of alternations across closely related forms, such as first-person singular and plural within perfective or within imperfective, would be more common than

a leveling across aspectual lines, with the result that, for example, the first-person singular always has the same stem.

Thus, leveling occurs within subparadigms of closely related forms where the more frequent form serves as the basis for the creation of a new form that replaces the less frequent form. For instance, consider the changes in the paradigm for *to do* in Old and Middle English (Moore and Marckwardt 1960):

(5)

		Old English	*Middle English*
PRS. IND	1SG	dō	do
	2SG	dēst	dest
	3SG	dēþ	doth
	PL	dōþ	do
PRET. IND	1SG	dyde	dide, dude [dyde]
	2SG	dydest	didest, dudest
	3SG	dyde	dide, dude

Old English had an alternation in the singular present between first person and second and third. There was also an alternation between present and preterite. In the preterite, there is a vowel change (from the present) and also an added consonant [d]. Given some leveling, there are theoretically two possibilities: the one that occurs, in which the vowel alternations among the present forms are lost, leaving only a vowel alternation between present and preterite. In this case, the vowel alternation now coincides with the major semantic distinction in the paradigm, the tense distinction. The other alternative would be to view the alternations marking the distinction between first person, on the one hand, and second and third, on the other, as the major distinction. In that case, leveling would mean eliminating the distinction between present and preterite in the first person, giving preterite **dode* for first person. Second- and third-person preterite might also become **dedest, dede.* Then the paradigm would be organized as follows:

(6)

1SG	PRS. IND.	*do*
	PRET. IND.	*dode*
2SG	PRS. IND.	*dest*
	PRET. IND.	*dedest*
3SG	PRS. IND.	*deth*
	PRET. IND.	*dede*

Such changes apparently do not occur because the person/number forms within tenses or aspects (or moods, for that matter) are more closely related to one another than they are to the same person/number forms in other tenses, aspects, or moods. It is notable that the traditional presentation of a verbal paradigm groups person/number forms together according to tense, aspect, and mood, as in (5), and does not group tense/aspect forms together according to person/number. Also, in the languages of the world, alternations often correspond to tense, aspect, or mood and rarely to person/number distinctions across tense, aspect, or mood (Hooper 1979; Bybee 1985).

To summarize, then, research into the structure and representation of morphological categories and forms has yielded predictions about analogical leveling. There are two usage effects related to the frequency of paradigms and forms within them. First, the low-frequency paradigms tend to level earlier and more readily than high-frequency paradigms, which tend to maintain their irregularities. Second, the higher-frequency forms with a paradigm or subparadigm tend to retain a more conservative form and serve as the basis of the reformation of the forms of lesser frequency. Note further that the fact that paradigms tend to undergo leveling one by one and not as a group indicates that morphophonological alternations are not generated by rule, but rather that each alternation is represented in memory in the forms of the paradigm. The fact that the more frequent forms resist change and serve as the basis of change for lower-frequency forms means that all of these forms are represented in memory, but that the higher-frequency forms have a stronger representation than the lower-frequency forms.

3.4. Analogical Extension

An alternation is said to have undergone extension if a paradigm that previously had no alternation acquires one or changes from one alternation to a different one. For instance, while *cling/clung* and *fling/flung* have had a vowel alternation since the Old English period, the verb *string* which was formed from the noun has only had a vowel alternation, *string/strung,* since about 1590. Similarly, the past of *strike* has had a variety of forms, but most recently, in the sixteenth century, the past was *stroke,* which was replaced by *struck* in the seventeenth century.

As mentioned above, it is popular to describe extensions as if they arose through proportional analogies, such as '*fling* is to *flung* as *string* is to X', where the result of the analogy is of course *strung.* However, there are examples that are very difficult to describe with such formulas. For instance, the original set of verbs that constitute the class to which *string* belongs all had nasal consonants in their codas: *swim, begin, sing, drink.* In the sixteenth and seventeenth centuries, however, *stick/stuck* and *strike/struck* were added to this class. A little later, the past of regular *dig* became *dug.* More recent nonstandard formations are also problematic: *sneak/snuck* and *drag/drug* (both used in my native dialect) present dual problems. First, all of the mentioned items require a stretching of the phonological definition of the class, since originally verbs ending in [k] or [g] without a nasal would not have belonged to the class. Second, *strike, sneak,* and *drag* do not have the vowel [ɪ] in the base form as other members of the class do. The question for proportional analogy would be: what are the first two terms of the proportion that allow *strike/struck* to be the second two terms? Perhaps, *string/strung* is the most similar pair existing at the time, but *strike* has both the wrong vowel and the wrong coda to pair up with *string.*

One solution is to suppose that the requisite categorization is of the past/past participle form, not the base form, nor the relation between the base and the past form. Thus, a schema is formed over the past forms, which have similar phono-

logical shape and similar meaning (Bybee 1985, 1988; Langacker 1987). There is no particular operation specified as to how to derive the past from the base, such as [ɪ]→[ʌ], as such a derivation would not apply to *strike*, *sneak*, or *drag*; rather, there is only the specification of the schema for the past form. Modifications that make a verb fit this schema could be different in different cases (Bybee and Moder 1983). Also, the schema is stated in terms of natural categories; that is, the phonological parameters are not categorical, but rather define family resemblance relations. Since so many members of the class have velar nasals originally, it appears that the feature velar was considered enough of a defining feature of the class that it could appear without the feature nasal, opening the door to extensions to verbs ending in [k], such as *stick* or *strike*, and eventually verbs ending in [g], such as *dig*. A schema defined over a morphologically complex word, such as a past, is a product-oriented schema (Zager 1980; Bybee and Slobin 1982; Bybee and Moder 1983).

All researchers agree that analogical extension is less common than analogical leveling. As with leveling, it is informative to observe the conditions under which extension occurs. Since extension is not very common, the historical record does not provide enough information about the parameters that guide its application. However, recently, experimentation with nonce probe tasks and computer simulations of the acquisition of morphological patterns have provided evidence to supplement the diachronic record. (An example is the experiment of Bybee and Moder 1983, cited above.) These sources of evidence indicate that extension relies on a group of items with at least six members having a strong phonological resemblance to one another. Such a group of words has been called a "gang," and the attraction of new members to the group has been called a "gang effect." Another constraint is that most members of the group should have sufficient frequency to maintain their irregularity, but items of extreme high frequency do not contribute to the gang effect, as they are in general more autonomous, or less connected to other items (Moder 1992). In general, the productivity of a class or gang depends upon the interaction of two factors: the phonological definition of the class and the number of members in the class.

Phonological similarity and type frequency play off one another in the following way: if a class has a high type frequency, then the innovative form does not have to be so similar to the other members of the class; if it has a low type frequency, then the innovative form must be highly similar (Bybee 1995; Hare and Elman 1992, 1995). Note that these parameters predict, correctly, that analogy based on only one form would be quite uncommon. This is another reason that the proportional analogy model is incorrect: proportional analogy requires only one form as the basis of the analogy and thus would predict many extensions that never occur.

Hare and Elman (1995) apply some of these principles to the changes in the English past-tense verb system from the Old English period to the modern period using connectionist modeling. One of their models accounts for the collapse of the subclasses of weak verbs into a single class. The connectionist model is "taught" the weak verb system, but with some "errors" remaining. The resulting not-quite-perfect system then provides input to the next learning epoch. At each epoch, the number of

errors or changes in the system increases. Given the factors of type frequency and phonological similarity, the result is the collapse of the four-way distinction among weak verbs in favor of a two-way distinction, which parallels the actual developments at the end of the Old English period through the beginning of the Middle English period. A simulation of the generational transmission of the entire system—both weak and strong verbs—yields similar results. In each case, classes of verbs that are less common and less well defined phonologically tend to be lost.

In the Hare and Elman simulations, the analogical changes come about through imperfect learning, but this does not necessarily imply that children are responsible for initiating and propagating these changes. The simulations merely point out the weak or variable points in the system, and over successive transmissions these points become even weaker. The actual changes in the forms produced could occur in either adults or children.

3.5. Conclusions Concerning Analogy

Analogical changes may be sporadic and appear to be random, but they provide us with a valuable window on the cognitive representation of morphologically complex forms. Since analogy works word by word, we have evidence of the stored representation of morphologically complex words organized into an associative network, rather than a rule-based model. Since frequent words are less subject to analogical leveling, we have evidence for the varying strength of representations. In addition, the workings of analogical extension point to a prototypical organization for classes of words that behave the same.

4. GRAMMATICALIZATION

This section focuses on the importance of grammaticalization for general linguistics, emphasizing the universality of paths of grammaticalization, its unidirectionality, parallel development of form and meaning, and the dramatic increases in frequency of use accompanying grammaticalization.[1]

4.1. Properties of Grammaticalization

Grammaticalization is usually defined as the process by which a lexical item or a sequence of items becomes a grammatical morpheme, changing its distribution and function in the process (Meillet [1912] 1958; Givón 1979; Lehmann 1982; Heine and Reh 1984; Heine, Claudi, and Hünnemeyer 1991a, 1991b; Hopper and Traugott

1993). Thus, English *going to* (with a finite form of *be*) becomes the intention/future marker *gonna*. However, more recently it has been observed that it is important to add that grammaticalization of lexical items takes place within *particular constructions* (Bybee, Perkins, and Pagliuca 1994; Traugott 2003) and further that grammaticalization is the creation of new constructions (Bybee 2003). Thus, *be going to* does not grammaticalize in the construction exemplified by *I'm going to the store* but only in the construction in which a verb follows *to*, as in *I'm going to buy a car*. If grammaticalization is the creation of new constructions (and their further development), then it also can include cases of change that do not involve specific morphemes, such as the creation of word-order patterns.

The canonical type of grammaticalization is that in which a lexical item becomes a grammatical morpheme within a particular construction. Some characteristics of the grammaticalization process are the following:

a. Words and phrases undergoing grammaticalization are phonetically reduced, with reductions, assimilations, and deletions of consonants and vowels producing sequences that require less muscular effort (see sections 2.3–2.5). For example, *going to* [gowɪŋtʰuw] becomes *gonna* [gənə] and even reduces further in some contexts to [ənə], as in *I'm (g)onna* [aimənə].
b. Specific, concrete meanings entering into the process become generalized and more abstract and, as a result, become appropriate in a growing range of contexts, as in the uses of *be going to* in sentences (7) through (9) below. The literal meaning in (7) was the only possible interpretation in Shakespeare's English, but now uses such as those shown in (8) and (9) are common.

   (7) MOVEMENT: We are going to Windsor to see the King.
   (8) INTENTION: We are going to get married in June.
   (9) FUTURE: These trees are going to lose their leaves.

c. A grammaticalizing construction's frequency of use increases dramatically 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 7), 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 (9), 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.
d. Changes in grammaticalization take place very gradually and are accompanied by much variation in both form and function. Variation in form is evident in *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.

4.2. General Patterns of Grammaticalization

One of the most important consequences of recent research into grammaticalization is the discovery of the universality of the mechanisms of change as well as the particular paths of change that lead to the development of grammatical morphemes and constructions. It is now well documented that in all languages and at all points in history, grammaticalization occurs in very much the same way (Bybee, Perkins, and Pagliuca 1994; Heine and Kuteva 2002). Some well-documented examples follow.

In many European languages, an indefinite article has developed out of the numeral 'one': English *a/an*, German *ein*, French *un/une*, Spanish *un/una*, and 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. Furthermore, the numeral 'one' is used as an indefinite article in colloquial Hebrew (Semitic) and in the Dravidian languages Tamil and Kannada (Heine 1997). Examples of demonstratives becoming definite articles are also common: English *that* became *the*; 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 and Kuteva 2002).

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, Kibundu, and Swahili (Bybee and Pagliuca 1987; Heine and Kuteva 2002). 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 *ken* (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 toward 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, Perkins, and Pagliuca 1994).

Of course, not all grammaticalization paths can be illustrated with English or European examples. There are also common developments that do not happen to occur in Europe. 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 (Heine and Reh 1984; Bybee, Perkins, and Pagliuca 1994). In addition, the same develop-

ment from the verb 'finish' has been recorded for American Sign Language, showing that grammaticalization 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, a variety of Melanesian Pidgin English, which is now the official language of Papua New Guinea. Pidgin languages are originally trade or plantation languages that 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 grammaticalization process in more established languages (Sankoff 1990; Romaine 1995).

4.3. Paths of Change and Synchronic Patterns

The picture that emerges from the examination of these and the numerous other documented cases of grammaticalization is that there are several highly constrained and specifiable *grammaticalization paths* that lead to the development of new grammatical constructions. Such paths are universal in the sense that development along them occurs independently in unrelated languages. They are also unidirectional in that they always proceed in one direction and can never proceed in the reverse direction. As an example, the following are the two most common paths for the development of future tense morphemes in the languages of the world:

(10) THE MOVEMENT PATH
movement toward a goal > intention > future

(11) THE VOLITION PATH
volition or desire > intention > future

The first path is exemplified by the development of *be going to* and the second by *will*.

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 toward 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 (see section 6.3).

Such developments are slow and gradual, and a grammaticalizing 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 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. For this reason, it is very difficult to formulate synchronic universals for grammatical categories such as tense and aspect. It appears instead that the diachronic universals in terms of the paths of change such as (10) and (11) constitute much stronger universals than any possible synchronic statements.

4.4. Conceptual Sources for Grammatical Material

The examples discussed in the preceding sections showed lexical items entering into the grammaticalization process. One of the major cross-linguistic similarities noted in the previous section is that the same or very similar lexical meanings tend to grammaticalize in unrelated languages. Of all the tens of thousands of words in a language, only a small set provides candidates for participation in the grammaticalization 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 grammaticalization. Heine, Claudi, and Hünnemeyer (1991b) 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 human relations 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, and postures, such as 'sit', 'stand', and 'lie' in progressive constructions. 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, Claudi,

and Hünnemeyer 1991b: 126–31). In a survey of such relational terms in 125 African languages, Heine and his collaborators found that more than three-quarters of the terms whose etymology was known were derived from human body parts. Svorou (1994), 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.[2] Less concrete, but nonetheless basic and culturally independent, notions such as volition, obligation, and having knowledge or power also enter into the grammaticalization process.

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 'toward' 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, with a verb, 'to' can signal purpose and eventually generalize to an infinitive marker (Haspelmath 1989; see section 7). In this way, 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 and come to express purely abstract notions, such as tense, case relations, definiteness, and so on. 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.

4.5. Grammaticalization as Automatization

Some recent studies of grammaticalization have emphasized the point that grammaticalization is the process of automatization of frequently occurring sequences of linguistic elements (Haiman 1994; Boyland 1996; Bybee 2003). Boyland (1996) points out that the changes in form that occur in the grammaticalization process closely resemble changes that occur as nonlinguistic 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 grammaticalization. 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 grammaticalization.[3]

5. Morphosyntactic Change

5.1. Development of New Constructions

Grammaticalization occurs when a specific instance of a more general construction increases in frequency and takes on new functions. For instance, several movement verbs are appropriate to fit into the following constructional schema of English:

(12) [[Movement Verb + Progressive] + Purpose Clause (*to* + Infinitive)]
  a. I am going to see the king.
  b. I am traveling to see the king.
  c. I am riding to see the king.

However, the only instance of this construction that has grammaticalized is the one with *go* in it. The particular example of this construction with *go* in it has undergone phonological, morphosyntactic, semantic, and pragmatic changes that have the effect of splitting the particular grammaticalizing phrase off not only from other instances of *go* but also from other instances of this general construction.

Israel (1996) discusses the development of the *way* constructions (e.g., *Joan made her way home*) out of a more general construction in which an intransitive verb could have an object indicating the path or way, as in *wente he his ride, wente he his strete* ('road, path'), *I ran my way* (examples from Israel 1996: 221). The object in the construction is now restricted to *way*, but the nature of the verb has changed gradually over time. Starting with verbs that indicate the manner of motion (*sweep, creep, winged, speed*, etc.), the construction extended to verbs that indicate the means by which the path is built (*hew out, sheer, plough, dig*, etc.), then also to less direct means to achieving a goal (*fight, battle, write*), and further to incidental activities accompanying the movement whether figurative or literal (*whistle, hum and haw*). The changes are gradual and very local, occurring one verb at a time. Israel (1996: 223) writes, "Long strings of analogical extensions lead to discrete clusters of usage, which then license the extraction of more abstract schemas for the construction."

In other cases of grammaticalization, similar extensions can be observed. The development of *can* as an auxiliary shows it is first used with main verbs indicating understanding, communicating, and some skills. Each of these classes of main verbs expands gradually to encompass a wider range of meaning until all verbs are possible in this construction (Bybee 2003).

5.2. Lexical Diffusion of Constructions

Apparently, all constructions extend their categories gradually, producing an effect that could be called lexical diffusion. The direction of the diffusion resembles that of analogical change in that it proceeds from the least frequent to the most frequent.

In some cases the most frequent instances of a construction retain archaic characteristics so that two means of expressing the same thing exist in a language (Tottie 1991; Ogura 1993). A case studied by Tottie (1991) involves the development of negation expressed by *not* in English. Synonymous pairs of sentences exist in English using two constructions, of which the one with *not* is the more recent and now more productive:

(13) a. He did not see any books.
b. He saw no books.
(14) a. He did not see anything.
b. He saw nothing.
(15) a. He did not see it any longer.
b. He saw it no longer.

Tottie examines a large number of spoken and written texts and finds that the older construction is still used only with very frequent verbs, that is, existential and copular *be*, stative *have*, and the lexical verbs *do*, *know*, *give*, and *make*:

(16) At last she got up in desperation. There was no fire and she was out of aspirins.
(17) The Fellowship had no funds.
(18) I've done nothing, except, you know, bring up this family since I left school.
(19) ... I know nothing about his first wife.

The resistance of particular verb-plus-negative combinations to replacement by the more productive constructions suggests a strong representation of these particular sequences in memory. Even though they are instances of more general constructions, these particular local sequences have a representation that allows them to maintain the more conservative construction. In this case, an understanding of diachrony helps us explain why there are two alternate, synonymous constructions and why they are distributed as they are. It also provides evidence for a strong connection between lexicon and grammar.

5.3. Decategorialization

Decategorialization is the term applied to the set of processes by which a noun or verb loses its morphosyntactic properties in the process of becoming a grammatical element (Heine, Claudi, and Hünnemeyer 1991a; Hopper 1991). In some cases, the lexical item from which a grammatical morpheme arose will remain in the language (*go* retains many lexical uses, despite the grammaticalization of *be going to*), and in other cases, the lexical item disappears and only the grammatical element remains (*can* is grammaticalized, and the main verb from which it developed, *cunnan* 'to know', has disappeared). In both cases, the grammaticalizing element ceases to behave like a regular noun or verb.

Grammatical morphemes typically have more restricted distributions than lexical morphemes. Thus, the process of decategorialization is the result of the

freezing of items into specific constructions and their split from other instances of the same item that occur more freely.

Verbs lose canonical verbal properties when they become auxiliaries. Consider the auxiliary *can*, which derives from the Old English main verb *cunnan* 'to know'. In Old English, *cunnan* could be used with a noun phrase object, but today *can* occurs only with a verb complement: **I can that* and **I can her* are ungrammatical. The English modal auxiliaries have lost all their inflected or derived forms and are invariable. There is no infinitive **to can*, no progressive or gerund form **canning*, and the past form of *can*, which is *could*, is developing nonpast uses (*I could do it tomorrow*) and will perhaps lose its function as the past of *can*, just as *should* no longer expresses the past of *shall*. The auxiliaries rarely modify one another. While the use of *shall can* was possible in Middle English, such constructions have disappeared from Modern English. In other words, *can* has no main verb uses.

An example of an erstwhile noun that has lost much of its categoriality is the conjunction *while*, which was previously a noun meaning a length of time. Today it is very limited in its use as a noun. When it is clause-initial and functioning as a conjunction, it has no noun properties. Thus, it does not take articles, nor can it be modified as in (20) (Hopper and Traugott 1993).

(20) *I was there the same while you were.

In other contexts, its use as a noun is restricted to set phrases such as *all the while*, *a long while*. It cannot be freely used as a noun; thus (21)–(23) are unacceptable.

(21) *I've been there many whiles.
(22) *I waited a boring while.
(23) *The while was very long.

Examples such as these that show the gradual loss of lexical categorial status point to the importance of viewing grammar as organized in gradient categories rather than in discrete ones. This issue is further discussed in section 5.5.

5.4. Loss of Constituent Structure in Grammaticalization

The elements in constructions that are grammaticalizing become more tightly fused together, and the internal constituent structure of the construction tends to reduce. This is a direct result of the chunking process that is associated with automatization of frequently repeated sequences. In this process, two clauses become one, two verb phrases become one, and so on. Two illustrative examples follow.

Heine, Claudi, and Hünnemeyer (1991a) report that in Teso (a Nilo-Saharan language of western Kenya and eastern Uganda) the negative construction (24) derived from a construction with a main clause and subordinate clause, as in (25).

(24) *mam petero e-koto ekiŋok.*
not Peter 3SG-want dog
'Peter does not want a dog.'

(25) *e-mam* *petero* *e-koto* *ekiŋok.*
3SG-is.not Peter (who) 3SG-want dog
'It is not Peter who wants a dog.'

The sentence in (25) consists of the main verb *-mam*, which originally meant 'not to be', with Peter as its object, and a relative clause modifying Peter. In the current construction, as in (24), the verb is grammaticalized to a negative particle and the negative sentence consists of one clause rather than two.

Another interesting case of the reduction of two verb phrases to one occurs in languages that allow serial verb constructions. The following example from Yoruba illustrates this nicely (Stahlke 1970; Givón 1975; Heine and Reh 1984). In (26), there are two verbs that each have direct objects and approximately equal status:

(26) *mo* *fi* *àdé* *gé* *igi*
I took machete cut tree

This can either be interpreted as 'I took the machete and cut the tree', or, since *fi* is grammaticalizing as an instrumental preposition, it is more likely to be interpreted as 'I cut the tree with the machete'. The fact that the serial verb construction has become a single verb phrase with the grammaticalization of *fi* is underscored by examples such as (27):

(27) *mo* *fi* *ọgbọ* *gé* *igi.*
I took/with cleverness cut tree
'I cut the tree cleverly.'

Almost every case of grammaticalization involves such a change in constituent structure. When viewed in terms of a structural analysis of the successive synchronic states, it is tempting to say that a reanalysis has taken place. For example, in the two cases just examined, what was a verb is reanalyzed as an auxiliary in one case and a preposition in the other. In the next section, we discuss reanalysis as a type of linguistic change in grammaticalization and independent of it.

5.5. Reanalysis

In the preceding examples of grammaticalization, one could say that a syntactic reanalysis has taken place since the constituent structure or category labels have changed. But it is important to note that even these reanalyses take place gradually, which means that when grammaticalization is occurring, it may not be possible to uniquely assign elements to particular grammatical categories or structures. Heine (1993) argues that the reason there is so much controversy surrounding the category of auxiliary verb, in that some linguists argue that they are verbs and others argue that they are a separate category, is that auxiliaries derive gradually from verbs and have not always lost all their verbal properties even though they have become grammaticalized. Haspelmath (1998) argues that the gradual changes in category labels that occur in grammaticalization show not so much that reanalysis has taken place, but more that

the categories postulated for grammar must be more flexible. If a verb can gradually change into a preposition (as in 26 and 27), then the categories verb and preposition must themselves allow gradience. Thus, the attempt by some researchers (e.g., Harris and Campbell 1995) to reduce grammaticalization to reanalysis denies the importance of usage-based factors and emphasizes the view of grammar as a discrete entity.

Haspelmath (1998) also notes that most examples of reanalysis cited in the literature (including the many cases discussed in Langacker 1977) are also cases of grammaticalization, in that they involve greater fusion of the whole construction, the change from a lexical to a grammatical category, and a change that is irreversible. Thus, it could be said that the main impetus for reanalysis is grammaticalization.

The few cases of reanalysis that seem independent of grammaticalization involve a resegmentation, such as the change of the assignment of the [n] of the English indefinite article in *an ewt* and *an ekename* to the noun, yielding *a newt* and *a nickname*. As is typical of reanalysis, the opposite change also occurred (however, mostly in loan words); for example, *a naperon* became *an apron*. Even a case such as this is not totally independent of grammaticalization, however, since the development of the alternation in the indefinite article was related to its increased grammaticalization. Similarly, the case of the colloquial French interrogative marker *ti*, which developed from the third-person verbal suffix *-t* plus the inverted third singular masculine pronoun *il*, might also be considered a case of grammaticalization since, as Campbell (1999: 233–34) notes, it involves greater cohesion in the phrase.

(28) *Votre père part-il?* 'Does your father leave?'
(29) *Votre père par ti?*

The evidence for the reanalysis (since both 28 and 29 are pronounced the same) is the extension of *ti* to contexts where it was not previously appropriate, as in these examples from Campbell (1999: 234):

(30) *Les filles sont ti en train de dîner?* 'Are the children eating dinner?'
(31) *Tu vas ti?* 'Are you going?'

Other cases of reanalysis without grammaticalization mentioned in Haspelmath (1998) include the change of prepositions to complementizers, which could also be viewed as a step in the grammaticalization process.

From the point of view of cognitive and functional theory, the whole notion of reanalysis must be considered suspect because it assumes a grammar that allows only one analysis of a structure at any given synchronic stage. However, if the cognitive system allows redundancy and multiple coexisting analyses, then reanalysis is accomplished by adding an alternate analysis to an existing one. This alternate analysis might in successive generations become the only surviving analysis. Thus, *part-il* and other verbs plus *il* might be units of representation highly associated with interrogative, and if the *il* (which reduces to [i]) gradually loses its association with the third-person singular masculine pronoun but retains its association with interrogative, then the change is accomplished without an abrupt change in structure suggested by the term "reanalysis."

6. Semantic Change in Grammaticalization

This section discusses semantic change that accompanies grammaticalization and emphasizes the mechanisms of change that have been proposed to explain semantic change. These mechanisms help us explain why grammatical meaning is abstract and relational as well as highly dependent on context.

6.1. Bleaching or Generalization

As grammatical morphemes develop, they lose specific features of meaning and thus are applicable in a wider range of environments. Haiman's (1994) study of ritualization in language strongly suggests that frequency increases in themselves lead to bleaching through the habituation process (see also Bybee 2003). Just as swear words lose their sting with repetition, so grammaticalizing constructions come to express less meaning as they are used more. As a result, they become applicable in more contexts, and this further depletes their meaning.

It is important to note that bleaching may describe the result of change even when it is not a mechanism in itself. For instance, in the case cited above of the grammaticalization of English *be going to*, the meaning of movement in space is completely lost, and this loss can be described as bleaching. However, the mechanism by which that meaning comes to be lost has been described by some as metaphorical extension (Fleischman 1982; Sweetser 1988) and by others as pragmatic inference. Thus, many of the mechanisms of change in grammaticalization lead to bleaching or generalization of meaning.

6.2. Metaphor as a Mechanism of Change

Many changes of lexical meaning to grammatical meaning involve a metaphorical process (Sweetser 1990). Such a process is identifiable as the transfer of reference from one semantic domain to another while preserving aspects of the structural relations present in the original meaning. Body-part terms used as relational adpositions make excellent examples (Heine, Claudi, and Hünnemeyer 1991b). For instance, the phrase *the head of X* expresses a relation (with reference to humans) between a part of an object that is at the top in relation to the whole object. When this schematic relation is extended to objects other than humans, a metaphorical extension has occurred. Now the meaning of *the head of X* is generalized or bleached, since it is no longer restricted to the domain of the human body.

Typically metaphors express abstract relations in terms of more concrete relations. Thus, the direction of semantic change where metaphor is the mechanism

is from concrete to abstract. Metaphorical extension then explains part of the pervasive unidirectionality that characterizes grammaticalization.

Heine, Claudi, and Hünnemeyer (1991a, 1991b) have proposed that metaphorical extensions go through a predictable sequence of domains of conceptualization, as represented in the metaphorical chain in (32). In this chain, any of the domains may serve to conceptualize any other category to its right.

(32) PERSON > OBJECT > PROCESS > SPACE > TIME > QUALITY

It is possible to document some of these sequences of domains in a single grammaticalization chain, but not all. For instance, OBJECT > SPACE > TIME is a well-documented chain. The English preposition *before*, if we assume that *fore* was once a noun designating the front of an object, came to express the front space and, with the preposition *bi-*, came to express 'space in front of', and later, 'time before'. One problem with this proposal is that it is not certain that the shift from SPACE to TIME takes place by the mechanism of metaphor, since, as we see in the next section, proposals that such shifts are inferential in nature are quite convincing. A second problem is that the last stage of the chain, TIME to QUALITY is not documented in grammaticalization, but rather appears only in lexical shifts, as in the example (33).

(33) *é* *tsí* *megbé.* QUALITY
3SG remain behind
'He is backward/mentally retarded.'

In fact, it appears that metaphorical extension is a more important mechanism of change in lexical semantics than in grammaticalization. The case could be made that pragmatic inferencing, which leads to the conventionalization of implicature, is the primary mechanism for the development of grammatical meaning.

6.3. Inference or Pragmatic Strengthening

A model of grammaticalization in which the only change is that lexical meaning is lost or bleached cannot account for all the changes that are documented. Clear cases exist in which meaning is added into grammaticalizing constructions through pragmatic inferencing. The ability to infer meaning is an important part of the communication process. The speaker is able to say less than he or she means because the addressee is able to infer the part of the meaning that is omitted (Grice 1975). Thus, the addressee is always asking, "Why is she telling me this?" and inferring the speaker's attitude and motivation. When a particular inference is frequently made in connection with a particular construction, that inference can become conventionalized and thus part of the meaning of the construction. Thus, the source of the new meanings that can be accrued in the grammaticalization process is inference-based on the context. Traugott and König (1991) use the following example to illustrate how inferencing can change meaning. In example

(34a), the conjunction *since*, which originally meant 'from the time that', is used in a temporal sense. However, since events described in temporal relation often also have a causal relation, that is, the first event causes the second (as in 34b), and since speakers and addressees are usually less interested in pure temporal sequence and more interested in causes, a causal inference becomes conventionalized as part of the meaning of *since*. As a result, a sentence such as (34b) can have either or both interpretations. In fact, the previously inferred sense can even become independent, leading to sentences such as (34c), which has a purely causal interpretation.

(34) a. I have done quite a bit of writing since we last met. TEMPORAL
b. John has been very miserable since Susan left him. TEMPORAL/CAUSAL
c. I'll have to go alone since you're not coming with me. CAUSAL

This particular change, from temporal to causal, can be documented across languages (Traugott and König 1991), which means that this particular inference, from temporal to causal, may be culturally independent. Thus, some of the unidirectionality and predictability found in paths of grammaticalization may be due to predictable patterns of inferencing.

Traugott (1982, 1989) and Traugott and Dasher (2002) have proposed a general direction for meaning change in grammaticalization from "meanings grounded in more or less objectively identifiable extralinguistic situations to meanings grounded in text-making (for example connectives, anaphoric markers, etc.) to meanings grounded in the speaker's attitude to or belief about what is said" (Traugott and König 1991: 189). This pattern, roughly specifiable as propositional > textual > expressive, represents increased subjectivization in meaning. That is, while linguistic elements and constructions begin by expressing more objective meaning about the world and events, the addressee's tendency to infer textual relations, such as causation, concession, and so on, and the speaker's attitudes or beliefs, leads to the conventionalization of inferences of an increasingly nonobjective nature. Commonly occurring examples are changes from spatial to temporal meaning, changes from demonstratives to personal pronouns, and changes from agent-oriented to epistemic modality.

6.4. Metaphor or Metonymy?

Change from pragmatic inference is considered a metonymic process, since a meaning (from the inference) that is often associated with a construction becomes one of the meanings of the construction. It must be emphasized that the association of the inference with the construction must be frequent enough in use for it to become conventionalized. This type of change, then, is highly dependent upon language use.

The grammaticalization literature of the 1980s and 1990s discusses the relative merits of viewing metaphor or inference as the mechanism in change in grammaticalization. It seems that an important role for metaphor was originally assumed

(Bybee and Pagliuca 1985; Sweetser 1990; Heine, Claudi, and Hünnemeyer 1991a, 1991b), due to the fact that many changes preserve the image-schematic structure of the original meaning. However, once Traugott presented the case for inference or metonymic change, many proposals had to be reexamined.

One problem addressed by Heine, Claudi, and Hünnemeyer (1991b) is that metaphorical extension should be abrupt since it involves a move across domains, while change by inference can be gradual, as the inference gains in frequency and eventually becomes the central meaning of the construction. Heine and his colleagues argue that the gradualness of change points to a major role of context in change and that metonymy may be the gradual mechanism that promotes change, but the result can be described as a metaphorical transfer. It appears, then, that the actual mechanism of change proposed by Heine and his colleagues is change by metonymy or inference.

Note also that some changes cannot be due to metaphorical extension because they do not preserve the image-schematic structure of the original meaning. For instance, a common change involving perfect or anterior marking is that with an inchoative or change of state verb, or a stative verb, the perfect construction takes on present meaning. Thus, in Island Carib, certain stative verbs in the perfective denote a present state. For instance, *lamaali* 'he is hungry' is a perfective form. Similarly, the stative *funatu* 'it is red' becomes the perfective *funaali* 'it has turned red', with inchoative meaning, which, in turn, when said of fruit gives the stative sense 'it is ripe'. Such inferential changes are not restricted to inherently stative predicates, but also apply to the resultative reading of change of state verbs. Thus, for example, *hilaali* 'he has died' can also mean 'he is dead' (Taylor 1956: 24). Similar examples are found in Kanuri, where the perfect suffix *-na* with certain verbs has a present stative interpretation (Lukas [1937] 1967: 43; see also Hutchison 1981: 121–22):

(35) *nŏŋín* 'I learn, I shall know'
nŏŋónà 'I know (I have learnt)'
nâmŋín 'I (shall) sit down'
námŋónà 'I am seated (I have sat down)
ragəskĭn 'I am getting fond of, I shall like'
raggskənà 'I like (I have got fond of)'

The change to present meaning from perfect is clearly a result of inference: it would only be relevant to say that he has become hungry if he is still hungry; if the fruit has become ripe, then the implication is that it is now ripe; what I have learned, I now know, and so on. A metaphorical analysis will not apply in this case: the image-schematic structure of entering into a state in no way resembles that of being in a state.

Note also that many changes that appear to result in metaphorical extension probably took place by the conventionalization of implicature. These include changes from the spatial domain to the temporal as well as changes from agent-oriented modality to epistemic.

A change of a *BE GOING TO* construction from spatial to temporal might also be regarded as metaphorical (Fleischman 1982; Sweetser 1988), were it not for clear examples in which the spatial interpretation has an inference of intention, as in this example from Shakespeare (Hopper and Traugott 1993):

(36) *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)

In this example, the explicit meaning of the question is clearly spatial but the implied message of the answer states intention rather than specific location. This answer is quite appropriate, however, because what the Duke really wants to know is Valentine's intention. Thus, rather than a switch directly from a spatial or a temporal meaning, we have a move from the expression of movement in space to the expression of intention. Later, an inferential change can take intention to prediction, that is, future, as in the following example from Coates (1983: 203), which is ambiguous between an intention and a prediction reading. Note that even if intention is what is meant, prediction is implied.

(37) The National Enterprise Board, which is going to operate in Scotland...

Other changes which appear to have metaphorical structure, such as the change from the ability or root possibility reading of *may* to an epistemic reading (Sweetser 1990), can be shown in texts to result from a frequently made inference in clauses without a specific agent (Bybee 1988).

It appears, then, that the most powerful force in creating semantic change in grammaticalization is the conventionalization of implicature, or pragmatic strengthening. The role of metaphor seems to be restricted to lexical change and early stages of grammaticalization, as when body-part terms are used for general spatial relations. Change by inference comes about through the strategies used by speaker and addressee in communicating and is directly related to the extra information that the addressee reads into the utterance. Of course, change by inference only occurs when the same inferences are frequently associated with a particular construction.

7. CONCLUSIONS

The developing view of language change inspired by cognitive and functional considerations is that usage gradually changes with a concomitant change in cognitive representation, which can also be gradual. This contrasts sharply with the view within Generative Grammar that language change is change in the grammar, with

change in usage being only incidental (Lightfoot 1979). Croft (2000) presents a theory of language change that is in accord with recent findings in cognitive and functional studies of change. Croft's evolutionary theory of change suggests an analogy with genetic change in which it is the utterance that is replicated in communicative acts. This replication can be "normal" in the sense that exact utterances are replicated, or more commonly, replication is altered. Altered replication leads to the development of contextual variants and the gradual rearrangement of the relation between the conventional structures and their functions. The mechanisms by which utterances undergo altered replication are precisely the mechanisms of change that have been discussed in this chapter. All of the mechanisms discussed here—automatization, gestural reduction, analogical reformation, categorization, metaphorical extension, pragmatic inferencing, generalization—are processes that occur in individual communicative acts. Their frequent repetition and thus cumulative effect is language change, but none of these processes is undertaken with the goal of changing the language. These processes operate like an "invisible hand" (Keller 1994). The audience for the juggler in the plaza does not plan to make a perfect circle; the individuals each have the goal of trying to see better and the circle emerges from these individual acts. Similarly, language users do not plan to change language, but by using language in a multitude of communicative acts, given the processes natural to human beings, language change occurs.

Recent studies in phonology, morphology, and syntax all point to a deep intermixing of grammar and lexicon. Lexical diffusion is shown to operate in all areas; change does not occur in a rule-like fashion in which all items submit to the rule at one time. Rather, change gradually diffuses across the mental representations of language. Here also, usage is important, as shown by the frequency effects that turn up in all domains. High-frequency items and constructions undergo reductive changes quickly, including phonological reduction, syntactic reduction (loss of constituent structure), and semantic change (generalization, etc.). But in the presence of competition from analogy of newer constructions, high-frequency instances hold out: high-frequency verbs resist regularization, and high-frequency instances of constructions (e.g., *I know nothing* . . .) resist reformulation in the new pattern (*I don't know anything* . . .). Thus, diachrony provides us with evidence for the interrelation of lexicon and grammar and also with evidence for the nature of the cognitive representation of phonological and grammatical form. In particular, it points to highly specific (though categorized) representations that are constantly changing to reflect details of language use, such as gradual phonological reduction, new inferential meanings, or new contexts of use. These representations also reflect frequency of use in their strength and accessibility as evidenced by resistance to change.

All the changes discussed here have been shown, when viewed up close, to be gradual. This means that all the categories of grammar must be gradient, as gradual change belies the structuralist conceptions of grammar as a closed system consisting of discrete structures. Cognitive Grammar, with gradient categories and immediate responsiveness to changes in usage, provides a model in which change is not only possible, but inevitable.

It is important to remember that grammar is always being created and re-created by language use. Mechanisms of change that create grammar are built into the language ability; they occur synchronically, as language is used. Thus, explanations for linguistic structures must make crucial reference to diachronic change and the mechanisms that propel that change. Moreover, because the mechanisms of change are universal, paths of change are highly similar cross-linguistically and change is typically unidirectional.

8. Future Directions

Advances in cognitive and usage-based linguistics have opened up a bright future for the study of language change. For the first time since philology dominated the field of historical linguistics, we have a framework that allows change to be gradual and specific on various dimensions, such as the lexical, phonetic, and morphosyntactic, while at the same time providing general principles of linguistic organization that explain why change moves in certain directions and not others. Future work will surely serve to further clarify the relation between the very specific and the very general in language change largely through the study of the process of lexical diffusion of various types of changes.

At the same time, cognitive views of change need to seek a better integration with the social factors in change, both at the general level of groups of speakers and at the interpersonal level. The latter study is just beginning to come into its own with the rapid development of a new field of historical pragmatics (Traugott and Dasher 2002), but more work needs to be directed toward general social factors in change and their interaction with cognitive factors.

Clearly, reference to cognitive factors brings us closer to explanation in both the diachronic and synchronic realms. In diachrony, it is of utmost importance to emphasize not just the motivation for change, but also the mechanism; that is, in order to establish why changes occur in a certain direction, we also have to understand how changes occur.

NOTES

Parts of section 2 are taken from Bybee (2001) and Bybee (2002b). Parts of sections 4 and 5 are taken from Bybee (2002a).

1. The terms "grammaticalization" and "grammaticization" will be used interchangeably.

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

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

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