DIACHRONIC REGULARITY AND IRREGULARITY: STRUCTURAL PARALLELS BETWEEN SEMANTIC AND PHONOLOGICAL CHANGE

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Abstract

Recent work in historical semantics challenges traditional views of meaning-change as random and irregular, as opposed to the regular, lawlike character of sound change. In this paper, we argue that not only are there major parallels to be observed between regular behavior in semantic and phonological change, but further, these parallels seem to be motivated by a realistic model of psychological categorization processes which are common to the two domains.

Among the kinds of regularity which have been observed in the history of phonological systems and which have parallels in the history of semantic systems are:

(1) It is possible to identify directions of change which are recurrent and natural;

(2) units can be observed to change "in parallel," maintaining the contrast relationships between them, and

(3) completed change affects a unit completely (all instances of the unit are affected).

We examine some of the evidence about the structure of psychological categories in the semantic and phonological domains, and attempt to show how such evidence motivates observed diachronic patterns. Further, looking at very general principles of categorization and generalization, we identify similar metonymic and analogical patterns in phonology and semantics which are motivated by these general principles.

We also see phonology and semantics to differ in important ways, and suggest ways in which the differences between the two may be due to the inherent differences between sound and sense. But in other ways, we show that general cognitive constraints appear to structure the history of both domains.

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[1] Numerous colleagues have furthered the progress of this paper by giving us the benefit of their reactions to earlier versions. We are particularly grateful to Claudia Brugman, Suzanne Fleischman, John Kingston, George Lakoff, and John Ohala. And we thank Elizabeth Closs Traugott for the example provided by her work. None of these people should be imagined to agree with all the opinions here expressed; nor should they be blamed for the places where we have gone astray by ignoring their advice.

0. Introduction.

We began this paper when, with some surprise, we reached the conclusion that we had no proof that meaning change is less regular than sound change. We still lack full data on the question of regularity in semantic change, but the last couple of decades have brought a wealth of new cognitive and linguistic knowledge to bear on both semantics and phonology. This new data tends more and more to call into question classical views of historical change, and to highlight parallels between synchronic and diachronic structure in these two disparate areas.

It is traditional to regard phonological change and semantic change as two poles of a spectrum: the former is the stronghold of regularity and systematicity, the latter is the home of whimsical and unsystematic phenomena. There are at least three ways in which regularity has been observed to manifest itself in the phonological domain:

(1) It is possible to identify recurring directions in sound change (particularly for conditioned sound change) which are more natural than others (e.g., palatalization before front vowels).

(2) There are frequent examples of sound change where natural classes of phonological units change in parallel, maintaining the contrast relationships between them (e.g., in word-final devoicing of stops to the corresponding voiceless stops, maintaining contrast in articulation-point).

(3) When a phonological unit changes its value (i.e., when a phoneme changes its phonetic shape) all examples of this unit are affected by the change: at least in theory, barring irregularity, all instances of that phoneme (or all which are in the relevant environment) throughout the lexicon should be subject to the same change.

Semantic change on the other hand has not traditionally been thought to manifest any of these aspects of regular behavior and therefore has been taken to be largely random and arbitrary.

Such a polarized picture is significantly altered by the increasingly supported hypothesis that much lexical semantic change can be seen as following ‘regular,’ directional tendencies which show up again and again in the histories of individual lexical items or even in the histories of semantically defined classes of words. The seed of this hypothesis can be found in the work of early semanticists like Bréal (1900), Stern (1931) and Ullmann (1963) and more systematically in recent work by Anderson (1982, 1986), Bybee (1985), Bybee and Pagliuca (1985), Fleischman (1982a, 1982b), Hopper (1982), Kemmer (1988), Sweetser (in press), Traugott (1982, 1987, 1989), and Wilkins (1981). We shall not review this work in detail, but will draw on it in discussing some well-known examples of phonological and semantic change. We will argue that interpreting these examples in the right way has some startling implications for the notion of diachronic regularity.

Work on recurring directions in semantic change shows that semantic change may behave regularly in the sense defined in point (1) above. This paper will be concerned with making explicit some of the mechanisms which motivate such regular historical directions in both domains. We will further argue that the aspects of regular diachronic behavior described in (2) and (3) above can also be found in semantics if we reconsider the basis on which comparisons between the two domains are usually drawn.

It is our purpose to show that there are salient parallels to be drawn between phonological and semantic change processes (although semantic change has only recently begun to be investigated with an eye to possible regularities). We argue that these parallels between divergent domains reflect the existence of psychologically real categories and category-formation processes operating similarly in both. We see both phonology and semantics as constrained by limitations on category formation (including prototype structure, analogy, and non-objective ‘feature’ parameters of contrast) which motivate regular diachronic and synchronic behavior and determine those regularities which show up in both kinds of diachronic change.

We do not wish to claim that there are no differences between semantic and phonological change; instead, we argue that to the extent that the differences between them can be seen as directly derivable from natural properties of the two fields, and to the extent that we could set aside such differences to expose any commonalities, the possibility of drawing comparisons and parallelisms between the two domains would be increased. We further argue that the same set of traditional criteria of regularity support (and call into question) claims of lawlike behavior in both.

The organization of the paper will be as follows: In section 1, and as a background to the arguments which follow, we present briefly the kind of semantic and phonological analysis that we take to be crucial for our argument. Section 2 will present a pair of case studies in phonological and semantic change, and will argue that there are aspects of semantic structure which can be argued to parallel closely the classic syntagmatic and paradigmatic forces influencing phonology and sound change. Section 3 will discuss the general question of lawlike behavior in both domains. Section 4 will deal with the ways in which basic cognitive mechanisms produce unidirectionality in semantic and phonological change. Section 5 will conclude by discussing some consequences of our claims for the possibility of explanation for linguistic universals.

1. Feature analysis and cognitive structure in semantics and phonology.[2]

It has been noted before that the type of synchronic analysis dominating the field at a given time inevitably constrains the possible theories of diachronic change. Weinreich, Labov, and Herzog (1968), for instance, offer an extensive discussion of the effects of structuralist and generative linguistics on diachronic theory, focusing on the phonological domain. In semantics, the analysis of lexical meaning into features appears to open at least one fascinating vista to the historical linguist: the possibility of investigating changes in feature-structure at large, including both phonological ‘feature-bundles’ and semantic ones.

[2] This section reviews current arguments against some traditional views of semantic and phonological analysis. Since the review is done only as a background to the historical goals of this paper, we cannot pretend to do more than cite some salient points in this active ongoing debate. Readers are referred to Lakoff (1987) for a far fuller review of some of the semantic issues.

This would have the major advantage of making the two domains parallel both in synchronic and diachronic analysis.

Ullmann (1974) and others have indeed proposed analyses of semantic change in terms of change (addition/loss) of features. More recently, Bybee and Pagliuca (1985) see the semantic changes occurring in grammaticalization processes as invariably involving the loss or deletion of specific semantic features. Consider for example the diachronic semantic statement below (from Ullmann, 1974), describing the change of Latin *ponere* 'to place' to French *pondre* 'to lay eggs':

+'place'--> +'place'
+'eggs'

Similarly, Bybee and Pagliuca in talking about the shift from root to epistemic senses in the semantics of the modal verbs (a shift we shall discuss in detail below), suggest that the change involves among other things the loss of the meaning feature 'animate and willful subject.'

1.1. Problems with binarity.

Analyzing lexical meaning in terms of binary semantic features has been common practice among semanticists. The work of the structuralist school in meaning analysis is well-known (cf. work by Ullmann and others) and so are the later contributions of Katz and Fodor (1963) and Wierzbicka (1980). Even more recent research, such as that of Jackendoff (1983, esp. chapters 9 & 10), uses a notion much akin to the semantic feature, namely that of the 'semantic function,' to analyze the meaning of spatial and other semantic fields. The idea of using feature analysis in semantics is, at first glance, an enticing one, offering improved rigor in formalizing the description of both synchronic and diachronic aspects of meaning.

However, extensive semantic literature has recently been devoted to the major difficulties which ensue from understanding lexical semantics in these terms. The standard understanding of binary features (cf. Katz & Fodor, 1963) is that they define Boolean conditions on category-membership; by checking down a list of features we can determine whether some entity or event should be talked about with that word. If and only if all the feature-values are correct, the entity or event falls in that category. However, such classical 'if-and-only-if' approaches to category-structure are inconsistent with the gradient character of many semantic parameters (e.g., color contrasts; see Kay & MacDaniel, 1978) and the evidence that category structure involves prototypes (Lakoff, 1987; Mervis and Rosch, 1981; Rosch, 1978). A color may be MORE or LESS red, meaning that the word *red* applies to it more or less well—there is no simple cutoff with only indubitable members of the category red on one side, and only indubitable nonmembers on the other. Further, other categories (not necessarily defined by gradient parameters) nonetheless show gradient membership: a robin is a 'better' bird than a turkey or an ostrich, and so forth. Speakers appear to define categories relative to some prototype member or group of members, and degree of resemblance to these prototypical members will determine degree of membership in the set (Coleman & Kay, 1981).[3]

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[3] Recent work by Brugman (1988) and Lakoff (1987) further demonstrates that many categories exhibit more structure than just the simple relationship between the prototypical and the other members; to account for

There is also evidence that even granted the possibility of feature analysis for a given lexical category, different features or parameters are differentially weighted with respect to category-membership decisions. For example, Coleman and Kay (1981) reported that of the three parameters relevant to subjects' decisions about whether a described speech act was or was not a lie, factual falsity was the least influential. The speaker's belief in the falsity of his/her statement was the most important factor, and the speaker's intent to deceive the hearer had a weight intermediate between that of the other two factors. The classical feature theory however does not provide the means to talk about the differential weighting of a given feature or parameter.

Finally, work by Fillmore (1976, 1985), Sweetser (1987) and others has shown that word-meaning often exists only embedded in a larger context or 'frame' (see the 'breakfast' example in section 2.3). This frame itself has structure, independent of the word's meaning, and cannot simply be included in a list of the word's semantic features. But the frame is not itself a binary feature, although a crucial element of lexical meaning; and it is also not an objective aspect of meaning, which poses yet further problems for most feature analysts.

1.2. Problems for objectivist semantic analysis.

The bulk of the theoretical work on semantic features (Jackendoff, 1983 is an exception) has assumed that they are not only binary but also objective in nature. But, as just mentioned, speakers' subjective framing of lexical meaning is often an important component of semantic structure. Fillmore's (1976) discussion of the word *bachelor* shows, for example, that culture-dependent understanding of marriageable age (not identical with physical puberty) is part of the frame with respect to which *bachelor* has meaning. Similarly, the lexical choice of a preposition *on* rather than *in* in phrases like *on the bus* versus *in the bus* reflects (among other factors) the speaker's framing of the situation as involving either a vehicle operating "in service" or a vehicle seen as a simple container (Fillmore, 1985): one cannot say of children playing in an abandoned bus that they are "on the bus" without participating mentally in their imaginary travels over an imaginary bus route. Since the spatial relationship between the passenger and the bus is the same in both cases, such an example poses problems for an understanding of *in* and *on* as encoding objectively defined spatial configurations.

A further challenge for objectivist semantic analysis comes from recent work on metaphor (Brugman, 1983; Lakoff and Johnson, 1980; Lakoff and Turner, 1989; Sweetser, 1987, in press). This work has seriously challenged the possibility of describing lexical meaning and polysemy structures in terms of objective features, arguing that in many cases the meaning of a given lexical item can be adequately understood only in terms of the metaphorical structuring of one sense in terms of another, often more concrete, meaning. For example, when we use *rise*, *fall*, *go up* or *go down* in contexts such as *My income rose/fell last year*, we use words whose primary senses have to do with verticality and physical motion to talk

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this kind of data, these researchers use the idea of radially structured categories, characterized by one or more prototypical members and structured relationships between the rest.

about changes in abstract quantities ('more' and 'less' in a non-physical domain). Such uses are pervasive, and structure polysemy relationships in our lexicon at large (cf. Lakoff & Johnson, 1980). There is no definable objective criterion by which we could judge abstract quantities such as income to be similar to physically higher or lower vertical locations: analysis in terms of objective features will thus fail to explain natural and pervasive aspects of lexical meaning.

The difficulties of describing meaning change in terms of objective features are evident from standard examples. Cross-linguistically, it is common for words referring to physical vision to come to mean 'knowledge' and 'know' (via a stage of meaning both 'see' and 'know').[4] In describing a meaning change of this kind should we fabricate a semantic feature [+psychological] or [–physical] to talk about knowledge being mental vision? If so, what are the objectively definable features SHARED by knowledge and vision (to the exclusion, for example, of other sensory modalities), which remain stable over the domain-shift achieved by changing the value of the one feature [+psychological]?

Research has been therefore accumulating which shows that analyzing meaning in terms of binary, objective semantic features cannot always account for the complexity of the data. Together with other cognitive mechanisms that will be discussed in later sections, metaphorical analysis gives a way of talking systematically about synchronic polysemy (a pervasive phenomenon, though neglected in the literature until recently), as well as about diachronic developments arising out of this polysemy. Historical semanticists agree that polysemy is a necessary intermediate stage before a word changes (adds or loses) meaning. A semantic theory which allows for the operation of such (apparently universal) cognitive mechanisms as metaphor is inherently better equipped than standard feature analysis to deal with these complex cases of relationships within lexical meaning. By virtue of this, such a theory is also better equipped to deal with directional tendencies in semantic change, which in turn greatly contribute to the notion of regularity in diachrony.

1.3. Cognitive category structure in phonology.

It would seem that the enrichment of our understanding of lexical categories entailed by this kind of research makes semantics look very different from phonology, and removes the possibility of investigating parallels between synchronic structures or diachronic developments in the two domains. However, such 'non-classical' categorization phenomena also occur in our phonological categories. Jaeger (1980a, 1980b) provides experimental evidence to the effect that phonemes are psychologically real categories, as are at least some traditional phonological features. In some instances, she demonstrates that these phonological categories manifest prototype structure. For example, talking about the possible extensions of the [k^h] category, she reports that experimental subjects trained to recognize the [k^h] sound showed an unambiguous tendency to respond (in a subsequent experiment) to the [k] in the [sk] cluster as an instance of the same category. On the other

[4] Cf. Sweetser, in press.

hand, their response to the word final [k#] was less clear; subjects responded less strongly and systematically to this as a member of the same category as [k^h]. [k^h] thus served as a central, prototypical member of a category which speakers extended to a broader category corresponding to something like /k/; not all members of this /k/ category are equal, in that subjects clearly treated new examples of the original [k^h] allophone as 'best' members of the category, followed by [k] in [sk] and by [k#]. Phonological category structure in this case looks a lot like Rosch's analysis of psychological category structure.

Although many theoretical phonologists still claim that phonological categories can be exclusively described in terms of binary features, data like Jaeger's makes some of the distinctions look less binary. Jaeger reports that of subjects who successfully formed a category [+anterior] or [–anterior] based on feedback to their classification of other sounds, some included almost all [w]'s as [+anterior] and excluded them from [–anterior], but others classified [w]'s as [–anterior]. Similarly, speakers who had formed a category [+sonorant] and were successfully accepting undoubted sonorants and rejecting clear non-sonorants, when asked to classify [h], showed significant variation and disagreement; [h] is presumably a borderline case. Moreover, certain phonological parameters, such as vowel height, have long been problems for binary analysis, and may well need at least a multi-valued phonological treatment of an evidently gradient phonetic variable.

Yet another form in which category structure manifests itself is through some well-known implicational universals. Languages elaborate certain areas of their phonology more than (or temporally prior to) others. Stop systems, for example, are never less elaborated than fricative systems (stops are possibly more central members than fricatives of the category of consonants) while no language has /f/ without also having /s/ (here, /s/ is manifested as a more central member than /f/ of the class of fricatives). Such implicational constraints are found in semantics as well. No language, for example, has a more elaborate system of distinctions in its future tense system than in its past system. Berlin and Kay (1969) and Kay (1975) have shown that languages do not acquire a basic color term centered on pink before acquiring a term centered on red. Similarly, Kemmer (1988) has demonstrated that middle voice systems begin with 'central' middle semantics and may gradually spread to less central but related senses.[5]

To posit simple Boolean categories in phonology or in semantics would entail attributing to chance the striking similarities between the ways that change takes place in the two domains. While feature theory in semantics and phonology may successfully delimit categories, it does not provide any way for talking about intra-category structure such as the prototype structures which we have said influence sound and meaning change. The motivations for /s/ being an earlier fricative than /f/, or for a red term being earlier than a pink term, may be more directly accessible to physical and perceptual explanations than the reasons for directions of change in middle voice senses. But all these cases demand an

[5] Anderson's (1982, 1986) discussions of 'mental maps' argue that semantic change tends to be between cognitively 'adjacent' meanings; this presumably overlaps with prototype structure in semantics, inasmuch as cognitively adjacent concepts will tend to be grouped together in psychological categories.

explanation in terms of non-classical psychological categories.[6] Nor does classical feature theory explain the fact that subjects in the experiments of Rosch (1978) and Jaeger (1980) seem to be able to impose boundaries on fuzzy categories and domains—boundaries which may themselves change depending on the context of the categorizing task.

This discussion of cognitive motivations for category (re)structuring is not intended to say that change will never follow an unexpected path, but that there are paths of change which are overwhelmingly predominant. Those paths are often explicable by reference to the structure of cognitive categories in the relevant domains. Claiming that historical change follows regular directions is not a claim that such changes will necessarily occur in any given case, only that IF some change occurs, it will be in the established direction. The notion of regularity we are arguing for is the one outlined in the introduction: regular (i.e., recurring) directions of change, maintenance of contrasts after the change, and 'global' change for all subinstances of a given unit.

The 'non-classical' aspects of category structure in semantics thus appear to match similar aspects of phonological categories. Semantics is of course a richer domain than phonology in that it is not limited by the rather narrow physical constraints on pronunciation and perception imposed by our physical production and reception apparatus. But like phonology, meaning is limited by human perceptual and cognitive capacity, and (re)structured by whatever general principles underlie that capacity. Some of the differences between the two domains will be taken up in a later section. Here, we have argued that the same kinds of cognitive categorization processes are at work in both domains, and that these processes affect broad directions of change inasmuch as those can be discerned from universals.

2. Structural parallels between sound change and meaning change.

2.1. Two case studies in parallel.

Having clarified the background understanding of semantics and phonology presumed by our analysis, we would now like to present a couple of very basic data sets, one from phonological change and one from semantic change, to exemplify some of the parallelisms between the two domains.

A well-documented grouping of semantic shifts is the development of epistemic senses from root senses of English modal verbs (cf. Shepherd, 1981, 1982; Traugott, 1982, 1989; Sweetser, in press). During a relatively restricted period, *may* took on a meaning of possibility, *must* took on a meaning of certainty, *will* added epistemic likelihood senses to its willingness and futurity senses, and *can* (later and less completely) added possibility to ability

[6] Most of the recent historical work cited at the start of this paper—Traugott, Fleischman, Bybee, Anderson, Hopper and Kemmer, for example—assumes systematic influence of cognitive structure on semantic change, and in turn constitutes further confirmation of such an assumption. What we are arguing here is not simply that these linguists are correct, but that current cognitive theory provides convincing motivation for their assumptions.

among its senses. The earlier ('root') meanings of these words, still maintained alongside the newer ones, have to do with completely distinct semantic domains: personal obligation, ability, willingness, and (in another development from the root sense of *may*) permission. Sweetser (1982, in press) argues that the connection between the two sets of senses is systematically structured by a metaphor; our epistemic processes are understood and described in terms of more social concepts such as obligation and permission. Thus, for example, *John must be home by ten o'clock* would have a reading involving a root sense of *must*, which would mean something like 'John is obliged to be home by ten,' and a reading involving an epistemic sense of *must*, which would mean something like 'I (the speaker) am OBLIGED TO CONCLUDE that John is home by ten.'[7] The particulars of this analysis are not here at stake. What is at stake is the intuitive perception that the connection between root and epistemic modal senses is not random: that *must* could NOT just as well happen to mean obligation and possibility, rather than obligation and certainty.

What then are the regularities concerning the grouped shift of modal verbs to epistemic senses? First and most importantly, there is a natural polysemy relationship between root modal senses and epistemic senses: cross-linguistically, such polysemy is common, and in English it exists in other lexical domains besides the modal verbs (Sweetser, 1982, in press).[8] It is as natural and as ordinary for a single word to have root and epistemic modal senses as for [b] and [p] to be allophones of one phoneme. Second, there are regular correspondences between senses in the two domains: ability and permission correspond to possibility, while obligation corresponds to certainty. When a word adds an epistemic sense to a root modal sense, it will be the epistemic sense CORRESPONDING to the relevant root sense. And apparently, when one modal verb adds an epistemic sense, the others have an added motivation (beyond the general tendency) to change in a parallel fashion.

Suppose we now examine the group of sound changes known as Grimm's Law. Diagrammatically, these changes can be represented as:

$$bh \rightarrow b \rightarrow p \rightarrow f$$
$$dh \rightarrow d \rightarrow t \rightarrow \theta$$
$$gh \rightarrow g \rightarrow k \rightarrow \chi$$
$$g^{w}h \rightarrow g^{w} \rightarrow k^{w} \rightarrow \chi^{w}$$

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7 A past tense example like *John must have been home by ten* is unambiguously epistemic ('I am obliged to conclude that he was home by ten'), since it is very hard to imagine a world in which one can be presently obliged to do something in the past.

8 We are aware that there exist past treatments of English modals as essentially two sets of homonymous lexical items, unrelated in meaning. In such an account, there would be only a historical rather than a synchronic relationship between the two senses of the English modals. Sweetser (1982, 1986, in press) has argued that a synchronic polysemy relationship now exists for the two senses of the English modals: but for the present argument it is sufficient to note that the historical relationship makes a stage of synchronic polysemy necessary AT SOME POINT. There cannot have been a sudden development of a set of epistemic modal verbs, unrelated to but homonymous with the root modals.

The following are some obvious, but nonetheless important, generalizations about these facts. One, the shifts are interconnected: we would have a far less likely set of shifts if we instead grouped /b/ → /p/ with /d/ → /dh/ and /k/ → /g/. The voiceless stops change in parallel, as do the other series. Two, the voiceless stops change to the CORRESPONDING (i.e., homorganic) voiceless fricatives, the voiced stops to the corresponding voiceless stops, and so forth. We would indeed be surprised to see /b/ → /t/ grouped with /g/ → /p/ and /d/ → /k/, rather than the groupings we do find.[9]

The usual explanation for the parallelisms observed in the groupings of changes such as the Grimm's Law shift runs as follows. First of all, speakers give preference to generalization in their grammars (cf. Chomsky & Halle, 1968; Kiparsky, 1968b): a rule saying that all voiceless stops become fricatives is more general than one saying that /t/ becomes /θ/.[10] Second, such a rule is only general if the change or changes it describes are all shared by all affected segments: other features of the segments, not changed in a shared fashion, are assumed to remain unchanged. This means the stops change to corresponding fricatives, rather than to some random ones.[11]

What emerges saliently from these two case histories is the structural parallelism between the semantic change case and the phonological case. In each case, a group of units with certain common parameters are seen to change in parallel with respect to one particular shared parameter; the other parameters or features of each individual unit remain in some way fixed. The result is that the contrast between the units in question remains the same before and after the change: /b d g/ contrast with each other in the same way that /p t k/ do, and root *must* contrasts with root *may* as epistemic *must* contrasts with epistemic *may*. Semantic change, like phonological change, thus shows regularity of the type described under (2) at the beginning of this paper. The fact that we understand the phonological parameters involved in such parallelism much better than we understand the semantic parameters (e.g., we understand voicing much better than epistemicity) does not mean that we should ignore the semantic cases—rather the reverse.

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[9] Note that these observations are completely independent of one's analysis of the Grimm's Law data. One could equally well accept Hopper's (1973) or Gamkrelidze and Ivanov's (1973) reanalysis of the Indo-European stop system, in which case the first Germanic sound shift would be described quite differently than Rask or Grimm ever described it. But the description would still have the kind of regularity we are talking about.

[10] As will become evident in section 4.3, we see category structure and analogy as motivating factors which underlie historical trends towards generalization. That is to say, speakers do not abstract just any kind of regularity from the data presented to them, so it would be insufficiently explanatory to speak simply of a trend towards 'generalization' or 'simplicity' in the abstract.

[11] In a more phonetically based terminology, this is natural because there are regularly shared acoustic and articulatory parameters which give rise to groupings of segments, and which will cause related misperception and mispronunciation phenomena.

2.2. Phonemes and morpheme-senses.

Grimm's Law involves phonemes changing their phonetic forms 'in tandem,' while our semantic example involved a group of semantically related but contrasting morphemes changing their meanings 'in tandem.' Interestingly, for the parallelism to emerge, the units we need to treat as equivalents in the two domains are the phoneme in phonology, and the morpheme-meaning (what Langacker, 1987, would call the 'semantic pole' of a morpheme) in semantics. It has not been traditional to treat these two units as equivalents; indeed, accusations of irregularity in semantic change all tacitly assume that 'regular' semantic change would involve all morphemes which share some particular semantic feature changing together, as a parallel to all instances of a phoneme changing their phonetic forms. But this would essentially posit a semantic parameter of contrast (a feature) as being the analogue of a phoneme, rather than setting up an analogy between parameters in the two domains, and between phonemes and morpheme-meanings. The suggestive parallelism of our two examples would thus be lost.

In this section, we will discuss the question of choosing equivalent levels of units in phonology and semantics: to what extent are phonemes and morpheme-senses comparable units?[12] From a formal point of view, both the phoneme and the morpheme-sense can be thought of as clusters of parameters. Values on these parameters distinguish the relevant unit from surrounding units in the phonological or semantic system; both phonemes and morpheme-meanings are embedded in systems of paradigmatic contrasts. In both cases, the relevant parameters of contrast and the relevant categories are abstracted by speakers from a set of actual instances of use—an observed range of actual pronunciations or actual uses. Further, in both cases, it appears that speakers successfully group together distinct subclasses of phenomena as members of these larger classes. Allophones are recognized as 'the same' phoneme, subsenses of a polysemous morpheme as instances of 'the same' morpheme.

Following our hypothesis about the phoneme-morpheme match in generality, all instances of a phoneme changing to another phoneme are exactly parallel to all instances of a given morpheme changing to or acquiring a new meaning (for example, there is no irregular treatment of morpheme meanings in the sense that we do not find random use of a morpheme with new and old senses; the morpheme 'globally' acquires a new meaning, or shows structured variation between subsenses).[13] Thus the diachronic statements in (1), (2) and (3) below all express the same level of generalization:

(1) Proto-Hellenic /a:/ $\rightarrow$ Attic-Ionic /e:/

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[12] See Lakoff and Brugman (1986) for a comparison of arguments about lexical semantic and syntactic structure.

[13] We do sometimes find old senses of a morpheme retained only in specific fixed phrases, as in *(bank) teller*, which retains an old sense of *tell* meaning 'count.' However, it is also the case that in phonology a fixed phrase may undergo some phonological reduction not undergone by the relevant sounds in the system at large.

(2) Latin *habeo*, Eng. *have* ‘physically hold’ (I.-E.) → ‘possess’ (Latin, English)

(3) Tzeltal *?isim* ‘corn’ → ‘grain’ (Berlin, 1972)

The change in (1) is an instance of unconditioned vowel fronting while the changes in (2) and (3) are instances of abstraction and broadening/generalization respectively. The possibility of embedding what appear to be isolated changes in more general and (at least for semantics) possibly unidirectional trends will be taken up in sections 3 and 4. The point we want to make here is that if indeed all instances of a phoneme ‘match’ all instances of a word (as the correct comparison unit), then the regularity of (1) is matched exactly by that in (2) and (3).

Naturally, there are evident differences between a morpheme changing meaning and a phoneme changing shape, as well as parallels. A case in point is the difference between polysemy and allophony, if we take both phenomena to involve subcategories beneath the level of morpheme-meaning or phoneme. A morpheme apparently must go through a stage of polysemy in order to change senses, and new and old senses can apparently coexist indefinitely, not as rivals but as co-components of an integrated system. But although allophonic variation may be a result of many sound changes, it is by no means an inevitable result. Still, both cases can be seen as involving the restructuring of categories, and the differences may well be due at least in part to the fact that a morpheme-meaning is inherently part of a form-function mapping in a way that a phoneme is not. There is a stable identity to the morpheme (as determined by the form) despite changing mappings between that form and some grouping of senses, while there is no similar stable identity to a phoneme despite changes in form—two unconditioned forms of a phoneme conflict directly in a way that two senses of a morpheme do not, although conditioned allophones do not conflict.

This section has thus addressed point (3) from the introduction, and argued that in the same way that all instances of a phoneme in different lexical items are all regularly affected by a sound change, similarly, meaning change has a global effect on a morpheme meaning.

2.3. Paradigmatic structuring in sound and meaning.

Both morpheme-meanings and phonemes exist as units partly by virtue of their relationships to other contrasting units. We have argued in section 1 that the parameters which distinguish phonemic categories from each other, or morpheme-senses from each other, cannot be objective, nor invariably binary. Here we will discuss the paradigmatic relations which structure the two domains, with a view to further clarifying the claim that phonemes and morpheme-meanings change in parallel ways.

Regular paradigmatic relations are much harder to establish in the domain of lexical and morphemic semantics than in phonology, largely due to the immense quantitative disparity between the two domains. The hugely greater number of semantic parameters and semantic units, compared to the relatively tiny number of linguistically relevant parameters and units in phonology, means that it is impossible for a researcher to deal with all the ways in which morpheme-senses can potentially contrast.

However, paradigmatic relations between lexical meanings have been discovered. The theory of semantic/lexical fields represented most prominently by Trier (1931) and Porzig (1967) was devoted precisely to demonstrating the structural relationships between meanings and their effect on semantic change. Trier's (1931) example of the different German words for 'knowledge' is to the point: in Middle High German, a shift took place between two lexical systems for referring to knowledge. The earlier system contrasted *kunst* (all high, courtly knowledge, including knowledge about social behavior) with *list* (lower and technical knowledge, including immoral magical knowledge) and *wisheit* (a general term, but also a synthetic one, emphasizing the integration of different aspects of the human intellect). The later system contrasted *kunst* (no longer courtly, but still non-technical) with *wizzen* (which includes more technical knowledge) and with *wisheit* (now no longer a synthetic term, but referring only to spiritual wisdom, in contrast with more mundane crafts or knowledge). Both the relevant parameters of contrast and the senses of the individual words changed between the two stages of the language.

American structuralist work (e.g., Lounsbury, 1964) has also treated the vocabulary of particular domains (kinship terms, pronouns, etc.) as analyzable in terms of a limited number of relatively orthogonal meaning parameters, and in such cases the presence or absence of a contrasting category is often crucial to the analysis of a morpheme's meaning. Studies of the synchronic variability and diachronic developments of color terms in different languages also make clear the structural relationship that exists among the meaning scopes of 'adjoining' color terms (Berlin & Kay, 1969; Kay & McDaniel, 1978). The color terms are a particularly interesting case, because no analyst could now argue that their meanings are structured SOLELY by contrast: on the contrary, the focal colors around which other hues are classified are determined by the physiology of vision. Yet in any individual system of color terms, the classification of a specific hue (for example 'blue') will depend not only on the hue itself but also on the number of categories so far given names in the language. Even a language with two color terms covers the whole color chart with those terms. In cases such as these, viewing the relevant meanings as participating in paradigms is crucial to both their synchronic description and to understanding the way they change.

Hoenigswald (1960) is an attempt to characterize morphological and lexical semantic change in explicitly structural terms. Semantic change is described in terms of the emergence or disappearance of linguistically relevant contrastive meaning-parameters. In his discussion of the possible 'replacement patterns,' we find complete parallelism with the patterns of phonological change discussed in the literature. Analogous to phonemic merger, for example, we find morphemic merger resulting in semantic change: Latin had a contrast between 'maternal uncle' (*avunculus*) and 'paternal uncle' (*patruus*) which was subsequently lost in French (*oncle* refers to both). Phonemic splits (phonologization) on the other hand, are paralleled by morphemic splits; for example, older English *calf* was used for both the domestic animal and its meat. The latter meaning was eventually taken over by the French loanword *veal*, creating a contrast between the 'animal' and the 'meat' meanings.[14]

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[14] The *répartition* of *calf* and *veal* is part of a broad pattern involving French loan words in English: *pork/pig* and *beef/cattle* are parallel cases.

Not all lexical items obviously participate in salient and regularly structured paradigmatic sets. But phonemes also differ in their degree of integration into the phonological contrast-system. There are many languages (Proto-Indo-European probably among them) where for example the only fricative is *s* or *h*. In such languages, the /s/ or /h/ would be less integrated into the system of contrasts than in a language where a larger fricative inventory included contrasts such as voicing or place of articulation. Finally, just as phonemes can participate in different paradigmatic classes, according to the relevant parameter(s) (for instance, either place or manner of articulation or both can be the abstracted features characterizing a paradigm), so can morphemes. Fillmore's (1976) observation about the possible meanings of the word 'breakfast' can serve to illustrate the point. 'Breakfast' can be used in either of the sentences below but in each case it is understood as a member of a different paradigmatic set or, in Fillmore's terms, of a different frame:

(1) Breakfast served all day. (relevant parameter = food varieties)

(2) The Wongs have chicken soup for breakfast.
(relevant parameters = place in meal schedule and time of day)

(3) After sleeping from 3 to 10 PM, Anne ate breakfast at 10:30 PM and left for her night shift at the hospital. (relevant parameters = place in schedule, and possibly foods)

The system of salient cognitive contrasts is crucial in structuring synchronic sound and meaning systems, and hence change in those systems. And the individual category structures appear to be influenced not only by particular contrast parameters, but also by the global structure of the paradigm of contrasts.

2.4. Syntagmatic factors influencing change.

In attempting to understand and motivate phonological change, linguists have found it useful to examine both the relationship of the phoneme to other units in the phonological system and also the context of the phoneme in particular sound-sequences. We argue that semantic shifts are similarly rooted in both semantic paradigmatic structure and the context of use of a particular morpheme. The important point here is that the character of the explanation has depended on the character of the change. Articulatory and perceptual explanations have generally been accepted for conditioned sound change,[15] while paradigmatic explanations have often been proposed for unconditioned sound change.

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[15] For instance, 'ease of articulation' (cf. Paul 1880) has often been cited as a cause of assimilation in particular. But if 'ease of articulation' is the motivating cause of sound change, why do some dialects perversely retain the 'less easy' pronunciation? A more precise way to talk about articulatory influences on assimilation is to refer to the independence of different parts of the articulatory apparatus: phonetic nasalization is thus often due to the imprecise timing of velar movement with respect to articulation of stops or vowels neighboring a nasal sound. The simple 'ease of articulation' factor becomes even harder to defend when processes like dissimilation enter the picture, which in an obvious sense undo the predicted assimilation patterns. For a discussion of the perceptual factors underlying historical assimilation and dissimilation processes, see Ohala (1981, 1983).

Our perception of phonological category-membership is strongly influenced by the context of adjacent sounds. For example, a minimally nasalized vowel which is NOT in a nasal environment may be clearly categorized as phonemically nasal, simply because there is no contextual factor to which speakers can attribute nasality. Conditioned sound change appears to result in large measure from the lexicalization of natural mispronunciations and misperceptions which depend on the syntagmatic sequence of sounds being produced or perceived. It is not clear that syntagmatic structure is relevant in precisely the same way to meaning change: in particular, the definition of *context* in semantics does not require linear adjacency, as we assume that phonological context does. However, there is a plausible semantic analogue to conditioned sound change. From the point of view of cognitive linguistics, we would argue that categorization is done in general with respect to a frame. In semantics, categorizing tasks also show different results depending on the set of contrasts which the speaker sees as relevant, and which are evoked by the presence of a semantic and pragmatic context. For example, categorization of speech acts as lies (Sweetser, 1987) depends crucially on the extent to which the user of the word *lie* sees the speech event referred to as being a prototypical informative speech act.

We might thus take the syntagmatic context of a morpheme-meaning to be the semantic and pragmatic information which is correlated with a use of the morpheme. And there are cases where this context appears to shape meaning change, just as phonetic context shapes sound change.

Nasalization of vowels adjacent to nasals is typically non-phonemic, since listeners attribute nasal quality in such contexts to the inexact timing of the speaker's velar lowering and raising for the nasal consonant, rather than taking it as intentional nasalization of the vowel. But speakers may reanalyze this situation, and attribute the nasality to the vowel itself, rather than to the context. This typically happens in conjunction with loss of the nasal, an important piece of evidence that speakers tend to treat predictable parts of the sound sequence as non-contrastive. (In the earlier form of this putative language, the vowel's nasal quality was predictable; in the later form, the presence of a nasal stop becomes predictable data, and hence ignorable.) Historical change can potentially occur in this way, as a result of listeners' perception and interpretation of sounds relative to the syntagmatic context.

Similarly, Stern (1931, 185ff.) observes that words meaning 'rapidly' frequently come to mean 'immediately.' The context here is the frequent correlation between rapid action and immediate results. Stern hypothesizes that in cases such as (a) below, there was no ambiguity, since there is nothing in the utterance explicitly mentioning results or telicity. Rapidity is thus simply attributed to the writing process, and the possibility of immediate results remains a possible pragmatic implicature, but not a cogent one which is likely to become conventionalized. (This would presumably be parallel to a vowel with no nasal quality and no nasal consonant in the immediate vicinity.)

(a) He wrote quickly.
(b) When the king saw him, he quickly rode up to him.
(c) Quickly afterwards he carried it off.

In (b), which involves an imperfective predicate which has been bounded and made telic by the phrase 'up to him,' the adverb can still be understood to modify the speed of the riding. But the telicity makes the pragmatic implicature of immediate results a very firm concomitant of the semantics of rapidity. That is to say, immediacy of results is a contextually predictable added feature of rapidity in the context of certain kinds of predicates (this is parallel to a phonetically nasalized vowel in the context of a nasal stop). Speakers apparently reanalyzed examples like (b), attributing the 'immediate results' reading to the adverb's lexical semantics, rather than to the pragmatic context. They were then free to produce examples like (c), where the adverb *quickly* modifies *afterwards,* and can therefore only be construed as meaning something like 'immediately' or 'soon.' These would be parallel to speakers reanalyzing nasality as a phonemic characteristic of a vowel.

We could therefore argue that lexical meaning is influenced by the way speakers interpret it relative to its syntagmatic context of other neighboring lexical elements, and of concomitant pragmatic implicatures. In semantics, just as in phonology, historical change can result from listeners' reanalysis of contextual factors, which by this means become attributed to the contextually affected unit rather than to the context.

2.5. Abstraction in sound and meaning.

The final point of convergence between the phonemic and morphemic levels is that at both levels we are dealing with abstractions, in one case of a set of phonetic realizations, in the other over actual uses of a morpheme in context. Different relationships are possible between a phoneme and its allophones: for example, one of the allophones may appear to be the basic form of the phoneme, or the phoneme may have a more abstract form, not identical to any particular allophone. Controversy has on occasion arisen (e.g., Kiparsky, 1968a; Hyman, 1969) as to whether a phoneme MUST always have a basic form identical to some particular allophone; or, indeed, whether a phoneme has any 'basic' form, or is simply a set of surface alternate forms (Hooper, 1976). Of course, there is always the possibility that allophonic variation is minimal or zero.

Regardless of one's stance on the phonological issues, it is evident that closely parallel questions preoccupy semanticists with respect to morpheme-meanings. Does some particular sense of a polysemous morpheme have to be basic, or can we have abstract senses which are not identical to any of the specific subsenses? The latter case is generally known in the literature as the abstractionist position. Jackendoff (1983, chapters 9 & 10) offers many examples of this approach in his analysis of spatial and non-spatial (temporal, possessive, existential, etc.) expressions. The former is argued for in detail by Brugman (1988), Lakoff (1987), Traugott (1986a).[16]

Should the analyst look for a 'basic' unifying sense of a polysemous word, or is it sufficient to talk about what groupings of senses co-occur in connection with a single form?

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[16] See also Sweetser (1986) for a discussion of the criteria for deciding between an abstractionist and a polysemy analysis in a given case.

We would argue that this is an empirical issue, and that individual cases may vary with respect to the presence of an abstract unifying sense, but that it is certainly not universally possible to produce satisfying abstractionist analyses for all morpheme meanings. Horn (1985) argues conclusively that morphemes such as *and* and *not* have unified (and inherently quite abstract) meanings, and that pragmatic principles of interpretation account for the differences in meaning observable in examples like (a) and (b).

(a) Chris isn't happy, she's sad. (entails 'Chris is not happy')
(b) Chris isn't happy, she's ecstatic. (entails 'Chris is happy')

On the other hand, we have previously mentioned that many examples of metaphorically based polysemy present serious difficulties for abstractionist analysis, since it is extremely difficult to find any 'shared' features of meaning in such cases.

But setting aside the question of when to treat a morpheme as polysemous (rather than highly abstract in meaning), the important point here is that polysemy (which has not always received the proper amount of attention) implies the recognition of a generalization in semantics parallel to the phoneme-allophone distinction. And just as with allophonic variation of a phoneme, the range of polysemy of a morpheme may be extensive or minimal; but in either case there is cognitive categorization of the allophones or the subsenses of the morpheme into a related grouping, along parameters abstracted by the speaker from observed use.

2.6. Syntagmatic and paradigmatic influences on regularity and irregularity in change.

For phonology, it has been possible to set forth a relatively complete set of relevant parameters (allowing, of course, for disagreement among researchers as to the exact set and their precise characterization).[17] It may be inherently impossible to delimit a full set of semantic parameters relevant to semantic categorization and semantic change, both because of the immense variety of entities and events to be categorized and because of the local nature of many of the parameters (as *male/female* is only relevant within the class of animals, so *leafy/needle-bearing* is only relevant within the domain of trees, and so on).[18]

But multiplicity and locality of relevant parameters do not prove that the parameters are unrelated. As we have shown in section 2.3, there are in fact systematic paradigmatic oppositions in semantics. Although the parameters involved in such oppositions may not be classical objectivist binary features, progress has been made towards understanding and characterizing them. And the ways in which they combine, or shift their combinations, show parallels to phenomena long recognized in phonological change.

In phonology, the structure of the paradigm itself has often been claimed to influence phonological change. Thus, for example, a pervasive phonological contrast parameter (such as voicing in English) may influence the likelihood of a new phonemic contrast emerging from allophonic status: the phonologization of English /v/ and /δ/ may have been abetted by the parallelism between the f/v or θ/δ contrast and others such as p/b, t/d. Martinet (1952, 1955) offered the notion of ‘paradigmatic ease’ as an explanation for unconditioned sound changes which could not be explained by any notion of syntagmatic ease of articulation. Without wishing to overemphasize the role of the phonological paradigm as some purely formal structure, it seems clear that restructuring of a phonological system will depend in important ways on which sound contrasts are already salient for speakers; i.e., on the psychological categories already formed and the relevant contrastive parameters determining them.

In a parallel fashion, there may be different sorts of explanations to be given for different kinds of semantic change. Related groupings of semantic shifts seem (as in the case of coordinated phonological shifts) to involve both basic structural facts about morpheme-meanings (by which we simply mean what meanings are similar or related), and broader syntagmatic relationships. Martinet’s ‘push chains’ and ‘drag chains’ in phonology may well have analogues in semantics. For example, the idea of *répartition* in semantics (cf.

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[17] Ladefoged and Halle (1988) is a striking tribute to the significant amount of understanding of phonological structure shared between researchers with widely differing approaches.

[18] We have above indicated that we do not think semantics is reducible to a limited number of meaning primes, although we have also indicated agreement with analysts who treat lexical meaning as universally constrained by cognitive factors. (Constrained is not ‘determined’; there is room for cultural variation.) We will not here address some related issues of importance: for example, whether synonymy is possible cross-linguistically, or the extent to which any language exhaustively covers human cognition. It is interesting to point out that the former question is paralleled by a rather difficult question in phonology, namely to what extent we should identify phonemes with each other cross-linguistically despite minor phonetic differences.

Bréal, 1900) essentially involves push chains. The idea is that words which are identical in sense are somehow naturally redivided and given distinct senses.[19] By the same principle, words which are too similar in sense are 'pushed' apart to avoid running into each other's space (a simpler way of putting this is that speakers are looking for meaning differences when they see differences in form). A very clear example of such a synonymy-avoidance chain can be seen in the Sanskrit and Armenian vocabularies for the equine domain (Watkins, 1970): the Armenian word for 'horse' (*ji*) is cognate with the Sanskrit higher poetic word for a heroic 'steed' or 'courser' (*háya*), while the Armenian word for 'donkey' (*e:s*) is cognate with the Sanskrit word for 'horse' (*áśva*). Whichever of the semantic shifts occurred first ('steed' to 'horse' or 'horse' to 'donkey'), there is a clear relationship and coordination between them. The systematic CONTRAST (here, a relationship on a scale of 'nobility') between the two words has been maintained, even while the actual meanings have changed over time, rather as the Great English Vowel Shift changed actual vowel heights but in many cases left the height contrasts between phonemes unaffected.

We shall return in section 4.4 to the question of how systematic contrasts are manifested in analogical developments. It does seem clear that more salient and entrenched parameters of contrast are more likely to spread analogically, so that in this respect also we can view paradigmatic structure as being deeply influential on directions of change.

Throughout the preceding discussion, we have tried to make it evident that there are apparent differences as well as parallels between the domains of sound and meaning. It is not yet clear, however, what are genuine non-parallelisms between the behavior of the two kinds of unit, and what are simply apparent problems raised by the imprecise and rudimentary nature of our understanding of semantics. Thus, for example, the English modals are not QUITE regular in their shift to epistemic senses: *can* takes on an epistemic meaning only in negative and interrogative contexts. One possible reason for irregularity of this kind is the richness of the semantic domain: there are so many more factors which are potentially relevant to semantic categorization than to phonological categorization, that multiple forces may be at work to categorize morphemes together and to categorize them differently. Another possibility is that a Verner has not yet come along to show us the tidy subregularity exemplified by this (and presumably a wider class) of 'exceptions' to a broader generalization.

Yet another point to be considered is that the number of phonological regularities that have been discovered is much greater than the number of regular semantic shifts known to linguists. This may be simply due to the fact that we have been looking for phonological regularity for a much longer period of time. Again, however, we are leaving open the possibility for a greater potential for irregularity in the semantic domain, given the complexity of the parameters involved and what we take to be the non-feature-like character of meaning.

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[19] cf. Malkiel (1982) for broad treatments of ways in which two words' proximity in sense may influence their phonological development as well, and ways which phonological proximity may influence either semantic or phonological development.

We should also recall the irregularities which do occur in sound-change, and which usually go unmentioned in discussion of regular phonological change. Semantics itself is sometimes an influential factor in such irregularities: for example, the /f/ in English *four* is irregular and is apparently due to its semantic proximity to *five* (which has a regular /f/). Learned forms from an older stage of the language may sometimes displace their own legitimate heirs, dialectal borrowing may give the same speakers two (phonologically distinct) forms of the same morpheme, and so forth. We are willing to admit these explanations for irregular results of phonological change. It is true that we cannot count on such explanations turning out to account for all irregular meaning shifts; but if Verner had not been looking for regularity he would not have found it, so it behooves us not to discount the possibility that there are rules about apparently exceptional quirks in an otherwise regular grouping of meaning-shifts.

In the rest of this paper we will address these aspects of regular behavior that have to do with recurring and directional trends (point 1 in our introduction). In section 3 we will try to show that recurring (and in this sense regular) trends occur in semantics as well as in phonology, while section 4 will take up the issue of directionality and the cognitive mechanisms that underlie unidirectional tendencies.

3. General trends and spatio-temporal unities: semantic and phonological laws.

A recurrent point in the arguments against the existence of regularity in semantic change is the observation that semantic change affects only individual words and thus cannot be considered anything but sporadic and unsystematic. For example, Hock (1986) writes that ‘by and large, semantic change operates in a rather random fashion, affecting one word here (in one way), and another form there (in another way). Given the ‘fuzzy’ nature of meaning, this is of course not surprising.’[20]

The sporadic nature of meaning change has not gone unnoticed. Characteristically, Saussure’s prime examples of the accidental and particular nature of diachronic events come from semantic change (although he claims that the same is true of morphological and phonetic—i.e., phonological—change). That French *poutre* ‘mare,’ for instance, has come to mean ‘piece of wood, rafter’ "is due to particular causes and does not depend on other changes that might have occurred at the same time. It is only one accident among all those registered in the history of the language." (Saussure, p. 93)[21]

Saussure’s position departs rather interestingly from the Neogrammarian position which is dominant in modern phonological theory. While the Neogrammarian hypothesis treated sound change as regular and exceptionless, Saussure sees the main dichotomy as

[20] Hock may be among the few to believe still that meaning is completely unstructured and fuzzy, since most modern semanticists agree that one can analyze meaning in a structured way (although the ways of analyzing semantic structure can, as we have seen, differ among semanticists). However, he is certainly not alone in believing that semantic change proceeds in a random and unsystematic way.

[21] All Saussure references are to Saussure (1915/1959).

being between synchronic facts, which evidence a certain regularity, and diachronic facts, which don't; thus for Saussure, the correct way of viewing a diachronic 'phonetic' (i.e., phonological) law is to see it as multiple manifestations of a single particular and thus isolated fact, even if it affects all the words containing that given 'phonic feature.' In his words (Saussure, p. 93), 'we can speak of law only when a set of facts obeys the same rule, and in spite of certain appearances to the contrary, diachronic events are always accidental and particular.'

There are (at least) two ways of interpreting Saussure's characterization of diachronic shifts as 'isolated and accidental': One interpretation may be taken to refer to his belief that all instances of change are due to particular causes, not depending on other changes that may be occurring at the same time; moreover, the causes may not be discoverable and observable, since change does not reflect any intentional 'move' on the part of language speakers.

Many linguists have remarked before on the apparent conflict between Saussure's synchronic view of the system as full of systematic paradigmatic pressure (e.g., if a word X did not exist, its functional load would go to its competitors) and the diachronic claim that all changes are isolated and unsystematic (see Ullmann, 1967, for an extensive review of the relevant literature). Indeed, his celebrated example of the chess metaphor (p. 88), as Saussure himself points out, illustrates perfectly the effect that a change can have on the system as a whole; it is in this respect that it is hard to conceive of change as completely unsystematic. Moreover, the influence of internal paradigmatic factors on change is evidence that our ability to discover external causes is independent of whether there are observed regularities in diachronic shifts.

There is a second possible aspect, however, in Saussure's characterization 'isolated,' namely that diachronic events, in his view, are each 'one of a kind'; that is they are all of the type exemplified by the change of *poutre*, of a particular character and restricted to a particular time and place. The rest of this section is devoted to addressing this last point.

In summarizing the literature on semantic change up to that time, Ullmann (1967, esp. chapters 3 & 4) correctly points out that all the debate on the possibility of stating semantic laws was done in the context of either the laws of natural sciences or that of sound-laws. This created the following assumptions and expectations regarding phonetic and semantic regularities:

(1) that all sound laws are of what Ullmann calls the 'spatio-temporal' variety, i.e., that any phonological change took place in a limited period X and within a definite area Y. But as Ullmann points out, such an assumption was already disputed (even in phonology) by the work of Grammont and other phoneticians on assimilation and dissimilation;

(2) that all linguistic laws should conform to this pattern, and

(3) that semantic developments in general do not offer themselves to this kind of formula.

The spatio-temporal requirement is of particular interest here. What Ullmann is referring to is of course the fact that, in general, diachronic phonological shifts are described as taking place in a specific geographic/dialectic area and within a specifiable period of time. Well known examples here include the Great English Vowel Shift and the numerous phonological rules proposed to account for the differences between PIE and the daughter languages.

This way of characterizing diachronic laws appears to be collapsing two kinds of generalities which should be kept distinct: first, general recurring trends (e.g., assimilation or dissimilation) and secondly, specific instances of these trends at the level of the specific phoneme or morpheme-meaning. One can think of this difference as a type-token kind of distinction: on one hand, we have general processes characterizing a number of specific shifts; on the other, we have the specific changes themselves instantiating the general principles within particular spatiotemporal boundaries (Grassmann's law, for example, is both an instance of dissimilation and a particular phonological change characterizing the passage from IE to Greek). We believe that this is an extremely important distinction, pertaining to the question of regularity in both phonological and semantic change. It addresses directly Saussure's objection to potential regularity in diachrony and the objection of other historical linguists to the possibility of stating semantic laws.

Turning now to the semantic domain, it seems possible to view the documented semantic shifts in exactly the same way, establishing a two level distinction; on the one hand, semantic change appears to affect a specific lexical item or a specific class of lexical items in a specific time and place. The shift of the English modals from content to epistemic meanings, and Stern's example of English adverbs changing from the meaning 'rapidly' to the meaning 'immediately' (before 1400) can be thought of as instances of completed and geographically definable changes. At the same time, however, the content-to-epistemic shift is seen as exemplifying general, natural tendencies which recur in the history of words. Thus, Sweetser (in press) talks about this particular change as an instance of the general and pervasive metaphor 'mind in terms of body' (that is, our understanding of internal/more abstract meanings in terms of the external/physical world) while Traugott (1987, 1989) views it as an instance of the general tendency for meanings to become more situated in the speaker's attitude towards the situation (in other words of the tendency towards pragmaticization).

The 'mind-as-body' metaphor, for example, also encompasses the semantic shift of perception verbs in English and in other IE languages from concrete, physical senses to internal/mental senses (cf. the polysemy of English *see*, or of Greek *oida* 'know' which comes from the same root as the verb 'to see,' the shift of verbs meaning 'hear' coming to mean 'obey' etc.). In Traugott's terms, on the other hand, the shift of the English modals is an instance of a general tendency towards greater 'situatedness,' a tendency which encompasses also the shift of *while* (and other such conjunctions) from temporal to concessive meaning. The same tendency is exemplified by the semantic history of presuppositional (scalar) terms (e.g., *even*, *just*, *very*, etc.) which in many languages start out with concrete adjectival meanings (*just* < 'fair,' *very* < 'true' etc.). At this level of description, therefore, and by virtue of being an instance of a regular (in the sense of recurring) tendency/trend, the semantic shift exemplified by *while* ceases to be an isolated change in the Saussurian sense.

Although it is definitely restricted by spatio-temporal boundaries, it is also regular by virtue of the fact that it instantiates a general shift, not constrained by such boundaries. We want to suggest that this is true for both the semantic and the phonological domains; to the extent that such recurring (in different languages, at different times) tendencies are discoverable, they justify the characterization 'regular.'[22]

For the semantic domain this is particularly important; as we noted above, viewing semantic shifts in isolation may obscure the existence of regularity outside the specific spatio-temporal boundaries. As Malkiel (1957-1958) observes, the split of Latin *leo* 'lion, lioness' into French *lion* 'lion' and *lionne* 'lioness' will tend to be viewed as an insignificant process unless one places it in the context of a long-range trend, in this case what Malkiel calls hypercharacterization (the process by which vague, broader meanings split up again and again into pairs of signs with different signifiers). In the same way, many apparently isolated semantic shifts can be seen as falling under the umbrella of the general concrete-to-abstract tendency in meaning change; Traugott (1986b) gives many examples of this cross-linguistically pervasive tendency: spatial vocabulary acquiring temporal meanings, developing into different kinds of connectives (e.g., *but* < *butan* 'on the outside') or giving rise to speech act verbs or verbs of mental activity (e.g., *assert* < Lat. *asserere* 'join oneself to,' *deduce* < Lat. *ducere* 'lead').

It is worth noting that such tendencies can be 'captured' at multiple levels of generality. The shift of spatial motion verbs like *go* and *come* to tense or aspect markers, for instance, is evidenced in many (genetically unrelated) languages at different periods of time (cf. Fleischman, 1983; Bybee, 1985). This particular semantic and syntactic change is also an instance of the more general trend of spatial terms acquiring temporal meanings. Finally, it is also an instance of the 'objective' to more 'subjective' meaning shift, of the tendency for meanings situated in the external/objective situation to change to meanings situated in the internal/perceptual/cognitive world (Traugott, 1987, 1989). In yet another view, it is an instance of our general metaphorical capacity to structure the more abstract in terms of the more concrete (Lakoff, 1987; Sweetser, in press). In the latter view, the different levels of generality noted above can be seen as metaphors stated at different levels of generality.

We have argued that if the phoneme and the morpheme-meaning are taken to be matching units in their level of generality, salient parallels may be drawn between cases of phonological and semantic change. We now suggest that by distinguishing between general trends of change and specific instances of these trends, the possibility of discovering regularities in both semantics and phonology is greatly increased.

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[22] The claim is not that semantic change will inevitably take place or that it will inevitably affect all potential candidates, but rather that if change occurs at all, it is much more likely to follow the direction predicted by the metaphor or (in Traugott's terms) by the unidirectional trend towards pragmaticization. The same is of course true of phonological change as well.

4. Directions of metaphor, metonymy and analogy.

Having discussed some of the ways in which the domains of sound and meaning are similar and different in category-structure, we will now treat some of the major cognitive structuring mechanisms which shape the two domains in parallel ways. Recent work on directions in semantic change has differed from earlier work in its focus on possible explanations for directional trends. Traugott (1988) postulates metonymic structuring as an important factor in certain types of unidirectional meaning change. Similarly, metaphorical accounts of meaning shifts seem to inherently involve an explanation (as well as a description) of the semantic change in question. That is, such accounts rely on a general understanding of human cognition as inherently and pervasively involving metaphor and metonymy. Analogy has long been treated as basic to linguistic change, and can presumably be added to metaphor and metonymy as a cognitively basic aspect of linguistic structure.

4.1. Metonymic relations in phonology and semantics.

In both phonological and semantic change, metonymic relationships are evident. As we shall see, there is a major discrepancy between the two domains, in that metonymy is bi-directional in at least *some* semantic domains, but apparently unidirectional is other semantic domains and in phonology. Without claiming to explain these facts, we would like to set forth some of the generalizations which seem to have emerged from recent research.

Classic discussions of semantic change (Bréal, 1900; Stern, 1931; Ullmann, 1967). have given the names of *broadening* and *narrowing* to cases where a word's meaning takes on a more inclusive class of referents (subsuming the older class) or comes to refer to a subclass of its older class of referents. Examples include *girl*, which narrowed from meaning 'young person' to meaning 'female young person,' and *stuff*, which broadened from 'cloth' to 'material, substance.' Broadening and narrowing phenomena can be viewed as metonymic in nature (cf. Lakoff, 1987; Traugott, 1988); the category-name of a subclass is used to refer to the whole larger class of which the subclass was a part, or vice versa. It is often said that broadening is more common than narrowing, although we know of no controlled studies of developments throughout a language's lexicon which have actually supported this hypothesis.

The most confusing aspect of metonymic developments in lexical semantic change is that two distinct varieties of semantic relationship have been referred to as metonymic. One is the kind of broadening/narrowing mentioned above, where the part-whole relationship is between the category and a subcategory; the other is cases like words for 'hand' coming to mean 'arm,' where the individual referents stand in a part-whole relationship. That is, metonymy occurs both in *partonomies* and *taxonomies*. The classic studies of semantic change in taxonomic systems (Berlin, 1972; Berlin, Breedlove, & Raven, 1973) have shown that folk taxonomies of plants and animals begin by naming the generic level (which seems to correspond to a basic level category in Rosch's sense (Mervis & Rosch, 1981; Rosch, 1978). Generic level names often historically develop into names for EITHER the larger class of which the genus in question is taken to be a salient representative (e.g., 'oak' $\rightarrow$ 'tree') OR the species taken to be a salient representative of the genus (note the English 'oak' for both genus *Quercus* and species *Quercus quercus*). In fact, such developments are one of the most common sources of higher and lower-level terms in folk taxonomies. The story is rather different for partonomies, however. Examining developments of body-part terms, Wilkins (1981) argues that while part for whole is frequently instantiated in semantic change ('foot' → 'leg,' or 'finger' → 'hand'), the reverse process is not observed. Although other principles may be at work here (for example, 'finger' also does not come to mean 'body'), the asymmetry observed by Wilkins suggests that development towards a more inclusive sense is more natural than the opposite direction in this domain.

Narrowness and specificity are often seen as linked to concreteness, generality to abstraction. However, it is important to keep the two claims distinct, and the two parameters independent. There seems genuine support for the claim that words do not tend to become more concrete in meaning: the reason for this appears to be (at least in part) that we tend to metaphorically understand abstract domains in terms of concrete ones, and not vice versa. Many cases of abstraction seem to be metaphorical, rather than metonymic in nature (see 5.2).

But there are amply documented cases in taxonomic structures of words either gaining or losing in specificity; this is presumably because the basic level of cognitive categorization is an intermediate generic level. Further, such cases (e.g., 'oak' → 'tree' or 'oak' → 'Quercus quercus') do not bring about a change in concreteness: a tree, an oak, and a member of the species *Quercus quercus* could in fact all be the SAME concrete physical object, referred to in more or less restrictive terminology. A more general term may simply refer to a larger class of concrete objects. It has often been suggested that a more general category has a simpler semantic representation (e.g., fewer features) than a more specific one. But if Rosch is correct, we in fact find basic-level categories cognitively simpler than either more specific or more general categories, because they involve experientially motivated correlations in the relevant parameters. And they are in close metonymic relationship with their adjacent superordinate and subordinate categories, sometimes leading to semantic change in either direction.

Wilkins suggests that part-for-whole is more common than whole-for-part because a part implies the existence of some whole of which it is a part, while a whole need not have parts. Of course, it is not some real, extant whole which is implied by a part, but some CONCEPT of a whole which frames our understanding of the part. Thus, an object can be 'part' of some particular variety of car, even if it was never used in the assembly of any whole car, or even if no such cars ever made it to the assembly line. Given this idea of the whole as a FRAME for the part (an idea strongly supported for body part terms by the work of Petruck, 1986), we might extend metonymy to include other kinds of framing. Thus Traugott (1988) discusses examples of pragmatic strengthening which involve speakers attributing aspects of the pragmatic frame to the lexical semantics of a morpheme used in that frame: for example, a conventional inference becoming lexicalized. She treats Stern's 'rapidly' > 'immediately' cases (see 2.4 above) as examples of metonymic reanalysis of the adverb. The adverb's original meaning of 'rapidly' produced, in conjunction with telic predicates, a pragmatic implicature that the intended goal of the quick action or event would be achieved in a short time.

The adverb was interpreted relative to a frame involving this implicature. From being a contributing part of this pragmatic frame, the adverb was reanalyzed as contributing the whole, including the implicature.

Metonymy involving frames is inherently partonomic rather than taxonomic, and so joins our list of ways in which metonymy is likely to produce unidirectional change.[23] Metonymy in general appears to be a powerful force for restructuring both sound and meaning systems.

4.2. Metaphor.

Metaphor is, like metonymy, an apparently universal human cognitive mechanism. It involves mapping one domain onto another, and its linguistic manifestation is frequently the use of the vocabulary of the 'source' domain to talk about the 'target' domain.[24] For example, in our earlier example of verbs meaning 'see' coming to mean 'know,' knowledge is the target domain, and is viewed as vision and hence talked about with vocabulary from the domain of vision; this makes the relevant vocabulary polysemous, and potentially subject to reanalysis as non-metaphorical elements of the target-domain vocabulary.

Metaphor regularly shapes semantic change in this way, and the routes of change set up by metaphorical mappings are unidirectional because the metaphorical mappings are inherently unidirectional.[25] It has been argued that more cognitively basic and/or structured domains tend to serve as source domains for mapping onto less basic or less structured areas of cognition (cf. Lakoff and Johnson, 1980; Johnson, 1987). In particular, our understanding of our everyday physical experience of space and motion in the concrete world provides a basis for structuring more abstract and less clearly intersubjectively shared domains. Given such an account of metaphor, regular trends in semantic change, such as the development of temporal senses by spatial vocabulary (Fleischman, 1982a, 1982b; Traugott, 1982), or the development of psychological and epistemic senses by physical vocabulary (Traugott, 1982, 1987, 1989; Sweetser, in press) are unidirectional because human experience of the world naturally prompts us to metaphorically view these particular target domains in terms of these particular source domains, and not vice versa.[26]

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[23] One might see as metonymic cases where nasalization or creaky voice start out as properties of a particular phoneme and spread to become properties of the syllable or the word.

[24] Our own views on the metaphorical structuring of linguistic usages have been particularly shaped by Lakoff and Johnson (1980), Johnson (1987), Turner (1987); some further description of one of the present writers' views can be found in Sweetser (1987, 1988, in press).

[25] It has frequently been noticed that the same pair of domains may have reversed source-target relations in two distinct metaphorical mappings. For example, 'My memory banks are shorted out today' is evidence of a metaphor with computers as source domain and human beings as target domain, which apparently maps (at least) aspects of the two domains such as memory and reasoning powers. But 'My MacIntosh has been temperamental lately' shows human as source and computer as target domain, and appears to map human emotional structure onto the causes of computer behavior. It is important to realize that these are not instances of the SAME metaphor, and that each of the two metaphors is in itself unidirectional.

[26] Such a claim says nothing about other *possible*, but less 'built in' metaphorical cognitive mappings, or about other possible mechanisms which might motivate reverse directions of change. Metonymy is one such mechanism, and metonymic time-for-space usages can be seen in examples like 'She lives five minutes from

Because of the unidirectional tendency to view abstract domains in terms of concrete ones, metaphor is often a motivation for morphemes' acquiring more abstract meanings. Why should metaphor, if it tends to use concrete vocabulary, tend historically to create abstract meaning? We may compare this with the parallel paradoxical effect of euphemism. In speaking euphemistically, we try to find a nice word (a word whose basic sense is 'nice') to express a 'not-nice' meaning, and the historical result is often that the word is reanalyzed as lexically meaning the 'not-nice' thing. In speaking metaphorically, we often try to speak concretely, looking for a way to express abstract concepts in terms which will be close to our shared experiential structure of the concrete world. The historical result is that the concrete vocabulary can lexically and conventionally take on the abstract senses, and become abstract vocabulary.[27]

Metaphor is often based on *experiential correlation* (cf. Lakoff and Johnson, 1980), but must be distinguished from it. Thus, for example, we experience a correlation between quantity and verticality, in situations like pouring milk into a glass and watching the level rise. But this is only a partial correlation: if we instead pour the milk onto the kitchen floor or onto the grass on the lawn, it might take a great deal more milk than we are likely to have to allow us to witness a rise in level rather than lateral spreading or absorption of the liquid. However, although not an absolute correlation, the link between verticality and quantity is apparently a salient one, and (perhaps via a metonymy of these cases for a broader set of less correlated cases), a metaphorical mapping between the two domains is established at large. The presence of such a systematic metaphorical mapping motivates our ability to say 'my income rose/fell' or 'my supply of patience is low today.' using the vocabulary of verticality to talk about abstract quantities which have no actual correlation with physical positions on a vertical dimension.

A primary level of structure, and one which may well universally remain constant across metaphorical mappings (Brugman & Lakoff, 1988; Sweetser, 1988) is image-schematic structure. This is an abstract and topological representation of aspects of meaning, largely rooted in the understanding of physical experience mentioned above (cf. Talmy, 1987). Thus, for example, Sweetser (1988) suggests that an image schema involving a proximal source, a distal goal, and an ego moving from source to goal is preserved in the mapping of the deictic physical motion verb *go* onto the abstract temporal domain of futurity.

Unlike metonymy, metaphor appears to be relevant to semantics exclusively, not to phonology. However, as we shall see below, analogy is relevant to both phonology and semantics, and analogy is often influential in the spread of metaphor through the lexicon (for example, once one root modal verb has taken on an epistemic meaning, that fact adds to the

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the BART station,' where 'five minutes' is metonymic for 'the distance travellable in five minutes.'

[27] Meillet (1965) discusses the recurring phenomenon of 'vivid' vocabulary being used to reinforce and strengthen speakers' communicative intent, and the resulting recurring tendency for vocabulary so used to become less vivid. See Sweetser (1988) for a rediscussion of some of the same issues from a different perspective, involving metaphor.

motivation for the other root modals taking on epistemic senses). Metaphor is thus an important input to cognitive processes which are involved in both sound and meaning change.

Further, it is not always easy to distinguish metaphor from analogy. Gentner and Gentner (1982) and Gentner (1983) have said that analogy maps relations rather than properties; but, as we shall see below, some phonological analogies seem to involve properties (or features).[28] So it may be useful to treat metaphor and analogy in some ways as a unified phenomenon; there may be generalizations about the way one domain is mapped onto another which apply to mappings which we would call both metaphor and analogy.

4.3. Analogy in sound, meaning, and grammatical paradigms.

It is intuitively clear that analogy has (like metaphor) some natural directions: it is not, in general, equally comfortable to talk about X in terms of Y or Y in terms of X, nor is it equally likely that domain A or domain B could serve as a source for analogical reorganization of the other domain. One area where we might find common limitations on historical change, therefore, is in the area of structural limitations on plausible sources and targets for analogical restructuring.

Analogy is the setting up of some equation (X:Y::X':Y') which identifies the contrast between X and Y as 'the same' contrast which separates X' and Y'. In linguistic change, such incomplete equations (X:Y::X':?) often result in a new form Y,' which is said to be analogically created. The classic example of analogy in linguistic change has often been taken to be the sort of grammatical analogy discussed in Kurylowicz (1945-1949/1966). For example, paradigmatic leveling is the result of grammatical analogy, as when a noun like *honos* (gen. *honoris*) changes its nominative form to *honor*, by analogy with the invariant stem-final r of nouns like *color* (gen. *coloris*). The analogy is *color:coloris:: X :honoris*. Crucial to the structure of this analogy is the perception of a contrast (*color* differs from *coloris* only in the presence or absence of an ending *-is*), and imposition of this contrast in the structure of another domain (the form which would differ from *honoris* precisely by the absence of *-is* would be *honor*).

Analogy is said to be (unlike phonological change) irregular in its operation: not every Latin nominative ending in *-os* was affected by the process just mentioned. But such a perception is dependent on the assumption that all instances of a phoneme changing form would be parallel to all morphemes of some morphological class (or all lexical items of some semantic class) undergoing some change. If the correct parallel is rather between a single phoneme and a single morpheme-meaning, then analogy is not so unlike processes which are regularly observed in phonological systems.

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[28] It also seems that some of Gentner and Gentner's analogy examples map properties as well as relations: for example, in her 'atom-as-solar-system' example, physical bodies (sun, planets) are mapped onto physical bodies (nucleus, electrons). Unless properties are sometimes to be treated as one-place relations, which would make the whole discussion vacuous, it seems that we cannot rigidly distinguish metaphor from analogy in this way.

For example, in the second half of the 4th century C.E., Daco-Romance (the ancestor of Romanian) underwent a sound change /i/ → /e/ (thus *nigr-* 'black' → *negr-*). Other Romance dialects underwent the same change, including Italian. Italian, however, (together with most of Romance), shows evidence of a parallel process /u/ → /o/, while Romanian does not (Latin *ursus* 'bear' > Italian *orso*, Romanian *urs*). We know the social and historical reasons for this: the Italian dialect area underwent the /u/ → /o/ shift some fifty years later than /i/ → /e/, and during that fifty years the political connection between Rome and Romania was broken. The theoretical points to be made are (1) that there is a coherence between these two changes (Italian did something natural in adding the second one to the first), and (2) that the coherence was nonetheless not of such a compelling nature as to force Romanian into the second shift. Let us first examine the nature of the coherence.

The contrast between /i/ and /e/ is one of height (plus the elimination of contrastive length in the later forms of Romance), and in particular between a lax high vowel and a tense mid-vowel—or, if one sees vowel height as a non-binary phenomenon, between two adjacent positions on the continuum. The contrast between /u/ and /o/ is the SAME difference, although between different vowels. We could set up a proportion i:e::u:o. Given the small number of units involved, we can give a classical broadening analysis to the second shift: we can say that rather than adding a second parallel rule, Italian broadened /i/ → /e/ to 'all high lax vowels go to the corresponding tense mid-vowels.' But that word 'corresponding' is a crucial one, involving precisely the perception that 'the same difference' is involved in each case.

Now, regular though the combination of /i/ → /e/ and /u/ → /o/ may be, pure structural regularity was not enough to force such a change on Romanian. /u/ → /o/ is no more an inevitable result of /i/ → /e/ than the replacement of *honos* by *honor* is an inevitable result of the analogy with paradigms like that of *color* (as we have said, not every Latin noun with stem-final s/r variation was restructured analogically).

Regular sound change itself is apparently spread from one lexical item to another by analogy. Speakers must be aware of two possible phonetic realizations of the 'same' phonemic unit, for this lexical diffusion to be possible: a speaker who simply learned some of the conservative forms and some of the new ones, never knowing that two forms of the same word existed, would have no particular motivation to lexicalize the new phonetic realization in new areas of the vocabulary.[29] Lexical diffusion of phonological changes eventually results in regular substitution of one phone for another, IF competing changes do not

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[29] John Ohala (personal communication, 1988) has pointed out to us a way in which sound change could be initiated, for at least one particular form, without any awareness on the part of the initiator. He recounts the story of a linguist who told a tableful of other linguists the name of her undergraduate alma mater; the listeners all heard 'Chulane,' although the speaker insisted that the word pronounced was 'Tulane.' The allowable range of affrication and palatalization of $/t^h/$ for this speaker was evidently different from those of her hearers; her $/t^h/$ probably overlapped both with their $/t^h/$ and with their $/\check{c}/$. If the speakers in question had copied her pronunciation, and if they had (recognizing $/\check{c}/$ as a new, replacement realization for $/t^h/$) spread this new pronunciation through the lexicon, sound change might have taken place in a regular fashion eventually. The propagators of such a change, if not the initiator, would have to be aware of two systems.

bleed possible input from each other (cf. Wang, 1969), or competing social groups do not succeed in imposing inconsistent dialectal forms on speakers.

It is quite revealing to compare the morphological and phonological examples above with classic examples of meaning change. A case in point is the semantic development of the English modals, already discussed above in another context. Epistemic senses have spread through the English modal verbs until it is close to true to say that the modals underwent parallel semantic changes (cf. Shepherd, 1981, 1982; Traugott, 1982, 1988, 1989; Sweetser, 1982). One can very well imagine setting up proportions like ‘root *may* : root *must* :: epistemic *may* : X.’ As has been argued in more detail elsewhere (Sweetser, 1982, in press), these proportions are inherently metaphorical, in that the mapping of root onto epistemic senses involves metaphorically talking about our mental processes in terms of external physical and social processes or modalities.

The analogical development in the modal example is the EXTENSION of the metaphorical polysemy from one lexical item to another which is perceived as having a similar basic sense. Metaphor thus structures the possible directions of analogical change in meaning. Metonymy could also be viewed as spreading analogically: it is reasonable to think that speakers who are used to a particularly salient species sharing the name of its genus might tend to extend this pattern to other genera, which had not previously shared names with their most salient subcategories.

Such analogical proportions have not produced complete regularity in the semantic paradigm of English modals, however: *can* has at best a restricted epistemic use in polar environments (negatives and questions), as in ‘You can’t be from New York with that perfect Boston accent.’ The extension of the root/epistemic contrast to many different words within the modal class has not forced a complete generalization of this metaphorical mapping; and although the mapping is motivated by the same metaphorical structuring in every case, actual semantic change is dependent on morpheme-specific analogical extensions.

Independent of analogical factors, there are natural metaphorical reasons for modals to take on epistemic meanings, just as there are natural metonymic motivations for the ‘rapidly’ → ‘immediately’ shifts. Even when a new epistemic sense arises with the analogical help of other extant root/epistemic polysemy patterns, these non-analogical motivations are present as well. Our claim, then, is not that either the ‘model’ polysemy structure or the newly created one is motivated solely by semantic analogy. Rather, the parallelism in behavior between semantically similar words may analogically reinforce natural tendencies in the development of lexical polysemy—without imposing completely obligatory restructuring on every possible target domain. Neither phonology nor semantics, then, REQUIRES paradigmatic parallelism in historical shifting of units, but to some extent such parallelism does occur in both domains, and may be viewed as structured by analogy.

It should be noted, finally, that the classic examples of grammatical analogy do involve semantic as well as phonological ‘proportions.’ The *honor/honoris* example is crucially dependent on the analogy-maker’s understanding that the formal contrast (presence or absence of an ending *-is*) correlates with a semantic contrast (genitive vs. nominative), and that that MEANING-contrast is ‘the same difference’ in the two different nominal paradigms.

To take another example, English has phonological identity between its agentive suffix *-er* and its comparative suffix. But if we hear a child produce *badder* as a comparative of *bad*, we assume this is on the analogical model of adjective pairs like *big/bigger, short/shorter*. We cannot imagine that the same formal contrast in pairs of verbs and nouns (*run/runner*) is relevant to *badder*, because the semantic contrast involved in such pairs is not the same as the one involved in comparatives. The unique facet of grammatical analogy (and in particular, levelling of morphological paradigms) is then that they involve PAIRED analogical structuring at two levels; the unique result is regularization of form-meaning mappings, of a kind which is sometimes called levelling.

Returning to the examples of semantic analogical structuring, we may say that they are a degenerate case of the sort of structure involved in paradigmatic levelling: in the case of the modals, there is no regular contrast in form paralleling the contrast in meaning (the whole point is that a single form has multiple related senses, and that the relationships between the senses are parallel). With no form contrast present, we can reduce our structure to a purely semantic analogy between parallel meaning-contrasts. Similarly, in phonological analogical structures, there is not a meaning-parameter.

4.4. Directions of analogical spread.

In general, most linguists would agree that a pattern is more likely to spread analogically (all else being equal) if it is more pervasively present in the language; the more regular it already is, the more likely speakers are to regularize other areas of the linguistic system by analogy with it. For example, with the spread of epistemic senses among the modal verbs in English, the initial changes were presumably motivated by broad tendencies to use concrete vocabulary in extended epistemic senses; but the later shifts were also specifically motivated by the growing root-epistemic polysemy pattern of the other modals. Connectionist theories of cognitive structure would say that the stronger a pattern of connections has been set up, the more likely it is to extend to new areas (cf. McClelland & Rumelhart, 1986).[30]

Kurylowicz (1945-1949/1966) lays out some proposed universals about the direction of analogy. Although most of these have been challenged in various ways, and some of them have been claimed to be mutually contradictory, Kurylowicz correctly observed that there are more and less likely choices of source and target domains for an analogy. In language, a root with less allomorphy is more likely to be the source for analogical restructuring of another root whose paradigm is full of allomorphy, rather than the other way around. (For example, a possible analogical restructuring of *color/coloris* to *colos/coloris* on the model of *honos* or *flos* was not at all likely, while the restructuring of *honos* which did occur was 'natural.') Certain members of morphological paradigms are frequently observed to be 'pivotal' in analogical restructuring: for example, the third person singular and first person singular forms in verbal paradigms are more likely to be the basis for analogically created

[30] Connectionist work offers interesting prospects for both the understanding of metaphorical mappings and, as here, the reasons why humans tend to generalize in analogical ways.

forms than the second person singular or the third person plural. The tendency to restructure away from allomorphy presumably has to do with maximizing the one-to-one fit of form-meaning mappings. The pivotal character of certain forms seems connected with their unmarked status: for example, as well as being pivotal in morphological change, third person singular verbal forms frequently have zero morphology.

The paradigmatic factors which appear to influence the direction of phonological change could also be seen as analogical in nature. For example, when we say that the presence of a broad systemic voicing contrast in the English stop system may have abetted the phonologization of the voicing contrast in the English fricatives (initially motivated by French and dialectal English loan words), we are essentially talking about an analogical spread of a distinctive feature from one domain to another. And it would probably be more reasonable that the stop system be an analogical model for the fricative system than vice versa, since stops are apparently more central to the consonant system than fricatives, and languages usually have better developed stop systems than fricative systems.[31] The stop system is thus, for various reasons, more ‘pivotal’ to the system than the fricative system.

In phonological change, broadening (‘generalization’) of a rule’s environment or domain of application is historically common. A classic example (Kiparsky, 1968b; Niepokuj, 1985) is the change in the structure of the vowel-lowering rule in certain dialects of Swiss German: originally these dialects lowered /o/ to [ ] before /r/, but the environment was later generalized to include all coronals. Icelandic (cf. King, 1973) broadened its final devoicing rule from oral stops to all stops including nasal ones. On the other hand, we do not in general observe phonological rules ‘narrowing,’ or coming to apply to some subclass of the entities to which they once applied. Analogical mechanisms spreading patterns to more general application are part of the reason why broadening is so common. For example, we could view the Swiss German case as involving an analogy between the /or/:/ r/ contrast and a more general contrast of /o followed by coronal/ versus / followed by coronal/. In order for this to be an analogical structuring, there must be metonymic structuring first: only given the metonymic relationship between /r/ and the class of coronals is there any motivation for treating the two classes of sequence in the same way with respect to some sound change. It is not clear why narrowing is so atypical in phonology: in particular, one might expect the relationship between /r/ and the class of coronals to be a taxonomic one, not a partonomic one, so that in principle either broadening or narrowing might be possible. However, analogy itself tends to broaden rather than to narrow the domain of a generalization (it *extends* the generalization to new cases). Perhaps the pervasiveness of analogy accounts in large measure for our large numbers of broadening examples in phonology and semantics.[32]

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[31] Connectionist theories of cognitive structure would add that it seems likely that the more cases of phonemic voicing contrast were already in the system, the more likely such a contrast would be to spread to some other part of the system.

[32] Broadening of a morpheme’s meaning also inevitably involves using the morpheme in some contexts where more conservative speakers would have found it incorrect. Narrowing, on the other hand, involves using the morpheme in a subset of the previously accepted contexts, so that none of the uses will actually be

Overall, then, we claim not only that similar cognitive factors of category structure and paradigmatic/syntagmatic environment are relevant to structure and change in the two domains of sound and meaning, but also that because of these parallels in cognitive structure, metonymic and analogical restructuring will occur in similar directions in the two domains. The differences in patterns of restructuring are not fully explained, but may be motivated at least in part by differences in the cognitive structure of the two domains.

5. Category structure, universals and directions of change.

Next, we would like to briefly address some of the inevitable consequences of our claim for the understanding of universals and diachrony. The specific issue we wish to discuss has to do with a distinction often found in the literature, concerning possible motivations for formal and substantive universals.

Hyman (1984), discussing the issue of the nature of explanations given for formal and substantive universals, suggests that most commonly a distinction is made between 'internal' and 'external' explanations: 'If the problem to be accounted for is a syntactic one, an internal explanation will propose an account in terms of the nature of syntax itself, while an external explanation will attempt to relate the syntactic problem to phenomena outside the realm of syntax (e.g., semantics or pragmatics). Similarly, if the problem is a phonological one, an internal explanation will construct a theory of phonology to account for it, while an external explanation will seek a relation with, say, articulatory or perceptual phonetics.' (Hyman, p. 67).

At first glance, it might seem that such distinct types of explanations can be found in semantics as well. For example, it has been claimed that binary feature analyses for semantics and phonology are made possible by a formal universal motivated by the respective natures of semantic and phonological theory. Similarly, a substantive semantic universal is the development of root/content meanings before epistemic ones in the modal operators (cf. Sweetser, in press; Shepherd, 1981, 1982 for the cross-linguistic evidence for this direction of development), while a substantive phonological universal is the assimilation of nasals to the place of articulation of stops or fricatives rather than the other way round. Motivating both of these presumably could be some sort of external explanation (cf. Traugott's pragmatic explanation of the nature of the modal shift, discussed in section 3; the explanation for the assimilation universal lies presumably in articulatory constraints).

However, our discussion of category-structuring principles in section 1 should have made it clear that category structuring considerations motivate both formal and substantive universals, which are thus unified in having a common type of explanation. This motivation has to do with the way we seem to structure categories in terms of their prototypical members and in terms of specific types of relationships (e.g., metaphorical or metonymic) between members. Features (semantic or phonological), as the experimental evidence

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unacceptable to conservative speakers: the lack of any violation may make the change unnoticeable, and therefore unlikely to be adopted by more speakers.

shows, may well reflect prototypically structured categories as well. It is in this respect that the dichotomy between internal and external explanations for language universals breaks down. We are not arguing that there are really no universals of a formal nature (such as phonetic features) but rather that category structure can motivate both substantive and formal universals. Perhaps many so-called formal universals should really be seen as higher-order organizational properties of the cognitive underpinnings of language (features reflect the human need to abstract relevant parameters of contrast), while so-called substantive universals may often reflect more particular interactions between general cognitive principles. The universal fact that languages have /s/ if they have /f/ may well have solid acoustic and perceptual motivations, but not at the level of generality at which feature categories are motivated.

Such an understanding of universals would by no means imply that there is no contrast between ‘formal’ aspects of the linguistic system (taking ‘formal’ in the sense of properties of some particular language system which cannot be predicted from universal cognitive principles) and human cognition in general. Hyman’s contrast between the tendency to phonetically nasalize vowels next to nasals and the issue of phonemicizing this nasalization in a particular language is a contrast well-taken. But phonetic nasalization is a universal, while phonemicization of this phonetic nasalization is not a universal. Any true universal of language must have its explanation in the structure of cognition. Language-specific phenomena, on the other hand, are constrained and motivated by general cognitive structure, but clearly not predictively determined by it.

We agree with Hyman in finding the internal-external distinction artificial and in seeking a unified approach to formal and substantive universals. But we hesitate to make a division between external and internal explanations, in the usual sense of these terms. If we understand formal universals such as binary features to be the result of human perceptual and cognitive structure, rather than the result simply of the external nature of the phenomena so categorized, then it is not clear that such universals are inherently different from universals which are based on our cognitive categorization of other phenomena such as vowels adjacent to nasals, or topicality, or the root-epistemic shift. To label some of these phenomena as ‘internally’ explicable, and others as ‘externally’ motivated only makes sense if we see some categories (the ‘internally’ motivated ones) as having a genuinely different sort of motivation from the others.

It might seem from this last point that we are at odds with those who seek to give a functional/external explanation to language universals. However, we do not believe that there is actually a contradiction. In fact, viewing these as contradictory motivations would seem to entail a rigid separation of semantics and pragmatics, a view that we do not wish to align ourselves with.[33] Rather, the approach we are taking is that a given word or morpheme serves a particular pragmatic function by virtue of having a particular semantics associated with it. As a result, we do not, for instance, see Traugott’s ‘external’/pragmatic motivation

[33] In this respect we share the views of a broad group of linguists, including, for example, and Fillmore, Kay and O’Connor (1988), Jackendoff (1983), and Langacker (1987).

for the semantic shift exemplified by the modals (and other semantic classes of words—cf. section 3) as being in opposition to Sweetser's metaphorical, and therefore more 'internal'/semantic account of the same change. It is by virtue of their acquiring epistemic meanings (of the sort predicted by their root meaning and the structure of the relevant metaphor) that modal operators can serve pragmatic functions closer to the speech situation.[34]

As with the phonological universals discussed above, some metaphorical and metonymic structures seem far more universal than others. For example, mapping space onto time appears to be a true universal, although—as with phonemicization of phonetic nasal spreading—it is a fact about a particular language that it has chosen to lexicalize a temporal sense of some particular spatial term. Other metaphorical structures which may be pervasive in the lexicons of particular languages may nonetheless be anything but universal: the Indo-European 'text as woven fabric' (etymologically, the English word *text* meant 'woven') metaphor, for example, may be quite culture-specific. The universal metaphorical structures are presumably determined by human experience and cognition, while the culture-specific ones are underdetermined by the human mind and body.

Both in Hyman's 'internal' areas such as phonology and syntax[35] and in 'external' areas like phonetics and pragmatics, the same universal cognitive factors seem relevant. The crucial distinction, as we see it, is between fully determined aspects of linguistic structure, and aspects of language which show cross-linguistic variation because they are not fully predictable from general cognitive capacities.

6. Conclusions.

In summary, we have argued that semantic and phonological change are as different as sound and meaning—and as similar as human category-structures are to each other. Given a level of analysis which takes the morpheme as parallel to the phoneme, the structural characteristics of the two kinds of change are strikingly similar. Both can be seen as involving reformation of category structure, often by parallel processes of analogy (which may partially overlap with metaphor) or metonymy.

To return to the central question of irregularity, the level of comparison suggested above radically changes our understanding of regularity in semantic change. Phonological change is regular in all of the senses mentioned in our introductory section: (1) there are regular directions of change (particularly for conditioned change) which are more natural than others; (2) there are instances where natural classes of units change in parallel, maintaining the contrast relationships between them, and (3) when a unit changes its value (e.g., when a phoneme changes its phonetic shape), all sub-manifestations of the unit are affected. The first two of these kinds of regularity are readily observable in semantic change, and we have cited examples above. The third is the most difficult one traditionally: semanticists are

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[34] As we read Traugott (1989), she sees her analysis as opposed to Sweetser's.

[35] cf. Van Oosten (1984) for a discussion of the prototype characteristics of English subjecthood as a category, and of the English passive construction.

asked to explain why, although all instances of a phoneme change shape together, all instances of a certain semantic class of morphemes do not necessarily change meaning together. Setting aside the fact that this statement of the problem represents an oversimplified understanding of phonological change (ignoring, for example, lexical diffusion), our reformulation would suggest that the comparison should be between change of all instances of a phoneme (or all instances in the relevant context), and meaning change affecting the uses of a morpheme-meaning globally (as stated above, it normally affects all uses in the relevant semantic and pragmatic context, rather than affecting only particular phrasal uses).

As with phonological change, we cannot predict meaning change: even the most natural changes are not obligated to happen in particular languages at particular times, although they will be statistically much commoner than the less natural ones. What we can do is observe regular directions and regular groupings of changes, and use them as further evidence in our attempts to understand the nature of the units and parameters involved in semantic structure. Since semantic structure is less readily accessible and far less well understood than phonological structure, investigation of historical semantic regularities is a data-source which semanticists cannot afford to neglect. Our deepest hope is that this paper will stimulate further additions to the corpus of thorough, theoretically situated studies of diachronic semantic phenomena.

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