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ABSTRACT

The natural phonology theory, related to European structuralism, makes two fundamental assumptions: (1) phonemes are mental images of the sounds of language, and (2) phonological processes represent subconscious mental substitutions of one sound or class of sounds for another that are the natural response to the relative difficulties of sound production. The processes are either fortitions, that is, they ensure perceptual clarity in pronouncing different words; or they are lenitions, that is, they represent change toward articulatory simplicity enabling the vocal apparatus to do less work. It is posited that these processes are not learned by speakers in acquiring their language, but are a universal response to difficulties presented by physical and perceptual limitations of human nature. Evidence is reviewed showing that these processes are found in the description of the development of various languages, and in the pidginization process. Difficulties encountered in first and second language learning seem to bear out the natural phonology theory. Natural phonology predicts that second language learners will substitute "easier" sounds for those that do not exist in their native languages, that they will treat similar sounds as if they were the same as those in their native language, and that some errors cannot be attributed to interference because they are due to the operation of universal phonological processes. (AMH)

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NATURAL PHONOLOGY INTERFERENCE IN SECOND LANGUAGE ACQUISTION

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As a linguist trained in phonological theory and employed in a department primarily oriented towards training teachers of ESL, I have become interested in the question of what current phonological theory can contribute to the question of second language acquisition. In consulting the literature on questions of phonological interference I discovered the 'debate' between the proponents of contrastive analysis (CA) and error analysis (EA). A good summary of this debate may be found in articles by Sridhar, and Schacter and Celce-Murcia in Croft (1980).

The debate struck me as extremely odd, in that the debaters do not seem to share common ground as to the terms of the debate. Contrastive analysis, based as it is in the theories of American structuralist linguistics, holds that interference can be explained in terms of contrasting phonemic inventories--and describes errors in terms of underdifferentiation, overdifferentiation and so on. The theory is thus highly dependent on linguistic assumptions that appear to be outmoded. Error analysis, on the other hand, is a purely pragmatic theory which holds that there is no theoretical way to predict the errors that language learners will make, and that consequently language teaching materials must be based on the empirical results of classroom studies. From the point of view of someone trained primarily in theoretical linguistics and interested in general questions of the nature of language, this strikes me as a very strange debate--a debate between a source of data and a possibly inadequate account of that data.

In addition there is the recent theory of interlanguage. Informed, as it is, by recent studies in the pidginization/creolization process, it would seem to have a great deal going for it. However, it also appears to be primarily a descriptive concept, explaining that learners go through various stages, but making no substantive claims about what those stages can be.

In this paper I want to examine a new, performance-based theory of phonology, concentrating on how it can provide an explanatory theory which will reconcile all three competing theories. The theory I am going to present is known as Natural Phonology, and was first formulated by David Stampe (1969, 1972), with additional work by Patricia Donegan (Miller 1972, 1973 & 1979,) and Richard Wojcik (1979, 1981). Let me note here that Natural Phonology is not to be confused with the similarly-named but toatlly different theory of Natural Generative Phonology proposed by Hooper (1976) and others. Natural Generative Phonology is a highly constrained version of orthodox generative phonology, while the Natural Phonology I am dealing with here is much more closely related to European structuralism as enumerated by Baudouin de Courtenay, Trubetzkoy, Martinet and some works of Edward Sapir.

There are two fundamental assumptions of natural phonology. The first is the psychological reality and importance of the phoneme. To the American Structuralists the phoneme is a structural element, a point in a network of oppositions. Thus phonemes were abstract elements describable only in terms of their differences from each other. In generative phonology, phonemes are the abstract units that most economically represent the morphemes of the language, with all redundant

information eliminated and the nature of the phonemes expressed with incompletely filled-in matrices of distinctive features. In a sense this is exactly the same as the structuralist definition--abstract items classified only according to their oppositions. Again, phonemes are not sounds, but merely points on some abstract plane.

In contrast to this view we may set natural phonology. This theory holds that phonemes are mental sounds--mental images of the sounds of language. Phonemes are the sounds that one hears when language is spoken, and the sounds that one aims at when one is speaking. Thus they are perceptual patterns and articulatory targets. Phonemes are thus not merely classificatory definitions, but real mental entities. They are the sounds we hear and speak with. As such, it is clear that they cannot be as abstract as those posited in generative phonology. For example, in the Sound Pattern of English it is claimed that the vowels in the English words fine and fin are 'the same' phonemically, differing only in the operation of some rules. Natural phonology would take issue with this claim, pointing out that native speakers never make speech errors substituting one for the other in spoonerisms nor do such word games as Pig Latin provide any evidence for this analysis, although other, more concrete phonemicizations produce such effects. On the other hand, it is clear that speakers' mental categorization of sounds must be at least as abstract as the American structuralist level, because allophonic variation in sounds is not perceived by native speakers.

Evidence from speech errors, language games like Pig Latin, first and second language acquisition and historical change is crucial to natural phonology, because the theory is interested in the mental reality behind sound systems. It is a performance-based theory, in that evidence from all kinds of performance, errors as well as formalized corpuses will give clues to the ways in which speakers of human languages actually organize, store and produce the sounds of their languages. To summarize, to natural phonologists, phonemes are mental images that are used as perceptual templates and articulatory targets.

Why, on the other hand, do we not pronounce the phonemes as we hear them? Why is phonology more than merely a listing of those sounds that we hear? The answer to this question is the second major tenet of natural phonology--the concept of phonological processes. Processes look like the rules of generative phonology, but they have totally different metaphysical status. They are not learned or acquired by the speaker, but rather represent subconscious mental substitutions of one sound or class of sounds for another that are the natural response to the relative difficulties of sounds. Thus, processes have articulatory and perceptual explanations, because they are carried out for articulatory and perceptual reasons.

There are two fundamental reasons for processes to occur. Some processes represent moves towards perceptual clarity or distinctiveness. These are called fortitions, and their purpose is to ensure that distinct words are pronounced distinctly because they contain sounds that are pronounced and perceived as different. Other processes represent change towards articulatory simplicity. These are changes resulting in ease of articulations, and are called lenitions. They are carried out on behalf of our vocal apparatus, and enable it to do

less work in the time allotted to it by reducing the number and amount of fine adjustments that human speech requires.

It can be seen immediately that these two sets of processes, fortitions and lenitions, operate in opposite directions. This provides an explanation for the question of why language change is not all uni-directional. Many linguistis have claimed, for example, that all language change is a kind of simplification. Much of generative phonology holds this view, for example. Such theories are unable to explain why all languages do not end up as vocal mush. Natural phonology holds that the conflicting tensions of clarity and ease of articulation hold all languages in a state of dynamic equilibrium, and that any movement towards one direction will ultimately be balanced by an opposite movement.

Fortitions come in several varieties. Some, the obligatory ones, establish the fundamental nature of the major allophones of the language. For example, there is an obligatory process of aspiration in English, which ensures that most occurrences of voiceless stops are aspirated, thus making them perceptually distinct from voiced stops. Optional fortitions also exist, and are brought into play when greater clarity of speech is called for. Thus they apply more often in formal presentation and in contrastive contexts. For example, word final fricatives may optionally be made syllabic after a consonant. Such syllabification may occur in contexts such as the following: 'I said dogs and cats, not dog and cat.' A similar process is operative in such pronunciations as 'Puh-lease' and 'ni-ines' as pronounced by telephone operators. Note that examples like these are considered to be evidence about phonology and linguistic theory just as much as the more popular citation forms, distribution charts and paradigms.

Lenitions, on the other hand, provide the explanation for many other so-called allophones of phonemes. For instance, in English all vowels are nasalized before a following nasal consonant. For example in the words canned and annotate the a is always nasalized. This represents a movement towards articulatory simplicity. By nasalizing the vowel we require a less rapid movement of the velum than would otherwise normally be necessary. Similarly, the well-known substitution of a voiced alveolar flap for the alveolar /t,d,n/ as in city, rudder, and runner is explained in terms of ease of several types. By voicing the sound less fine-grained adjustments of the glottis are necessary. By substituting a ballistic motion for the more carefully placed one required for normal stops, articulatory programming is simplified.

Since these processes are posited as responses to perceptual and articulatory pressures, they are not learned by speakers in acquiring their language. Thus, they do not differ from language to language, but represent a universal response to difficulties presented by our natures as human beings with particular, physical and perceptual limitations. It is in this sense that natural phonology holds that processes are innate--not that they are somehow 'wired-in' evolutionarily, as Chomsky holds, but that they reflect the universal articulatory and perceptual apparatus of human beings. Since the velum is a relatively large and heavy piece of tissue, languages will tend to 'spread' nasalization over several segments to minimize the number and speed

of the movements required of it. Similarly, the presnece of a voiceless burst after a stop (aspiration) renders the acoustic signal more segmentable, ever by a machine.

Since these processes are universal, we would expect to find them in other places besides in the synchronic descriptions of the phonological systems of languages. This is in fact exactly what we find. For example, English has a process velarizing /l/ syllable finally. This often ultimately results in what sounds like an /o/ so that words like real end up being pronounced like Rio. This change is often found in the acquisition of English by speakers who will then go on to have normal /l/'s in that position. It is also found in various language changes in other language families. It is the same change, for example, which results in the spelling Beograd for the Yugoslavian city, and in the French veau corresponding to English veal. Similarly, the change from Latin /l/ to Italian /y/ in such words as fior 'flower' is reflected in child language acquisition studies. One child, who at the time in question was replacing all /y/'s with /z/ pronounced lamb with an initial z as zab. Presumably this reflects the process: l becomes y followed by a separate process replacing y with z (a change which is necessary for example, in the description of the development of the Scandinavian languages).

Similarly, many changes that occur in the pidginization process are also specific instances of these universal phonological processes. Most English-based pidgins (as well as Black English and Hawaiian English) simplify final consonant clusters, giving forms like lef' (left) and ast (asked). Exactly the same process occurs in children's English, and of course in historical changes in many languages. In general, those changes which are posited as universal processes occur in the acquisition of various languages, and are instantiated as historical changes in numerous unrelated languages. The reason for this is that processes exist because the human speaking and perceptual apparatus has a particular nature which all human beings share.

At this point we may contrast natural phonology with generative phonology, which has 'rules'. Rules are established in generative phonology to account for allophonic variation and to account for morphophonemic alternations such as the famous divine--divinity. Generative phonology views these processes as learned (although such metatheoretical devices as arrows, environment slashes and so on are considered to be innate.). To the extent that American structuralists raised the question of acquisition they also believed these processes to be learned.

In natural phonology, on the other hand, the processes are explicitly not learned. Since they are automatic responses to the nature of our vocal apparatus, they occur at first spontaneously in their entirety. Phonological acquisition is thus viewed by natural phonologists as the suppression of processes. That is, learning to speak is learning not to apply those processes which eliminate or modify the sounds of the native language, retaining only those which eliminate non-native sounds, or which correctly produce the appropriate allophones. Thus in English the process eliminating initial velar nasals (which are relatively rare in the languages of the world, and which are often eliminated in language change) is never suppressed. Consequently,

people who speak English find initial velar nasals in names like Nguyen and Nkruma 'hard to say'. As Wojcik (1981) has pointed out, it is the cumulative residue of unsuppressed processes which accounts for our inability to say non-native sounds and sequences of sounds. To a child, all sounds are hard to say. And to a learner of a second language, those sounds are hard to say for which there are unsuppressed processes in the first language.

As a consequence of this fact, second language learners of some L2 will no more be able to produce the 'difficult' sounds of that language than a child learning the L2 as a native language. Exactly this fact seems to be behind the convergence of L2 errors and developmental errors referred to by Schacter and Celce-Murcia. For example, the English /r/ is a relatively difficult sound for ESL students to acquire. Most ESL students have some equivalent resonant which they can substitute. Children acquiring English, on the other hand, are forced to replace it either with nothing or with /w/. In both cases, the sound presents an equally great obstacle although the solutions may differ.

The subconscious nature of processes leads to another source of difficulty for learners of a second language. It is often the case that sounds produced by allophonic processes in one language correspond to quite different phonemes in another language. Thus speakers can produce a particular sound while aiming at another, but not while aiming at the sound itself. Several well-known examples should clarify this. Many languages have unaspirated voiceless stops: French, Spanish and Greek for instance, and these always present difficulties for speakers of English. However, it is not the case that English lacks voiceless unaspirated stops. Such sounds represent the voiceless phonemes of English after /s/. However, producing these sounds consciously when they do not follow /s/ is very difficult for English speakers, because of the process aspirating initial voiceless stops. Most speakers of American English do produce voiceless aspirated sounds frequently in initial position, however because there is a process devoicing initial voiced stops in English. While the process is optional, it is quite normal for native speakers of English to pronounce initial voiced stop phonemes as voiceless unaspirated stops. Of course we are not aiming at those sounds, nor do we hear them in those terms. We perceive them as voiced. That is why English speakers are unable to distinguish between voiceless unaspirated and voiced stops (speakers of French and Spanish have no difficulty). In initial position, voiceless unaspirated stops are voiced phonemes. However the consequence of this fact is that when English speakers aim at voiceless unaspirated stops they produce aspirated ones, but when they are told to aim at voiced stops (which they are sometimes told will help) they usually produce real fully voiced stops. This occurs because in learning a second language people tend speak more carefully, and in careful speech fortitions predominate. One of the fortitions operative in English is careful voicing of initial voice stops. (As evidence of the fact that English voiceless stops are not perceived as being aspirated, but merely as being voiceless, is the fact that it usually takes a special demonstration with candles or pieces of paper to convince a language or phonetics class that aspiration even exists in English.)

Another example, again going from English to an L2, involves acquisition of Turkish. Turkish has a high back unrounded /ɨ/ phoneme. This sound, again, is relatively rare in the languages of the world (primarily for acoustic reasons) as a phoneme, and speakers of English have never suppressed the processes which eliminate it, replacing it either with /i/ or with schwa. Thus, in encountering Turkish names or words with this sound they respond with one or another of the changes. (The fact that the sound is written with a modified ı doesn't help, although it does not explain replacement with schwa.) However, most speakers of (at least) Midwestern English have this sound all the time. It is a reflex of the phoneme lax /u/ and occurs in such words as good and should. Again, of course, if speakers are encouraged to focus on this fact in order to help them acquire Turkish (or Japanese, which also has this sound), the sound will almost certainly be produced with strong rounding, because of the fortition effects brought about by the strain of trying to speak a new language.

What general claims can we make then, about how learners go about learning a second language, from what natural phonology tells us? The first task the learner must accomplish is to become aware of the sounds of the new language, and to store them as idealized targets. However, it is at this point that the real battle begins. Although the targets now exist as mental images, all of the unsuppressed processes left over from the innate equipment as human beings come into play. Some processes will eliminate sounds, others will wreak havoc with 'impossible' sequences of sounds. Following the predictions of the classical CA analysis, sounds that do not exist in the L1 inventory of phonemes will be eliminated, replaced with 'easier' sounds. Thus, in the acquisition of French or German, front rounded vowels are replaced either with the sequence /yu/ or with an unrounded equivalent. What is done with the sounds that do not exist, will follow the lines drawn for them by the innate processes. For example, it has been noted that L2 learners often do things to their language that cannot be explained by processes operating in the first language. Stampe points out (1972), for example, that Vietnamese speakers devoice final stops and fricatives in their English. But Vietnamese does not have final stops and fricatives of any kind. Only the existence of innate processes could explain substitutions of this kind. Since Vietnamese speakers have never confronted final obstruents, they have had no reason to suppress the process devoicing them. Thus the process which occurs as an important rule of German and Russian also interferes with the acquisition of English by speakers of a language which doesn't have the relevant sounds in the first place. In my research I have found the replacement of the voice uvular fricative of French (the "French /r/") with a voiceless velar fricative, the ch-sound of Bach or loch. While such a substitution is completely inexplicable from the point of view of CA, it makes good sense in natural phonology terms. The sound in question is extremely rare in the languages of the world (in this case for articulatory reasons involving airflow). Devoicing it makes it much easier to produce (many more languages have voiceless velar and uvular fricatives than voiced ones). Thus there is a process devoicing back fricatives. Speakers of English, of course, have never had any reason to suppress this process, since they do not normally run into the sound. When they do, however, it comes into play, producing a simpler, but still non-English sound.

What happens, on the other hand, when the learner runs into sounds that appear to be identified with the phonemes of the L1? In that case, they get treated exactly as if they were sounds of L1. So voiceless stops in French are aspirated by English speakers. And both /t/ and /d/ are flapped. French has a process denasalizing vowels in certain circumstances (in particular, in front of certain nasal consonant structures). Americans must learn not to apply this process (or alternatively, not to nasalize vowels in that context). The alternative is an American accent.

In conclusion I would like to argue that natural phonology is the only current theory of phonology in general linguistics today that can account for the facts that teachers of second languages already know--that learners substitute 'easier' sounds for those that do not exist in their native languages, and treat similar sounds as if they were the same. Thus, natural phonology also predicts that native speakers will make errors that cannot be attributed to interference from the native language in any obvious surface sense. Errors also occur because of the operation of universal phonological processes, processes which do not figure in the normal description of English, because within other theories they do not exist. Furthermore, natural phonology presents a conceptual framework for the study of interlanguage. In most cases, the facts of interlanguage, to the extent that they cannot be attributed to the operation of processes in either L1 or L2, must come about because they represent the residue of unsuppressed processes our language has never taught us not to do.

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