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ABSTRACT

This paper begins by distinguishing phonology (the study of the systematic nature of the inter-relations of sounds in a language) from phonetics (the attempt to describe completely all the physical properties of an utterance). It is shown how in any language some properties of sounds are intuitively more relevant to the grammar and functioning of that language than others, and that it is therefore necessary to recognize the existence of a representation of an utterance from which a great deal of phonetic information has been removed but which contains all of the information necessary to distinguish this utterance from others in the language. As an example of how a consideration of the phonology of English can reveal a systematicity not obvious from the phonetics of the language, a discussion of the placement of primary stress in English words is presented. (FWB)

PHONOLOGY

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. onology, like phonetics, is concerned with the study of the sound system of a language. It differs from phonetics, however, in that while phonetics aims to capture as completely as possible all of the physical properties of an utterance, phonology aims to clear away as many of these as it can in order to reveal the systematic nature of the inter-relations of sounds in a language.

At a fairly early point in the development of sophisticated studies of phonetics it was realized that from one point of view, the addition of more and more parameters to the description of the speech act constituted a step backward, rather than forward. Some properties of sounds, that is, are intuitively more relevant to the grammar and functioning of the language than others. To take a simple case, consider the t sound in stop: we know that it is a voiceless dental stop, but we also know that it is unaspirated; that it is held for a particular amount of time (on the average); that it is in fact a tip-alveolar, not simply a dental; that the pharynx assumes a certain characteristic width during the production of the sound, and so on. All of these properties are necessary to a complete phonetic description of the sound,

and yet there is a sense in which it is enough to say of this t that it is a voiceless dental stop. The question is, then, how we determine which properties are important in this way and which are not.

The range of answers to this question that have been proposed by various linguists would take us far afield of our concerns here. The important point to be noted, however, is that in order even to pose it we need to recognize the existence of a representation of an utterance from which a great deal of phonetic information has been removed, but which contains all of the information necessary to distinguish this utterance from others in the language. This other level of representation, then, (called "phonemic" in various uses of the term) is an abstraction, not necessarily directly discoverable in the utterance without recourse to other information about the language, but systematically related to a complete phonetic record.

Consider, for example, other segments in utterances other than stop which we might also call "voiceless dental stops." Take the t's of top, spot, and potter. The first of these, the t in top, is aspirated, unlike the t in stop. Its duration is also greater. The t in spot, on the other hand, is like neither of these; it is, for most speakers of English, unreleased altogether. The t in potter, furthermore, is different from all of these; it isn't even voiceless, being (again, for most speakers, at least in American English) a

voiced alveolar flap. Careful phonetic transcription ought to reveal all of these differences, and yet standard English orthography represents them all in the same way. Is this a failure on the part of the orthography? No, for from the point of view of the system of the language, there is no need to differentiate them from one another; they are all somehow the same kind of unit, and the differences between them can all be predicted. The t in top is aspirated because it is in initial position; that in stop is unaspirated because it follows s, the t in spot is unreleased because it is final, while the one in potter is a flap because it appears in position between a stressed vowel and another vowel. All are t's; the differences between them are predictable. Therefore, an abstract representation of all of them will identify them as t (a voiceless dental stop), and will not mark any of the other properties. Notice that this is a fact about English; the properties abstracted away from in the phonemic representation might each have to be present in phonemic representations in some other language.

As an example of the kind of system that is revealed in abstract phonological representations, let us consider the placement of primary stress in English words. Before dealing with this, however, we must mention a fact about the set of vowel nuclei in English. We can say that these are divided into two classes, tense vowels and lax ones (without at this point giving any substance to this characterization beyond

a division into two classes). The tense vowels are those underlined in 1:

1.	a. b<u>ea</u>t	[ij]	e. b<u>oo</u>t	[uw]
	b. b<u>ai</u>t	[ej]	f. b<u>oa</u>t	[ow]
	c. b<u>i</u>te	[aj]	g. b<u>ou</u>t	[aw]
	d. b<u>oy</u>	[oj]	(h. b<u>o</u>dy	[a:])

Other vowels are lax.

Now consider the words in 2 below (where the location of the main stress has been marked with an accent):

2. a. América
   b. táffeta
   c. basílica

These words, which are typical of English words of three or more syllables, might lead us to the conclusion that English primary stress is always assigned to the third vowel from the end of the word. Exceptions to this principle, however, leap immediately to mind: consider the words in 3:

3. a. philodéndron
   b. Waukégan
   c. balalaíka

Here stress falls on the <u>second</u> vowel from the end. We must, therefore, either modify our principle of stress assignment or abandon it altogether. In order to modify it, we must discover some property of the words in 3 that differentiates them from those in 2. We see that indeed there is such a property: look at the shape of the second syllable from the end (the penult). In the words in 2 this consists of a lax vowel plus exactly one consonant, while the words in 3 all have either a tense vowel or more than one consonant. This difference is in

fact generally characteristic of English; words which are stressed like either 2 or 3 will be like 2 if the penultimate syllable consists of a lax vowel plus at most one consonant, while words in which the penult contains either a tense vowel or more than one consonant will be stressed like 3. We might propose this as the basic principle of stress assignment in English.

Once again, however, exceptions are not hard to find. Consider words like those in 4:

4. a. machíne
   b. careér
   c. Julý

These words have <u>final</u> stress. How can we modify our rule further to account for them? Notice that these words have tense vowels in their final syllables, while the words in 2 and 3 have lax vowels. Let us restrict our stress rule (as formulated so far) to words with final lax vowels; we can then say that words with final syllables contsining tense vowels receive stress on their final syllable.

Our completo stress rule now looks like 5:

5. a. if a word has a tense vowel in its final syllable, it receives final stress.
   b. otherwise, look at the penult: i) if that consists of a lax vowel plus at most one consonant, assign stress three syllables from the end. ii) otherwise, (i.e., if the penult contains either a tense vowel or two or more consonants) assign penultimate stress.

Rule 5 will in fact account for the placement of primary stress in the great majority of English nouns, and if this is so we can consider the stress to be a predictable property of these words, not present in their phonemic (abstract) representations.

Rule 5 falls down, however, for a certain range of cases which we cannot deal with as easily as we have dealt with the recalcitrant words above. Consider the words in 6:

6. a. cíty
   b. ménu
   c. commíttee

All of these words have penultimate stress, but they all have final tense vowels. Accordingly, they should have received final stress by rule 5a above. If we cannot find a way to deal with these words, we must conclude that (at least in cases of words with final tense vowels) stress is not, in fact, predictable in English, and must be marked in the abstract representation as well as the phonetic representation.

In considering what to do here, let us note that in English the range of vowels which can occur in absolute final position is more restricted than the set which appears in other positions in the word. In final position, only tense vowels occur, with the exception of the vowel schwa (the final sound in basilica). Suppose, then, that some words were represented with other final lax vowels, and we said that the language contained a rule that made all of these other vowels tense. This would not affect any words adversely, since, as we have seen, all other final vowels have to be tense anyway. We would then say that (phonetic) final tense vowels could be represented as either tense or lax on the abstract level, the distinction being neutralized in the phonetic representation by the proposed tensing rule:

7. Any final vowel other than schwa becomes tense.

How does this help us with our stress problem? Recall what was unusual about the forms in 6; despite final tense vowels, these words did not have final stress, as 5a would predict. But now we see that this need not be a problem; we can simply represent these words as having (abstractly) final lax vowels, which only become tense by the operation of rule 7. Now the words in 6 are no longer exceptions to 5a; they simply undergo 7 as well as 5.

This explanation is sufficient for 6a and 6b, but what of 6c? Here, even if we assume that the final vowel is lax in the abstract representation, we will incorrectly assign antepenultimate stress by 5b(i), rather than penultimate stress by 5b(ii), since the penult of this word consists of a lax vowel plus only one consonant. How can we account for this word? Notice that the orthography indicates a possibility, since it marks the penult of this word with a double t. If the abstract representation were like this, the word would contain two consonants in its penult, and hence would be stressed (correctly) by 5b(ii) instead of 5b(i). We would then need a rule that said that double consonants are phonetically single. This rule would have no adverse consequences for English: indeed, no phonetically double consonants are found, even where they might be expected (in words like dissemble). Accordingly, we can represent committee as having a double t and a final lax vowel, with the vowel becoming tense by rule 7 and the t becoming single by rule 8:

8. Double consonants become phonetically single.

We are now in a position to predict the stresses of all of the words discussed so far. Stress need not, therefore, be indicated in the abstract representations of these words. Notice the important point here: it is only by saying that stress is assigned by considering the abstract form of the word, the representation to which rules like 7 and 8 have not yet applied, that we are able to obtain this result. This furnishes powerful evidence for the utility of these abstract forms, and for the rules of the language which relate them to phonetic representation.

In choosing to account for apparent exceptions to the stress rule 5 above in terms of other rules, we could be accused of arbitrariness. Why not simply represent the words with final tense vowels, no double consonants, etc., and with stress indicated? The answer is that principle 5 is, in general, a valid rule of English, accounting for the stress in most English nouns. To mark the stress in the abstract representation and omit this rule from the grammar of English would implicitly make the claim that this was not so, and that stress was unpredictable in English. Since the rules which we need to assume in order to avoid this unpleasant consequence are in fact also generally valid rules of English, they permit us to preserve the important generalizations about stress without complicating the grammar. The fact that the exceptions to the stress rule can be accounted for in terms of independent

rules is further evidence for this procedure. Thus, while there are exceptions to 5a in the case of words with absolute final vowels, and all absolute final vowels (other than schwa) are tense, there are no exceptions to 5a among words with a final tense vowel followed by a consonant (i.e., there are no words like *<u>máchine</u>, *<u>káhoots</u>, etc.). Since we could not use rule 7 to do away with exceptions like these, the fact that they do not exist confirms our use of rule 7 to deal with the forms in 6.

The foregoing discussion is an example of the sort of procedure by which one arrives at an answer to the question of what properties of an utterance need to be marked in order to distinguish it from other utterances in the language. While it appears at first glance that English stress can fall on any of the last three syllables of a word, it turns out on closer examination that when other predictable properties are taken into account, it is possible to predict completely the placement of primary stress. A consideration of the phonology of English has revealed a systematicity that is not obvious from the phonetics of the language.