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DEEP AND SURFACE STRUCTURE IN TONE LANGUAGES

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In a recent paper[1] it was pointed out that there are two views about the units for which tone is to be specified. One view is that tone is associated with syllables, and that a tone language is one in which syllables have features of pitch associated with them. The other, less common view, is that features of pitch are rather associated with morphemes or words, and that it is only in languages where the morpheme is normally one syllable long (e.g. Chinese, Yoruba) that there is no real ground for choosing between the two possibilities.

It was further pointed out that descriptions of African tone languages do quite often treat the morpheme (or word) rather than the syllable as the tone-bearing unit.[2] Essentially, this is done in the many treatments which divide stems into TONE CLASSES. Thus verb stems, for example, are often divided into high and low tone classes; the high or low tone can be regarded as a morphemic feature just as well as a syllabic one. In the case of nouns, there are usually more possibilities (at least four or five tone classes). Here there is a choice between two treatments. Either the tone classes can be regarded as indivisible wholes, or they can be regarded as complexes of features. FEATURE is used here in an extension of Chomsky's use of 'syntactic features' in ASPECTS OF THE THEORY OF SYNTAX;[3] since his introduction of features into linguistic theory, their use has been extended considerably. Thus it is now possible to use features not only to say that a given noun is, for example, [+Animate], but also that it has an irregular plural or that it undergoes some particular phonological rule.

The following example from the Kolokuma dialect of Ịjọ should help to make plain the difference between treating the tone classes as wholes and treating them as a complex of features.[4]

In Kolokuma, morphemes can be divided into five tone-classes on the basis of the tone pattern they produce in a syntactically determined TONE GROUP, when they are initial in this group. Thus:

Tone class	Isolated form		Pattern when initial in tone group	
1	burú	'yam'[5]	buru gboro kịmị	'yam-plant-er'
2	dírí	'medicine'	dírí gụ́ọ́ kịmị	'medicine-make-r'
3	wárị	'house'	wárị kọ́rị kịmị	'house-build-er'
4	sọ́pụ	'shop'	sọ́pụ dii kịmị	'shop-keep-er'
5	kẹnị	'one'	kẹnị séri	'one time'

[1] K. Williamson, 'The definition of a tone language', to be published in PROCEEDINGS OF THE XTH INTERNATIONAL CONGRESS OF LINGUISTS.

[2] A recent example is: T. Edmondson and J. T. Bendor-Samuel, 'Tone patterns of Etung', J.A.L. vol. V (1966), pp. 1–6. They treat tone 'primarily at the level of the phonological word' and regard a tone pattern as something spread over the syllables of the word; thus there is a single pattern which is low–high–high on a trisyllabic noun, low–high on a disyllabic one, and rising on a monosyllabic one.

[3] M.I.T. Press, 1965.

[4] The possibility of using morphemic features to break down tone classes was first suggested to me by Professor Morris Halle and Mr David M. Perlmutter of M.I.T.

[5] High tone is marked ′, low is unmarked.

It should be stated that:

(1) the tone class of the second or later morpheme of the tone group makes no difference to the tone pattern of the group;

(2) class 4, the 'miscellaneous' class, can have quite a large number of different tone patterns;

(3) although in the examples above all morphemes begin with a consonant, it is also possible for them to begin with a vowel which will be called a 'prefix' and which sometimes affects the tone pattern; in tone group initial position it is always low.

It is clear from the above example that:

(1) the isolation tone pattern alone is insufficient to determine to what class a given morpheme belongs, as, for example, morphemes of class 2 and class 3, or class 1 and class 5, are identical in isolation;

(2) the effects of the initial morpheme on the following tone group are quite far-reaching, and show rather clearly that in Kolokuma tone should be regarded primarily not as syllabic, but as morphemic.

So far, the tone classes have been regarded as indivisible wholes. If, instead, we try to analyse them, we find that they can be broken up as follows:

(1) Those which in initial position in the tone group have HIGH tone throughout (except on an initial prefix) on the initial morpheme (classes 2 and 3) and those which do not (classes 1, 4 and 5). This feature will be abstracted and called [+High] versus [−High].

(2) Those which cause a drop (i.e. a sequence high–low) after the first morpheme. Classes 1, 3 and 5 are thus [+Drop], while classes 2 and 4 are [−Drop].

(3) The class in which the drop can occur later than the first two syllables of the second morpheme (i.e. class 1), versus those where it cannot occur later than this position. This feature will be called [Extend]; thus class 1 is [+Extend], all the others are [−Extend].

The classes can therefore be described in terms of features as follows:

	F_1[High]	F_2[Drop]	F_3[Extend]
Class 1	−	+	+
2	+	−	−
3	+	+	−
4	−	−	−
5	−	+	−

A set of rules will then relate the underlying forms to the actual tone patterns which occur, thus:

Rule 1. If a tone group begins with a morpheme with the features [+D, +E] it will contain an 'extendable' high tone, as is clear from the following examples:

taá[6]	wife
burú	yam
saanlɔ́	gills
buru dií	look at a yam
buru gboró	plant yams

[6] In other positions this stem contains only a single vowel. It appears to be preferable, however, to postulate that ALL Kolokuma stems are of the form $C_0VC_0V(C_0V)$ in the deep structure (where C_0 means 'zero or more consonants'); *taa will then be shortened to ta where appropriate.

buru koromọ́	drop a yam
buru gboro kịmị	yam-planter
buru ọgọ́nọ	on top of a yam

(In the last example, the high tone occurs earlier because the second morpheme begins with a prefix.)

The rule for this can be written informally thus:

$$V \rightarrow [+h] \qquad /\#_{+D,+E}[(V)CV(CV(CV)+\begin{cases}(CV(CV(+))) \\ V\end{cases})C\text{—}\ldots]\#$$

(where [h] indicates phonetic high tone, # marks tone group boundary, + marks morpheme boundary). The morphemic features are regarded as being extended from the initial morpheme to the whole tone group, although in a dictionary entry they characterize a single morpheme. The reasons for this are:

(1) that this appears a natural way to express the fact that only the first morpheme is relevant to the tone pattern of the group;

(2) that it would be difficult, notationally, to use square brackets round the initial morpheme as the relevant constituent when the high tone inserted by the rules occurs sometimes on the initial morpheme, sometimes on a later morpheme, without complicating the bracketing unduly. [ ], therefore, enclose the whole tone group, and the morphemic features are written as subscripts to the whole tone group.

Rule 2. If a tone group begins with a morpheme with the features [+D, −E], it contains a high tone on the first syllable of the second morpheme (or, if there is no second morpheme, on the last syllable of the first morpheme).

This rule can be stated thus:

$$V \rightarrow [+h] \qquad /\#_{+D,-E}[(V)CVC(\acute{V}+C)-\ldots]\#.$$

Rule 3. If a tone group begins with the feature [+H], the group (apart from an initial prefix) will be all high until it is interrupted by a high already there (i.e. one placed by the preceding rule).

The rule can be stated thus:

$$V \rightarrow [+h] \qquad /\#_{+H}[(V)C\ldots-(\acute{V}(\ldots))]\#.$$

(The three rules above are not sufficient for all tone patterns. Additional rules are needed:

(a) to insert the high tones of Class 4 morphemes and of enclitics;[7]

(b) to account for the intonational variations in emphatic sentences, questions, and tags;

[7] Class 4 is, as stated above, irregular, although there are minor regularities within it (e.g. the tones of English loanwords are mostly predictable, as will be shown in another paper). Enclitics are high if they occur BEFORE the syllable where a high would be inserted by rules 1–2, otherwise low: e.g. buru-bí gboro kịmị-bị, 'the-man who planted the-yam'; diri-bí gụọ kịmị-bị, 'the-man who made the-medicine'. This result can be achieved by two additional rules: (A) Each syllable following the pre-enclitic juncture (marked by a hyphen) becomes high: V → [+h]/[...-C— ...]. That is, ALL enclitics become high. (B) A high on an enclitic which is not the first high in a tone group is deleted: V → [-h]/[.....V́-C— ...]. Thus: buru gboro kịmị-bí → buru gboro kịmị-bị, diri-bí gụọ kịmị-bí → diri-bí gụọ kịmị-bị. Both rules must precede rule 3 above; B must follow rules 1 and 2 (and whatever rules insert high tones in class 4 morphemes).

(c) to account for certain assimilations that take place between simple tone groups.)[8]

The foregoing analysis of Kolokuma shows that greater flexibility is obtained by breaking down the tone classes into features, in two ways:

(1) By specifying the feature which is relevant to a particular rule, we avoid having to state 'either/or' rules; e.g. it is not necessary to state that rule 3 applies either to class 2 or to class 3, but simply that it applies wherever the feature [+H] occurs.

(2) Morphemic features can be quite varied, i.e. they are, so far as is known, not restricted to a limited set as are phonological distinctive features; it is therefore possible to set up an extremely abstract and relative feature such as [+Extend], which would not be permissible as a phonological feature.

We have, furthermore, established a basic distinction between the deep structure of Kolokuma, where tone exists in the form of morphemic features, and the surface structure, in which tone is distributed by rules to particular syllables. There is therefore no contradiction between the observation that every syllable occurs as either high or low (surface structure) and the further observation that, given a knowledge of the junctures and the features of the morphemes which occur in tone group initial position, the tone patterns are predictable. This approach is very much like Meeussen's morphotonological treatment; his morphotonemes correspond to complexes of features, and his rules derive the surface, syllabic tones from the underlying morphotonological (morphemic) ones. It is not then necessary to say that tone is either a morphemic or a syllabic feature; it can be both—morphemic in the deep structure and syllabic in the surface structure.[9]

In some languages—for example, Yoruba—there seems to be relatively little difference between the deep and the surface structure, i.e. there is relatively little morphotonemics. In Igbo there is much more, and in Ịjọ there is still more; it is, for instance, languages of the Ịjọ type which show how inadequate it is to regard tone as a feature of syllables alone. We see here an analogy with syntax; in parts of language where deep and surface structure coincide fairly closely, phrase structure rules (or IC analysis) seem adequate to describe syntax; it is only when the parts of syntax where deep and surface structure do not coincide are considered that it becomes obvious that phrase structure rules alone are inadequate to describe language.

Phenomena like downstep can now be considered in the light of this distinction. In a recent study of Igbo, Patricia Carrell sets up only high ([+h]) and low ([−h]) in the deep structure.[10] In the surface structure she introduces by rules an additional feature [e], 'echo'; thus a high tone with the feature [+e] is the same level as a preceding high tone, while one with the feature [−e] is lower than a preceding high. This is a formalization of Welmers' distinction between 'same high' and 'new high'. She regards a high tone as being normally [−e], i.e. downstepped, and therefore has special rules to introduce [+e] in the cases where there is no downstep. It is possible that a different set of rules might be devised (e.g. one in which all the downstep tones were regarded as raised lows rather than lowered highs), but it is clear that Dr Carrell is correct in her basic contention that the deep structure can be set up with only high and low tones, and the distinction between

[8] A full account of these tone patterns will be found in my GRAMMAR OF THE KOLOKUMA DIALECT OF IJỌ (C.U.P., 1965).

[9] The fact that it was unnecessary to regard tone as being exclusively either morphemic or syllabic was pointed out to me by Professor A. E. Meeussen.

[10] A TRANSFORMATIONAL GRAMMAR OF IGBO, University of Texas Ph.D. dissertation (1966), unpublished. (It is planned to include a modified version of Dr Carrell's dissertation in the W. A. LANGUAGE MONOGRAPH SERIES.)—ED.

same high and downstep high can be introduced later. Consequently, downstep is only a phenomenon of the surface phonology. The result of this is that our usual typologies of tone languages, e.g. the division into discrete-level and terraced-level types, appear to be based on surface and not on deep characteristics. We can, however, say that there is a difference in the rules of the two kinds of languages. A terraced-level language, for example, results from a 'downdrift rule' followed by rules which delete or assimilate a low tone; a downdrift language results from the first rule alone; a language with neither downstep nor downdrift has none of these rules. That is, the typology of tone languages will depend not on the inventory of elements in deep structure but on the occurrence of rules that produce differences in surface structure.[11]

[11] This paper was first presented to the Linguistic Seminar, University of Ibadan. I am grateful to my colleagues there, particularly Mr E. Fresco, for their helpful criticism.