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A CRITIQUE OF SOME TONE UNIVERSALS PROPOSED BY WOO

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In an unpublished doctoral dissertation written in 1969, Nancy Woo proposed a set of universal prosodic features. In brief, she states that a stress feature is needed (45), but not a length feature; all length is best treated as gemination (237). For tone, three features are needed: high, low, and modify (236). The feature 'modify' involves some component besides pitch, and is needed for languages with more than three pitch levels (251). All tone languages are register systems; contours are best treated as sequences of registers, each on a separate sonorant segment (141). She illustrated her thesis primarily with data from Mandarin and other Chinese dialects. Recently, Halle has shown that Woo's system of features works well for describing Slavic accent (1971),[1] and Leben has shown that the system also helps to describe Thai (1971).

In this paper I attempt a critique of two of Woo's proposals: the feature 'modify', and the segmental nature of tone. In support of my criticisms, I refer to published materials, mainly on Amerindian tone languages.

On the Feature 'Modify'

Woo posits that the tone features high and low account for up to three pitch levels (141). Systems with four or five levels, however, utilize a further feature, 'modify', which involves some waveform modification, to specify the intermediate levels, e.g. levels two and four of a five-tone system (251). She states (249):

> "...it is difficult to imagine that the intermediate pitches are produced using only this mechanism. To do so would involve incredible control of the laryngeal muscles. In fact, if one

assumes that the differences between all five pitches is solely one of frequency, then one must assume that listeners can consistently detect five pure tones.

Woo's first mistake here is that she greatly underestimates the average person's capacity to produce controlled pitch differences. The average kindergarten child can sing "Three Blind Mice", a song which involves eight different pitches. In Woo's opinion, therefore, anyone who can carry a tune has "incredible control of the laryngeal muscles".

Her second mistake is that she assumes that the ability to consistently detect five pure tones is a prerequisite for a speaker of a true five-tone system. Since people cannot in fact do this, she reasons that five-tone systems are impossible. In support of this, she cites a study by Pollack (1952), which allegedly proves that people cannot discriminate among more than four tones consistently. What Pollack's study does show, however, is that people cannot discriminate consistently among among more than four single tones presented individually, as Pollack himself clearly states in the first sentence of his abstract (745). A study by Flanagan and Saslow has shown that for synthetic vowels varying in vowel quality, sound pressure, and fundamental fequency, people can distinguish changes in fundamental frequency of the order of 0.3 to 0.5 cycles per second (1958, 435). Linguistic tones are more comparable to Flanagan and Saslow's study than to Pollack's, because they do not normally occur in isolation, but rather in a linguistic context that provides a frame for the tone. In the same issue of The Journal of the Acoustical Society of America as Pollack's article, there is an article by Pike which discusses at length the importance of context in determining linguistic contrasts, including contrasts of tone (1952, 620-621). It is of

interest that native speakers of Coyaltepec Mazatec, a four-tone system cannot consistently classify the tones of words pronounced in isolation, because of key shifts (Gudschinsky 1958, 340). If Woo's inference from Pollack's findings is correct, then not only are five-tone systems impossible, but also "Three Blind Mice" and all music with it. Music, however, still seems to be alive and well in our culture.

Woo's basic bias in favor of binary features has led her to posit 'modify' as a basically non-tonal feature in order to handle four- and five-tone systems. As I have shown, a non-tonal intermediate feature is certainly not required by either our laryngeal or our auditory mechanisms. The binary assumption is, I feel, untenable for some tone systems, and any attempt to make what is clearly a parameter having several values binary will distort the facts. Binariness now seems to be the new Procrustean Bed into which all languages must be forced to fit.

Furthermore, the three Amerindian languages for which five-tone systems have been described in print do not seem to justify the use of the feature 'modify'. It is true that something beside pitch level often helps to distinguish among the five tones. In Chicahuaxtla Trique, the highest tone occurs only in tone sequences (Longacre 1952, 74). In Usila Chinantec, the lowest tone has a sharp phonetic pitch downglide (Skinner 1962, 254). Note that in each case it is a tone at one extreme of the system that has something extra, not one of the intermediate tones.

Ticuna, the third language for which a five-tone system has been posited, has laryngealization on vowels, distinct from both tone and glottal stop. Laryngealization may occur with levels 2, 4, and 5; and with sequences 1-2, 1-3, 3-5, and 4-5 (Anderson 1959, 96 and 98). It strains my credulity far more to believe that there is additional

waveform modification, beside laryngealization, that distinguishes tones 2 and 4 from the rest of the tones, than to believe that pitch alone (or primarily) is involved.

In addition, Pike has stated that Igede, a West African language with four tones, can be shown from instrumental displays to have very clear-cut pitch levels (1966, section 6.2.1.). Again, there is no hint from the displays of any waveform modification in one of the middle tones.

A common laryngeal quality phenomenon is described by voice teachers as head register versus chest register. Head register is more efficient at higher pitches, and chest register at lower pitches, with some overlap in the middle where both work efficiently. I therefore find it hard to believe that tones two and four of a five-tone system have a laryngeal quality register different from that used for the other three tones. This would require some fancy laryngeal footwork, unlike the usual one-register switch in singing up or down the scale.

I am forced to conclude that the feature 'modify' is an interesting bit of armchair linguistics, unrelated to the way that four- and five-tone systems actually operate.

On the Segmental Nature of Tone

Woo has made some very strong claims on this point. She states (141):

> We therefore propose that the distinctive features of tone are features of pitch height, and that contour tones are represented as sequences of these features, each one of which is uniquely associated with some sonorant segment.

She also states (62):

> "...so far as we know, no dynamic tone can occur on a short

vowel distinctively.

In a footnote, however, she qualifies this by stating (133):

> "There appears to be only one language which may be an exception to this statement, and that is a dialect of Mazatec about which Robert Longacre has spoken with me briefly.

Contour tones, it is true, can always be represented as sequences of pitch heights. Nor do I dispute that Woo's system may account elegantly for the pitch phenomena of Mandarin, Tepehuán, Slavic, and Thai. I do not feel, however, that Woo's system is universally true. Specifically, I do not think that each pitch in a contour tone is uniquely associated with a sonorant segment. There are many Amerindian languages beside Mazatec with register tones, including sequences of such tones, where the investigator found no motivation, either phonetic or structural, for positing either a separate sonorant segment or an extra degree of vowel length to handle each pitch height.

This can always, it is true, be done in a trivial way, positing an extra mora in the underlying structure for each pitch height, and later reducing the length in the phonetic output by a phonological rule. Woo herself, however, appears to rule this out. She states (237-238):

> "...a geminate vowel in a given language, and in a given environment, will be articulated with longer duration than a single vowel in the same environment."

Even if we permit the extra moras to be deleted by the phonological rules, however, there is no motivation for positing them in the underlying structure unless we are led thereby to insightful generalizations about the structure of the language. It is of interest to me that several investigators, most of whom speak well the language they were describing, found no reason to posit such extra moras.

Ticuna has five level tones. Anderson has posited one vowel per

syllable, with clusters of up to five vowels in as many syllables. Within the syllable, however, single tones occur, and also sequences of two tones (1959, 104, 112, 92).

Chicahuaxtla Trique has five level tones. Longacre posited one vowel per syllable, and one, two, or three tones per syllable (1952, 75-76). Historical considerations allow us to eliminate the three-tone sequences, however, and some of the two-tone sequences, as a fused form of a phrase-final particle (Longacre 1957, 78-79). Several two-tone sequences on word-final syllables with single vowels still remain, however.

The Chinantec languages furnish further examples. For Lalana Chinantec, Rensch and Rensch state (1966, 457):

> "There are three contrastive pitch levels: high (1), mid (2), and low (3). Either a single tone or a sequence of two or three tones may occur on any syllable regardless of the length of the syllable nucleus."

Rensch and Rensch list eight vowels and a length phoneme (462). Thus, there are two possible lengths in the syllable nucleus: vowel, and vowel plus length, and either may take from one to three tones.

For Quiotepec Chinantec, Robbins states (1961, 241):

> "A short, long, or interrupted syllable occurs with any one-tone pattern: ... Two-tone patterns occur in both short and long syllables. Three tone patterns are limited to long syllables."

Length, he states, refers to vocalic nucleus plus the peak satellite h (239). The vocalic nucleus itself has from one to three vowels; nuclei with one or two vowels may be either short or long, while nuclei with three vowels are always long (240). Thus, both the number of vowels and the number of tones are distinct from length. Robbins also

states (24):

> "One might consider interpreting vowel length as a feature of individual vowels, rather than of whole peaks. However, most peaks pair off as long and short--the diphthongal ones as well as the monophthongal. When the informant whistles an utterance, long syllables have about the same length regardless of whether they have a single vowel, two, or three vowels."

In Usila Chinantec, one or two vowels occur as syllable peaks, and one or two tones (Skinner 1962, 252, 254). An inspection of the list of examples on pages 254-255 shows that either single vowels or double vowels may have one or two tones.

In Palantla Chinantec, one or two vowels (including certain geminate clusters) occur as syllable peaks, and one or two tones, with y and w as optional post-vocalic elements (Merrifield 1963, 3, 5, 7). An inspection of the list of examples on pages 12-14 shows no restriction on the number of tones with the number of sonorant segments.

Similar evidence is in print for non-Amerindian languages. Compare, for example, the point made by Welmers concerning Yoruba and Jukun. He states (1959, 6):

> "In an unpublished paper, Olmstead reported such limited glides as "high falling" and "low rising" in Yoruba. However all of the patterns of Yoruba favor the analysis of such glides as sequences of different level tones. They occur only with long vowels, which are best interpreted as double vowels, and pattern exactly like sequences interrupted by a consonant. But Yoruba, like many other West African languages, does have a unit falling toneme and a unit rising

> toneme as well, each occurring with short vowels. These are quite different from the sequence glides, the end points are not readily identifiable with any of the level tonemes. With double vowels, sequences such as falling-plus-mid also occur. The analysis of many glides as sequences, usually associated with double (i.e., long) vowels, is frequently necessary in West African languages. The presence of double vowels, however, is not essential to such an analysis. Jukun has no long or double vowels, and yet has glides that must be analyzed as sequences of two or even three level tonemes."

Woo attempts to dismiss pitch contours perceived on short vowels as the effect of stress, intonation, or a contiguous consonant (225-270). I think it is obvious that the studies to which I have referred describe languages which show pitch contours on short vowels that cannot be explained away by such conditioning. These contrasts were discovered by controlled frame and substitution techniques. It is possible that further study of the languages mentioned above from a generative point of view, rather than from the point of view of autonomous phonology, would eliminate some of the apparent counter-examples. I consider it highly unlikely, however, that all of them could be eliminated. Until such studies have been made, the segmental nature of tone should not be considered a language universal.

FOOTNOTE

[1] Halle has recently, however, together with Stevens, proposed another system for laryngeal features, which involves two pairs of features: spread and constricted, stiff and slack (1971, 201-202). The latter pair, stiff and slack, like Woo's high and low, handle up to three tones, because no segment can be both stiff and slack. Halle and Stevens seem to ignore the existence of tone systems with more than three levels (208). They do state in a footnote that pitch may not be segmental (212). This appears to contradict Halle's treatment of Slavic (1971).

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