

AUTOSEGMENTAL PHONOLOGY AND THE
BANTU TONE SYSTEMS

H.M. Batibo

1. The Theoretical Framework of Autosegmental Phonology

Autosegmental Phonology as a theory about certain types of what have traditionally been known as "suprasegmentals" is a relatively new conception. Its rigorous formulation dates only in the mid-seventies with the publications of Goldsmith (1974, 1975, 1976/9), Clements (1976), Leben (1978), Haraguchi (1977), among others. It should, however, be noted that this approach was motivated by previous works, mainly those of Harris (1944), Greenberg (1948), Meeussen (1954, 1963), Van Spaandonck (1967), Carter (1971, 1973), Stevick (1969), McCawley (1970), Leben (1971, 1973) and, especially, Williams (1971) who, in his article entitled "Underlying Tone in Margi and Igbo," demonstrated that in both Margi and Igbo it was more appropriate to separate the segmental sequence from the tonal sequence since the latter was capable of moving, spreading and displacing over the whole morpheme or word. The following are some of the examples he gave from Margi language.

Tone Movement

- (1) tlà 4 wá → tɪ (á) → wá → tɪwá "cut in two"
cut two
- (2) ngyir + rí → ngyir (í) → ngyir "cause to burn, light"
burn causative

Tone Spreading

- (3) ù + nya → ùnyà "pound all"
pound all
- (4) tá + nya → tányá "cook all"
cook all

Tone Displacement

- (5) fí + ani → fíí + ani → fí + ani → fyáni
swell causative "make swell"

(6) $bd\check{l}\acute{e} + na \rightarrow bd\check{l}\acute{e} + n\acute{a} \rightarrow bd\check{l}\acute{e}n\acute{a}$ "forge"
 forge causative

Williams (1971) proposed the following analysis in order to capture the tone/segmental relationship:

(7) $tla + wa \rightarrow tlwa \rightarrow [tlw\acute{a}]$ (movement)
 L + H L H

(8) $ta + nya \rightarrow tanya$ $[t\acute{a}ny\acute{a}]$ (spreading)
 H H

(9) $fi + ani \rightarrow fyani$ $[fy\acute{a}n\acute{i}]$ (displacement)
 L H L H

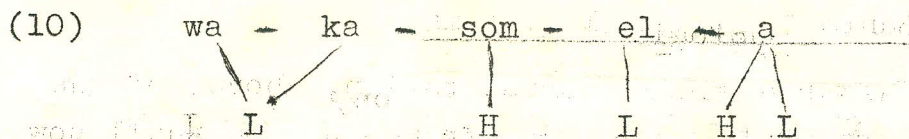
From the above evidence, Williams suggested that, at the deepest level of representation, tones should not be associated with segments or syllables, but rather with morphemes. Each morpheme had, as part of its phonological representation, a string of tones. A Tone Mapping Rule was proposed to relate the underlying string of tones of a phrase to its segmental (or syllabic) structure.

Although Williams' work was not published until 1976, it was well read in its manuscript form and provided the basis for the development of the Autosegmental approach. The main claim of this theory (and its fundamental orientation) is that phonological, and ultimately, phonetic representations do not consist of single linear sequences of segments as conceived in the Standard Model (see Massamba 1982), but rather comprise multilinear sequences composed of several rows, or tiers (as currently called), of segments. In order to arrive at this claim, the theory is based on the following conceptions:

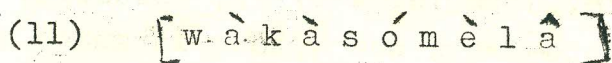
- (i) Certain "suprasegmental" elements are autonomous or independent in that they may operate beyond the syllable or even the morpheme.

those present in the representation; but that also, and perhaps primarily, phonological processes could modify the structure or organization of the representation.

In the application of the autosegmental rules, a single tone can be associated with more than one vowel (or syllable,) and similarly a vowel (or syllable) can be associated with more than one tone. Furthermore, rules can modify associations, and not only affect the segments themselves. Thus in the hypothetical example in (10), the first tone is associated with



two syllables while the second and third are associated with one syllable each. The final two tones, however, are associated with one syllable. The surface tonal representation is shown in (11) below.



The tonal mapping rules do not merge tonal and segmental representations, but rather associate their elements by means of formal entities termed "association lines."

The Well-Formedness Condition governing autosegmental representations was originally formulated as follows:

Well-Formedness Condition (WFC):

- (i) All Vowels (or syllables) are associated with at least one tone.
- (ii) All tones are associated with at least one vowel (or syllable)
- (iii) Association lines do not cross.

This Condition should not be interpreted as a principle ruling out representations which do not conform to it, but rather as defining a neutral position (Clements and Goldsmith, 1984). It should also be noted that in recent years a number of modifications to this condition have been proposed, notably by Clements and Ford (1979), and Halle and Vergnaud, 1982. The general claim which persists is the proposal that there is a neutral or "well-formed" state, defined by the theory, from which representations may deviate.

2. Bantu Tonological Systems

After a general presentation, above, of the autosegmental theoretical framework, we shall now see how the Bantu tone system has evolved over years to create varying tone types.

It is generally agreed (See Greenberg 1948, Kahler-Meyer, 1967/8, Guthrie, 1967/71, Meeussen, 1967, 1980) that Proto-Bantu was a tone language with two distinctive tone levels, high (H) and low (L). Noun stems were generally bisyllabic and were characterized by one of the four tone melodies HH, HL, LH and LL. Verb radicals consisted of monosyllabic morphemes with a high (H) or low (L) tone, and zero or toneless on the verbal extensions. Evidence that Proto-Bantu was tonal rather than accentual is threefold: (i) the fact that the bisyllabic nominals could have two high (H) tones on successive syllables; (ii) the fact that the tone assimilation rule caused all extension syllables to acquire high (H) tones preceding an inflectional suffix bearing high (H) tone; and (iii) the fact that the closest relatives of Proto-Bantu were themselves typically tone languages (see Guthrie 1967/71, Mukarovsky (1976/7)). Thus if Bantu languages now manifest accentual features, these must be seen as recent developments.

A typological survey of those Bantu languages which have lost their tonal distinctiveness indicates that such languages are to be found to the West, East and Centre of the Bantu Zone (Guthrie, 1967/8,). This wide extension makes us conclude that the reanalysis of tone in accentual systems in Bantu languages was done independently in many parts of the Zone. This also means that there was a development in the Bantu tonal system which favoured such reanalysis. Clements and Goldsmith (1984) suggest that the new development was the overlap of HH and HL by both of them being made identical through a rule (which has been termed "Meeussen's Rule") that changed HH to HL. Such a rule permitted the high (H) tone to be interpreted as an accent in the Bantu languages with accentual systems. Thus HL was interpreted as penultimate accent, LH as final accent and LL as non accentuated form. Verb radicals with H were considered as accentuated and those with L were reanalysed as not having any accent.

Another reason why the Proto-Bantu tone system was reanalysed as accentual system is the predominance of low (L) tones. Most Bantu languages manifest, by far, more low (L) tones than high (H) tones. For example, in Kisukuma (Batibo 1976b), the underlying low (L) tones have a frequency of occurrence of 66.2% as compared to only 33.8% for the high (H) tones.

The reanalysis of the Proto-Bantu tone system in various accentual systems resulted in the following diachronic developments:

- (i) the mobility of tone to the left and right in such a way that the domain of tone mapping was no longer the syllable, but the morpheme or word.

(ii) the diachronic development into many tone types, classically described as etymological, repetitive, anticipatory, reversive and shifting (see Van Spaandock, 1967);

(iii) the diachronic development of Bantu languages into fully tonal (etymological), partially tonal (majority) and fully accentual (where there are no traces of tone);

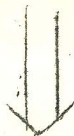
(iv) the free spreading associated with toneless morphemes, namely the verbal extensions, which is not wide-spread in non Bantu languages (but see Goldsmith 1976, in the case of Igbo).

Moreover, this reanalysis brought about a complex interplay between tone and accent in Bantu languages. Generally, the elements affected by high (H) Proto-Bantu tones became the accentual positions. The accents in the Underlying Representations triggered Basic Tone Melodies which differed from language to language. One word may have several accents in the underlying structure. The Basic Tone Melodies would, in turn, characterize the various segments depending on the Well-Formedness Conditions. Several Rules might therefore apply. These might include processes of simplification, spreading, hopping, deletion, shifting, copying etc. In the case where no accent characterizes a whole word or unit, the Surface Low Tone Assignment Rule (See Massamba, 1984) would apply.

3. Application of Autosegmental Theory to Bantu Languages

A systematic application of Autosegmental approach to Accent-type Bantu languages would start by identifying the accentual position which would be interpreted as a fixed Basic Tone Melody for all words. This melody is assigned the Well-Formadness Condition which associate V with T. This can be summarized as follows:

UNDERLYING REPRESENTATION



1. Accent Rules
2. Basic Tone Melody Association



UNDERLYING TONE LEVEL



Tone Rules



SURFACE PHONETIC REPRESENTATION

In this model the Accent Rules, which only apply after the Underlying Representation has been assigned the necessary accents, may insert, delete or shift these accents. The Underlying Tone Level is reached after associating the respective Basic Tone Melody with each of the syllables which are characterized by the accent through a rule known as the Basic Tone Melody Association Rule. The other tone rules then apply in the required order, until the surface level is reached.

The fact that different Basic Tone Melodies developed in Bantu languages is the major reason for the presence of many tone types the following example shows how to tonal contour of the Proto-word for "monkey" (in-kima) has developed into accentual systems with varying Basic Melodies.

(12) (a) Etymological

H = (i) n-kima (Mongo, Bobangi etc.)

H

(b) Displacement

LH = (i) n-kima (Holoholo, Bangubangu, Ciruri etc).

LH

(c) Anticipation

HL = (i) n-kima (nhkumbi, Tonga etc.)

HL

(d) Repetition

LH = (L) n-kima



(e) Reversive

H L H = (i) n-kima



This development can be evidenced in the following examples.

- (13) Mongo: nkéma (etymological)
 Bobangi: nkéma (etymological)
 Holoholo: nkimá (displacement)
 Bangubangu: ngimá (displacement)
 Nhkumbi: ónhkima (anticipation)
 Tetela: nkémá (repetition)
 Budya: nkima (repetition)

4. Conclusion

This paper has looked into the autosegmental theory as distinct from the traditional suprasegmental analysis. It has then demonstrated how this new conception has captured the way tone in Bantu has been reanalysed into accentual systems. Such an approach has proved to have the following advantages

to have the following advantages:

(i) From a purely theoretical viewpoint, this approach has allowed new theoretical formulations which are more sound and systematic about the structure of the representations of tone (in relation to the segments with which they are associated) at the phonological and phonetic levels.

(ii) It has made it possible to deal with eccentric or phenomenal cases which are so common in African, and notably the Bantu languages. Such cases include, melodious tones found in short vowels (or syllables), the transfer to other segments of tones where segments have been deleted, the question of floating tones, the phenomenon of automatic spread of tones to the right or left, and the placing of tones on nasals found on nasal compounds.

(iii) The autosegmental approach is an analytical framework which is general enough to handle accentual and tonal phenomena manifested in the various languages of the world. It is therefore more universally applicable than some of the other recent suggestions which are of more specific nature (see for example Batibo, 1976a).

(iv) It is a theory which is well equipped to account for elements and processes which are results of diachronic developments. This is very important in the case of the Bantu tonal systems which are often difficult to account without referring to the Proto-Bantu tonal structure;

(v) Most of all, the approach has provoked the reconsideration of the original analytical framework of Generative Phonology as described in Chomsky and Halle's Sound Patterns of English (1968). It has

been shown, for example, that phonological processes should not be restricted to adding and deleting segments, or changing the feature specifications of those present in the representation; but that they should be allowed to modify the structures or organization of presentation. Moreover, the omission of the syllable in the SPE is now seen as a serious shortcoming since the syllable may be important in certain representations.

There are, however, a number of questions which need to be discussed in connection with this theory:

(i) If morphemes or words associated with LL or L tones are to be interpreted as units which have no accents, it would mean that there are languages with accentual systems in which some of the words are not accentuated. The existence of such languages has been evidenced by L. Hyman (1977). A number of American Indian Languages like Kitsai (see Bucca and Lesser, 1969), Saho (See Welmers, 1952), Seneca (see Chafe, 1960) are accentual languages but which do not necessarily have an accent on every word.

(ii) If the Proto-Bantu tone system allowed two high (H) tones on successive syllables of one word, how could these high (H) tones be reanalysed as accents since this would mean a word has more than one accent? Again, it has been found that there are languages with more than one phonemic accent in successive syllables (Pike and Kindbey, 1956; Hyman 1977). Languages like Campa, Nimboran and Tahltan (all American Indian languages) have several accents on one word. Moreover, many Bantu languages have evolved a rule which deletes some of the accents where they are in succession.

(iii) So far this theory has been applied to Bantu languages whose accentual systems trigger tonal melodies. What about those Bantu languages that are now fully and purely stressed? The answer is that the method would still be applicable only that the Basic Tone Melody patterns would not be as prominent or as complex. Stress-characterized Bantu languages have usually retained some tonal properties on the stressed syllables. Moreover, it has been shown that Digo (see Kisseberth, 1984) which is traditionally regarded as a stress language, more or less like Kiswahili, had a complex tone system which could be systematically analysed by the autosegmental approach.

Moreover, since autosegmental theory has resulted from attempting to refine what has traditionally been termed "suprasegmentals", it would be appropriate to find solutions to the other phenomena like juncture, loudness (or intensity) and length which do not enter into the framework of autosegmental phonology. Likewise, generative phonologists ought to decide what status to give the syllable (which was never mentioned in the SPE model) in a phonological, and especially autosegmental, analysis.

Finally, it is worth mentioning that the critics of this theory point out that this approach relies too much on diachronic assumptions which, often, cannot be evidenced with synchronic facts. For example, there is no way in which one could be absolutely sure that the high (H) tone in Proto-Bantu was interpreted as an accent, and that this accent, in turn, triggered a tonal melody. Moreover, another valid criticism is that the theory has drawn much of its evidence from relatively rare cases of multiaccentualism, nasalisation spans and even vowel harmony phenomena. Some linguists still wonder whether the recognition of many tiers in utterances really simplifies linguistic description.

REFERENCES

1. BATIBO, H.M., 1976a "A New Approach to Sukuma Tone".
In Hyman (Ed.) pp. 241-257.
2. BATIBO, H.M., 1976b Le Kesukuma, langue Bantu de Tanzanie: Phonologie et Morphologie. Ph.D. Thesis (Mimographed). Published in 1985 by ADPF, Paris.
3. BUCCA, S. and A. LESSER, 1969, "Kitsai Phonology and Morphophonemics" in International Journal of American Linguistics, 35, pp.7-19
4. CARTER, H., 1971, "Morphotonology of Zambian Tonga: Some 'Developments of Meussen's System" - I. in African Languages studie 12, pp. 1-30
5. CARTER, H., - 1972, "Morphotonology of Zambian Tonga: Some Developments of Meussen's System. "II in African Language Studies, 13 pp 52-97.
6. CARTER, H. 1973, "Tonal Data in Comparative Bantu in African Language Studies 14, 36-52
7. CHAFE, WL., 1960, "Seneca Morphology I: Introduction"., International Journal of American Languages, 26, pp.11-22.
8. CHOMSKY, N. and M. HALLE, 1968, The Sound Pattern English. Harper & Row.
9. CLEMENTS, G.N., 1976, Vowel Harmony in Nonlinear Generative Phonology: An Autosegmental Model. IULC, Bloomington.
10. CLEMENTS, G.N. and K.C. Ford, 1979, "Kikuyu Tone Shift and its Synchronic Consequences," In Linguistic Inquiry 10.2, pp.179-210.
11. CLEMENTS, G.N. and J. Goldsmith, 1984, Autosegmental Studies in Bantu Tone, Foris Publications.
12. GOLDSMITH, J., 1974, "Autosegmental Phonology". Unpublished Manuscript, MIT.
13. GOLDSMITH, J., 1975, "Tone Melodies and the Autosegment". R.K. HERBERT (Ed.) pp. 135-147.
14. GOLDSMITH J., 1976, Autosegmental Phonology, MIT Ph.D. Thesis Published by Carland Publishing Inc. N.Y. 1979.

15. GREENBERG, J., 1948, "The Tonal System of Proto-Bantu." Word. 4, 196-201.
16. GUTHRIE, M. 1967 - 71, Comparative Bantu 4 Vols. Gregg International Publishers.
17. HALLE, M. and J.R. VERGNAUD, 1980, "Three Dimensional Phonology," Journal of Linguistic Research 1.1., pp. 83-105.
18. HARAGUCHI, S. 1977, The Tone Pattern of Japanese: An Autosegmental Theory of Tone, Kartakusha, Tokyo.
19. HARRIS, Z., 1944 "Simultaneous Components of Phonology" in Language 17, 345-349.
20. HERBERT, R.K. (Ed.) 1975 Ohio State Working Papers in Linguistics, No.20
21. HYMAN, L., 1976 Studies in Bantu Tonology, SCOPIIL No.3.
22. HYMAN, L., 1977, Studies in Stress and Accent, SCOPIIL No.4.
23. KAHLER - MEYER, E., 1967 - 68, The Tones in - Urbantu. Auu 51, pp. 8;-90.
24. KISSEBERTH, 1984, "Digo Tonology" in CLEMENTS and GOLDSMITH (Eds). p.p. 105 - 182.
25. LEBEN, W, 1971, "Suprasegmental and Segmental Representations of Tone" Studies in African Languages: Supplement, 2, pp. 183-200.
26. LEBEN, W., 1973, Suprasegmental Phonology, MIT Ph.D. Thesis, published by the Garland Publishing Inc. N.Y.
27. LEBEN, W, 1978, The Representation of Tone. In Fromkin (Ed), Tone: A Linguistic Survey. Academic Press N.Y. PP. 177-219.
28. MASSAMBA, D.P.B., 1982, Aspects of Accent and Tone in Ci-Ruri. Unpublished Ph.D. Thesis, Indiana University.
29. MASSAMBA, D.P.B., 1984, "Tone in Ci-Ruri", in CLEMENTS and GOLDMITH (Eds) pp. 235-254.
30. McCAWLEY, J., 1970, "Some Tonal Systems That come Close to Being Pitch Accent Systems but Don't Quite Make It". CL 6, pp. 526-532.
31. MEEUSSEN, A.E, 1954, Linguistische Schets van Let Bangubangu, Tervuren: Linguistieh, deel 5.

32. MEEUSSEW, A.E, 1963, "Morphotonology of the Tonga Verb", Journal of Africa Languages, 2, pp.72-92.
33. MEEUSSEN, A.E, 1967, "Bantu Grammatical Reconstructions" Annales du Mussee Royal de l'Afrique Centrale, No. 61, pp.80-121, Tervuren
34. MEEUSSEN, A.E., 1980 Bantu Lexical Reconstructions Vol. 27, Tervuren.
35. MUKAROVSKY, H., 1976/77. A Study of Western Nigritic. 2 Vol. Afro-Pub., Vienna.
36. PIKE K.L. and W. KINDERG, 1956 "A Problem in Multiple Stresses". Word 12, pp.415-428.
37. STEVICK, E., 1969, "Tone in Bantu" in International Journal of American Linguistics, 35, pp. 330-341.
38. VAN SPAANDONCK, M. 1967, French Translation by L. BOUQUIAUX, L'Analyse Morphotonologique dans les Langues bantoues, SELAF, 1971, 23-24.
39. WEIMERS, W.E., 1952, "Notes on the Structure of Saho", Word 8, pp. 145-162
40. WILLIAMSE, 1971 "Underlying Tone in Iargi and Igbo", Unpublished MIT paper. Appeared in Linguistics Inquiry Summer 1976, pp.463-484.