The Status of Lexical Associations and the Obligatory Contour Principle in the Analysis of Tone Languages
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THE STATUS OF LEXICAL ASSOCIATIONS AND THE OBLIGATORY CONTOUR PRINCIPLE IN THE ANALYSIS OF TONE LANGUAGES[1]

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Both Goldsmith (1976) and Leben (1978) have shown the suprasegmental treatment of tone as introduced in Leben (1973) to be too highly constrained. Their evidence is straightforward: Goldsmith presents data from Etung, and Leben, from Mende and Hausa which suprasegmental phonology would predict not to occur. Goldsmith and Leben differ, however, as to how they would alter the theory so as to accommodate the language data in question. Goldsmith's solution is to abandon what he calls the Obligatory Contour Principle (OCP), a facet of Leben's theory, which stipulates that

> [a]t the melodic level of the grammar, any two adjacent tonemes must be distinct. Thus HHL is not a possible melodic pattern; it automatically simplifies to HL. (Goldsmith, p. 36)

In Goldsmith's "autosegmental" theory, the OCP has no status; with regard to it, Goldsmith comments that ". . . the Obligatory Contour Principle is a condition not on possible underlying forms, but on simply-learnable grammars; not all grammars, however, need be simple." (p. 135)[2] On the other hand, in Leben's "revised suprasegmental" theory, the OCP is retained, but lexical associations are introduced as a way to account for those forms which violate the OCP.[3] Thus, in Leben's framework, the contrast in Mende disyllabic nouns having the underlying tone melody HL between those having the surface tonal pattern H L, e.g. [kényà] 'uncle', and those having the surface tonal pattern H HL, e.g. [ngɔ́ngɔ̂] 'tooth', is established by marking each of the H HL words with an association line in the lexicon, e.g.

(1) /ngɔngɔ/
/ H L /

Then, the process by which the language associates the segmental and the suprasegmental will yield [ngɔ́ngɔ̂] in contrast to [kényà]. Although Leben does not say this, it is in fact the case that his use of lexical associations preserves the OCP. Thus, Goldsmith's 1976 statement still holds that "the principal empirical differences between Leben's analysis and mine result from the inclusion or rejection of the 'Obligatory Contour Principle' . . ." (p. 36).

A consequence of this difference is the difference to which each theory is constrained. Autosegmental theory allows far fewer surface tone patterns than does a revised suprasegmental theory with its use of lexical associations. For example, while revised suprasegmental theory could account for the forms in (2), autosegmental theory could not.

(2)	Suprasegmental	Autosegmental
[CV̂CV́]	/CVCV/ \ /H L H/	?
[CV́CV̌CV̀]	/CVCVCV/ | /H L H L /	?

There are no possible surface melodies which would be permitted by autosegmental theory but not by revised suprasegmental.

The crucial difference between the two theories--the difference in status of the OCP--thus constitutes a difference as to the extent to which each theory is constrained. Additionally, the introduction of lexical associations weakens a claim fundamental to suprasegmental (as well as autosegmental) theory, namely, the claim of the autonomy of strata.

In the discussion which follows, data are presented from Etung, Klaǫ, Hausa, and Mende, data for which the original suprasegmental theory was too highly constrained. Autosegmental and revised suprasegmental analyses are provided in each case. The autosegmental analysis of Etung is from Goldsmith, and the revised suprasegmental analyses of Hausa and Mende are from Leben (1978); the remainder of the analyses are based on the principles set out in Goldsmith, for the autosegmental, and Leben (1978), for the revised suprasegmental.

The ability of the revised suprasegmental theory to account for the data at hand is not in question; the ability of the autosegmental theory is. If autosegmental theory does prove capable of accounting for the evidence at hand, then autosegmental theory will, ceteris paribus, be more highly valued than revised suprasegmental theory by virtue of the fact that, while both theories provide adequate accounts of the data in question, autosegmental theory is the more highly constrained.

As a preliminary to the discussion, mapping principles will be introduced. The differences between theories with regard to these are not crucial, and the principles in (4), while formulated by Leben, are used in presenting analyses from both theories in order to facilitate comparison.

(3) The Well-Formedness Condition

a. Every tone is associated with some syllable.
b. Every syllable is associated with some tone.
c. Association lines may not cross.

(4) Mapping Principles

a. Associate the external boundaries of the tonal representation with those of the segmental representation.

b. For any tones that are not associated with any syllables, associate the first tone with the first syllable, the second with the second, and so on.

c. Any syllable that has no tone is associated with the tone of the preceding syllable, if there is one. Otherwise, tone assignment takes place according to the Well-Formedness Condition.

The rules in (4) are demonstrated in (5). (5a) shows the case where the number of tones equals the numbers of syllables, (5b) where tones outnumber syllables, and (5c) where syllables outnumber tones.

(5) Mende

a.	/ngila/	4b→	ngila			[ngílà]	'dog'
	/ H L /		H L				
b.	/nyaha/	4b→	nyaha	4c→	nyaha	[nyàhâ]	'woman'
	/L H L/		L H L		L H L		
c.	/foni/	4b→	foni	4c→	foni	[fònì]	'savannah'
	/ L /		L		L		

The first language to be considered is Etung, an Ekoid Bantu language spoken in Nigeria. Etung is Goldsmith's example of a language which violates the OCP. He cites distinctions within pairs of forms, each member of which would have to have--in original suprasegmental theory--an underlying melody of L H, e.g. [ǹsí] 'fish' and [ǹsǐ] 'mud', and pairs of forms, each member of which would have to have the underlying melody of H L, e.g. [égòm] 'jaundice' and [érôp] 'spear'. Goldsmith's solution is to posit, for one member of each of the pairs, a form at variance with the OCP:

(6a) /nsi/ 'mud'
/LLH/

(7a) /erop/ 'spear'
/H H L/

On the other hand, if lexical-associations are employed (à la Leben), then the OCP can be preserved:

(6b) /nsi/ 'mud'
/L H/

(7b) /erop/ 'spear'
/ H L /

A different type of violation of the OCP exists in Klaǫ, a Kru language spoken in Liberia.[4] Here the contrast is between di- and tri-syllabic forms having, for example, the tone melody M H, as illustrated by [nānę́] 'to speak' and [pǭpɔ̄lɔ́] 'wind, breeze'. If both are assigned MH without further adjustment, the mapping principles yield [nānę́] and [*pǭpɔ́lɔ́]. The solution, as in the case of Etung, is the introduction of a lexical-association in the revised suprasegmental analysis or, alternately, a departure from the OCP in the autosegmental analysis:

(8)

Suprasegmental	Autosegmental
/pǫpɔlɔ/	/pǫpɔlɔ/
/ M H /	/ M M H /

If the mapping principles spelled out in (4) were applied starting from the right rather than the left, then the adjustment to the forms in (8) would be unnecessary; however, this would yield an incorrect surface form in the case of (9a); moreover, it is not borne out by the general tendencies of the language with regard to tone. (Singler (1979) discusses the directionality of tonal processes in Klaọ in greater detail.)

(9a) Right-to-Left Application of the Mapping Principles

/tapɛ/ —4b→ tapɛ —4c→ tapɛ [*tàpɛ́] 'cup'
/M L H/ M L H M L H

(9b) Left-to-Right Application of the Mapping Principles

/tapɛ/ —4b→ tapɛ —4c→ tapɛ [tāpɛ̌] 'cup'
/M L H/ M L H M L H

For Hausa, a Chadic language discussed in Leben (1978), the revised suprasegmental analysis employs lexical associations for forms at variance with the OCP; examples are given in (10a-12a).

(10a) /alhamis/ [àlhàmîs] 'Thursday'
/ L H L /

/alhamiis + ii/ [àlhàmíiš-ìi] 'Thursday'
/ L H L /

(11a) /kadangaree/ [kàdáŋgárèe] 'lizard'
/ L H L /

(12a) /majalisaa/ [màjàlísàa] 'council'
/ L H L /

(With regard to variants such as those found in (10a), Leben notes: "Nouns ending lexically in a consonant often have a variant form with the ending -ii attached." (1978:207))

In addition to lexical associations, the Well-Formedness Condition, and related principles of association, Leben's analysis also requires a special mapping principle for some, but not all, four-syllable words with the melody LHL; this principle would apply before the other mapping principles, i.e. before those set forth in (4). Although Leben does not attempt to formalize it, the mapping principle would have to be something like the following:

> For words having the melody LHL and a lexical association between the H and the second syllable, associate the low tones to the first and last syllables.

This mapping principle would apply to (11a) but not to (12a) (since the lexical association in (12a) is between the H and the third syllable). If the principle were not applied, the surface form of

(11a) would be [*kàdángàrèe]. In the autosegmental analysis, no such ad hoc mapping principle is required. Rather, the application of the mapping principles in (4) to the underlying forms posited in (10b-12b) yields the correct surface forms in each instance.[5]

(10b)	/alhamis/	[àlhàmîs]	'Thursday'
	/L L H L/		
	/alhamiis + ii/	[àlhàmíisìi]	'Thursday'
	/L L H L /		
(11b)	/kadangaree/	[kàdángárèe]	'lizard'
	/ L H H L /		
(12b)	/majalisaa/	[màjàlísàa]	'council'
	/ L L H L /		

Mende, a Mande language spoken in Sierra Leone and Liberia, is yet another language which contains forms at variance with the OCP. [ngɔ́ngɔ̌], given below as (13a), was shown in (1) to have the same tone melody, HL, as [kényà] but a different surface representation of it; similarly, [làsìmɔ́], in (13b), is at variance with the more common pattern for trisyllabic LH forms. The solution is the same as before: lexical associations in the revised suprasegmental analysis, departures from the OCP in the autosegmental.[6]

		Suprasegmental	Autosegmental	
(13) a.	[ngɔ́ngɔ̌]	/ngɔngɔ/	/ngɔngɔ/	'tooth'
		/ H L /	/H H L/	
b.	[làsìmɔ́]	/lasimɔ/	/lasimɔ/	'amulet'
		/ L H /	/L L H/	

Before further discussion of Mende, a word is in order with regard to the autosegmental analyses presented thus far. In each case, the exceptions presented to the OCP have been assigned an underlying form very close to the surface form. That is, forms have either conformed to the OCP or have been posited as having an underlying sequence which closely parallels the surface sequence.

To return to Mende: the forms [bɛ̌sí] and [hǐndɔ̀], as presented in (14), taken from Leben (1978), cannot be accounted for by autosegmental theory.

		Suprasegmental	Autosegmental	
(14) a.	[bɛ̌sí]	/bɛsi/	?	'pig'
		/L H/		
b.	[hǐndɔ̀]	/hindo/	?	'male'
		/L H L/		

However, as Leben (1973) remarks with reference to forms like (14a): "It is not clear whether these vowels are phonetically short." (p. 85) Dwyer (1978) maintains that the initial vowels in both (14a) and (14b) are phonetically long. If the initial vowels are long, then the forms conform to the OCP and require special treatment in neither analysis, as demonstrated in (14c-d):

(14)		Suprasegmental	Autosegmental	
c.	[bɛ̀ɛ́sí]	/bɛɛsi/	/bɛɛsi/	'pig'
		/ L H /	/ L H /	
d.	[hĭíndɔ̀]	/hiindo/	/hiindo/	'male'
		/L H L/	/L H L/	

At present, the status of the crucial first vowels remains unresolved. However, given the uncertainty as to their length, these forms cannot yet be said to constitute evidence in favor of lexical associations and the revised suprasegmental analysis over the autosegmental analysis.[7]

The largest part of Leben's discussion of Mende is devoted to the morphotonemics of Mende nouns. Examples of the surface tonal patterns of nouns in constructions involving more than one morpheme are given below in Table 1.[8]

Table 1

The Surface Realizations of Mende Nouns

	Uninflected form		Indef. Pl.	Def. Sg.	(1)	(2)
/H/	kɔ́	'war'	kɔ́-ngàa	kɔ́-í	kɔ́-hú	kɔ́-híndà
/H/	pélé	'house'	pélé-ngàa	pélé-í	pélé-hú	pélé-híndà
/L/	bèlè	'trousers'	bèlè-ngàa	bèlè-í	bèlè-hù	bèlè-hìndà
/HL/	mbû	'owl'	mbú-ngàa	mbû-í	mbú-hù	mbú-hìndà
/HL/	ngílà	'dog'	ngílà-ngàa	ngílè-í	ngílà-hù	ngílà-hìndà
/LH/	mbǎ	'rice'	mbǎ-ngàa	mbè-í	mbà-hú	mbà-híndà
/LHL/	nyàhâ	'woman'	nyàhá-ngàa	nyàhê-í	nyàhá-hù	nyàhá-hìndà

(1) = With the toneless "postposition" hu 'in'
(2) = In a compound with hìndâ 'business'

("The change of a to ɛ before -i is regular." (Leben 1978:194))

The rules by which the forms in Table 1 are derived in an autosegmental analysis are presented in (15) and (16). Implicit in an autosegmental analysis is the principle that pre-mapping rules in the tonal stratum do not make reference to segmental information. (The segmental stratum is present in the description of Rule (15b) only as a way to indicate that there is a morpheme between the boundaries.) After mapping has occurred, then rules involving tone are similar to other rules of segmental phonology. Accordingly, Rule (16) utilizes segmental information to restrict its applicability to the appropriate forms: it applies only to contour tones. (In the statement of the rule, this fact is symbolized by the arc over the input.)

(15) Pre-Mapping Rules

a. Nominal-Compound Tone-Adjustment

$T]_N \quad \# \quad T_0] \ \{N, Adj\}$

1 2 3 $\Longrightarrow$

1 2-1-L $\emptyset$

Example:

/ngila#hinda/ $\xrightarrow{15a}$ ngila#hinda $\xrightarrow{4b}$ ngila#hinda

/ H L #L H L/ H L # L L H L # L L

b. Tone Copy

X # Y V Z # X # Y V Z #

T_α # # $\longrightarrow$ T_α # T_α #

Example:

/ngila#hu/ $\xrightarrow{15b}$ ngila#hu $\xrightarrow{4b}$ ngila#hu

/ H L # / H L #L H L #L

(16) Post-Mapping Rule

Alpha-Tone Absorption

$\overbrace{[\alpha\ H]\ [-\alpha\ H]} \longrightarrow [\alpha\ H] \ / \ \underline{\quad} \ \# \ [-\alpha\ H]$

Example:

/mbu#ngaa/ $\xrightarrow{4b}$ mbu#ngaa $\xrightarrow{4c}$ mbu#ngaa $\xrightarrow{16}$ mbu#nga

/H L# L / H L# L H L# L H # L

Though the principle of separation of tone from segments before mapping is a part of suprasegmental theory, too, it is not strictly maintained in the revised suprasegmental analysis presented in Leben (1978). That is, one of the things accomplished by Leben's pre-mapping rule of Nominal-Compound Tone-Adjustment (given as (17)

below) is the association of a tone with a segment. Specifically, when the tone melody of the first member of the compound ends in H, Leben's rule associates the H tone with the first vowel of the second constituent of the compound. While this may seem less of an attack on the notion of the separation of tone and segments than are lexical associations, the latter are restricted to exceptional forms; this rule, on the other hand, is posited as applying to non-exceptional forms.[9]

(17) Leben's Nominal-Compound Tone-Adjustment Rule (1978:203)

$[X]_N$ # $[CV\ Y]_{\{N,\ Adj\}}$ $\longrightarrow$ $[X]_N$ # $[CV\ Y]_{\{N,\ Adj\}}$

T_0<H># T_0 $\longrightarrow$ T_0 # <H> L

Example:

/mba#hinda/ $\xrightarrow{17}$ mba#hinda $\xrightarrow{4b}$ mba#hinda

/L H#L H L/ L # H L L # H L

Another feature of Leben's analysis is the introduction of an additional, language-specific mapping principle, presented in (18) below; the principle is specified by Leben as applying before the mapping principles outlined in (4). (The autosegmental analysis does not require such a rule.)

(18) Associate a final H with the rightmost syllable.

Leben's analysis requires him to treat word-internal boundaries in an unorthodox way. In autosegmental theory, association occurs across a formative boundary, as in (19a), but is blocked by a single (or a double) word boundary, as in (19b). In the autosegmental treatment of Mende nouns, each of the word-internal boundaries is assumed to be a single word-boundary and, therefore, to block association.

(19) a. /CVCV + V/ [CVCV-V]

/ L +HL/ L -HL

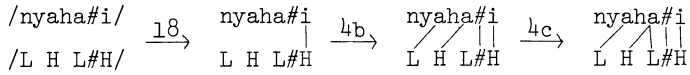
b. /CVCV # V/ [CVCV-V]

/ L #HL/ L -HL

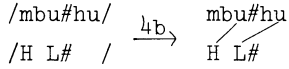
Leben's treatment of boundaries is detailed in (20).

(20) a. Word-internal boundaries do not have the power to block the application of (18).

b. When there are tones on either side of a word-internal boundary, the boundary acquires the power to block association across itself as part of the application of (4b), e.g.



c. For those forms for which there are no tones on one side or the other of a word-internal boundary at the time of application of the mapping principles, the boundary has no status, i.e. cannot block association across itself, e.g.



The principles in (20) are not stated in that form by Leben, but they are what the derivations which he provides reveal.[10] Leben's manipulation of word-internal boundaries does yield the correct forms; however, no other motivation for it presents itself.

In summary, Leben's analysis of the forms in Table 1 suffers--at the least--not only from a violation of the principle of keeping tones and segments separate until association occurs but also from an unprincipled treatment of word-internal boundaries.

The relevance of the rules in (15) and (16)--or of Leben's equivalent--to the discussion of the Obligatory Contour Principle becomes clear with the introduction of the forms in (21).

(21) Two Types of [CV̀CV́] Nouns

a.	Uninflected	[fàndé] 'cotton'	[nàvó] 'money'
b.	Indef. pl.	[fàndé-ngàa]	[nàvó-ngàa]
c.	Def. sg.	[fàndè-í]	[nàvó-í]
d.	With hu	[fàndè-hú]	[nàvó-hú]
e.	In a compound	[fàndè-híndà]	[nàvó-híndà]
Underlying forms:			
f.	Autosegmental	/fande/ /L L H/	/navo/ /L H/
g.	Revised Supra-segmental	/fande/ / L H /	/navo/ /L H/

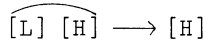
While [fàndé] and [nàvó] both appear on the surface as L H (in their uninflected forms) and while they have the same surface pattern for the indefinite plural as well, the two differ throughout the remainder of the paradigm.

The underlying forms posited in the autosegmental analysis, given in (21f), do not represent a new solution. Rather, they are more appropriately seen as the autosegmental variant of an analysis that has appeared in various forms in the past decade. Dwyer (1971, 1973, 1978), Voorhoeve (1975), and Leben (1971) have all had a LH on the final syllable of fàndě at some abstract level. The auto-

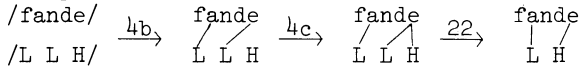
segmental analysis presented here draws heavily from Dwyer (1978) both with reference to the underlying forms in (21f) and to the post-mapping rule, (16). (While Dwyer's 1978 analysis is not autosegmental, it is, he notes, "not incompatible with . . . models such as that put forward by Goldsmith." (p. 170))

A further rule is required in the autosegmental analysis in order to account for the surface forms [fàndé] and [fàndé-ngàa]. (Using only the rules in (15) and (16) and the mapping principles in (4) would yield the incorrect [*fàndě] and [*fàndě-ngàa].) Specifically, a post-mapping rule of "low loss" is required; the rule is to be ordered after (16). Again, the arc over the input is meant to indicate that the rule applies only to contour tones.

(22) Low Loss



Example:



Monosyllabic nouns having a LH tone melody, e.g. mbǎ 'rice', do not undergo this rule; they must be marked as exceptions to it. The motivation for (22) is presented below.[11]

It must be noted that Leben (1973, 1978) raises several objections against the earlier, non-autosegmental versions of the solution which posits the underlying forms in (21f) and the rule in (22). Those objections apply putatively to the autosegmental version as well and must be addressed. However, before doing so, it is appropriate to note that the forms in (21a) occur only rarely. The forms which usually occur in isolation, for example, or as a response to an elicitation are those like (21c). Innes (1967), referring to forms like those in (21a), calls them "indefinite" but warns against equating them with the indefinite in English. He adds, "Indefinite forms are not common except as first part of a compound," (p. 16) i.e. as in (21e). Note that in the commonly occurring forms--(21c) through (21e)--fàndě and nàvó have different tone patterns on the surface. Moreover, if the key forms in language-learning are the most commonly occurring ones, then it is the forms in (21c), contrastive and commonly occurring, which provide the basis for the language learner's acquisition of separate paradigms for fàndě and nàvó. For the language learner, at least, the neutralization of forms in (21a) and (21b) need not be problematic.

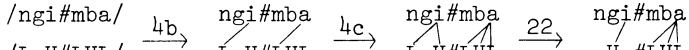
To return to Leben's criticisms: the first is that solutions of the type proposed in the present autosegmental analysis use a phonological feature as a diacritic. Whether or not this objection can be refuted depends upon the range of applicability of Rule (22), Low Loss. If the rule applies only to the forms like fàndě and fàndě-ngàa (in (21a-b)), then the rule can probably be said to exist

in order to make the solution work. On the other hand, if (22) can be shown to apply to monosyllabic forms as well, then phonological--rather than merely diacritic--motivation for the use of phonological features will have been demonstrated.

As noted above, (22) does not apply to monosyllabic nouns. But what of other monosyllabic forms? According to Leben (1971), (22) applies to possessives (illustrated in (23)); according to Spears (1967) and Dwyer (personal communication), it applies to verbs as well (as in (24)).[12]

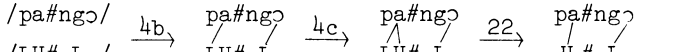
(23) /ngi/ 3sg. poss. /mba/ 'companion'

/L H/ /LHL/



(24) /pa/ 'to come' /ngɔ/ "passive" suffix

/LH/ / L /



((23) is taken from Leben (1971:187); he translates the form as 'his companion'. (24) is taken from Spears (1967:238); he translates the form as 'it is come'.)

Given the wider use of (22) demonstrated in (23) and (24), it is legitimate to consider Low Loss a rule of the language and to consider the autosegmental analysis proposed here as one which uses phonological features phonologically, not as diacritics.

Leben's two other criticisms of solutions like the autosegmental one are the following: first, that words like fàndě are far more numerous than forms like nàvó yet--in analyses like the autosegmental one--are the forms which are marked, and second, that there are unexplained gaps in distribution, since there are no disyllabic H LH nouns. Dwyer (1978) has responded to these criticisms indirectly by using diachronic evidence to show how such a situation could have evolved. Very briefly put, Dwyer has reconstructed the tone system for an ancestor language of Mende's, Proto-Western Mande; he postulates two tone classes for nouns, H and L. Then, the latter class is posited as having acquired a word-final H. From this class come words of the fàndě type.

That the special status of nouns like fàndě (as accorded them by the autosegmental analysis) is not an innovation in Mende is further supported by evidence which Dwyer presents from Bandi, the language most closely related to Mende. According to Dwyer, by the time of Proto-Central Southwestern Mande, five tone classes were present (illustrated in (25)). fàndě and other words like it were in Class 2. (nàvó and words like it are borrowings into Mende from a later period.) In Bandi, Class 3 and Class 4 nouns both lost their word-final low. However, while the Class 4 nouns are now

identical throughout the noun paradigm to Class 1 nouns, Class 3 nouns behave differently from those in Class 2, suggesting--at the very least--that there is more to one of the latter two classes than a simple LH tone melody.

(25) Proto-Central-Southwestern Mande Tone Classes

		Mende	Bandi	
Class 1:	(H) H	[ngúlú]	[ngúlú]	'tree'
Class 2:	(L) LH	[nìká]	[nìká]	'cow'
Class 3:	(L) HL	[ngètê]	[ngèté]	'pestle'
Class 4:	H L	[kálì]	[kálí]	'hoe'
Class 5:	(L) L	[bèlè]	[bɔ̀lɔ̀]	'trousers'

While diachronic evidence alone is insufficient to motivate a given solution for a set of synchronic facts and while the present diachronic evidence is perhaps more suggestive than conclusive, diachronic evidence can give support for a solution which also possesses synchronic motivation. This, I wish to argue, is the case here: the peculiar facts of the language have their basis in the language's history, but the solution offered by the autosegmental analysis reflects synchronic realities as well, specifically with reference to the wider--though not exceptionless--applicability of the rule of Low Loss.

To return, then, to the original hypothesis: In Etung, Klaọ, and Hausa, the evidence is incontestable that lexical associations are unnecessary once deviation from the Obligatory Contour Principle is permitted. In Mende, while the evidence is more checkered, it is again the case that lexical associations need not be used. Thus, autosegmental theory--because it is more highly constrained than revised suprasegmental theory yet can account for the facts at hand--is to be preferred to revised suprasegmental theory.

Footnotes

1. This paper developed from one given in a seminar on tone conducted by Victoria Fromkin at UCLA in 1979. For their helpful comments, I am grateful to Vicki and to the other participants in the seminar: Sorie Yillah, Andreas Wittenstein, John Watters, Ernest Byarushengo (USC), Janine Bays, and Stephen C. Anderson (USC). In what is essentially its present form, this paper was presented to a seminar on Mande languages conducted by William Welmers at UCLA earlier this year. It benefited there from the comments of Prof. Welmers and the other participants: Linda Arvanites, Thaïs Aubry, James Fordyce, Sukari Saloné, and John Watters. I am also indebted to David Dwyer, Baruch Elimelech, and Linnea Lagerquist.

2. To be sure, Goldsmith accepts the OCP at the surface level (a level at which Leben abandons it). However, the issue of the OCP's status on the surface is not relevant to the present discussion.

3. "Original suprasegmental" is employed in the present work to refer to Leben (1973), and "revised suprasegmental," to Leben (1978). It is not a distinction which Leben himself makes.

4. Most of the literature on Klaọ, e.g. Elimelech (1974) and Lightfoot (1974), refers to the language as "Kru"; more recently, "Kru" has been reserved for the language group, and "Klaọ" has been used to specify the language in question.

V̰ indicates that a vowel is [- EXPanded], i.e. [- ATR (Advanced Tongue Root)].

Elimelech (1974) argues for underlying contour tones in Klaọ. At the phonological level, he posits two level tones, L and H, and two contour tones, Rising and Falling. Lightfoot (1974) posits three underlying level tones, L, M, and H, and no contours. Singler (1979) presents several pieces of evidence in favor of Lightfoot's analysis (and against Elimelech's). The present discussion assumes the analysis put forth by Lightfoot.

5. Whichever analysis is employed, the following rule of Low-Tone Raising operates after mapping has occurred:

$$\begin{matrix} V \\ [+\ \text{Long}] \end{matrix} \longrightarrow H \ / \ \begin{matrix} V \\ | \\ L \end{matrix} \ C_0 \ \_\_\_\_ \ \#$$

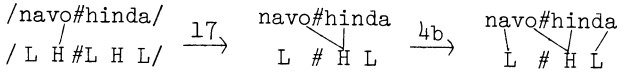
6. For Mende, Leben states that only an H may be lexically associated with a syllable. He comments ". . . that the revised analysis makes Mende look more like a pitch-accent system than the original suprasegmental analysis did. . . . There are . . . facts about the distribution of tone in Mende that favor this interpretation over a purely segmental account." (p. 191) For Hausa, he also restricts lexical associations to H's, but he offers no principled reason for this constraint. Clearly, however, in the cases of Etung and Klaọ, no such distributional restrictions are possible.

7. Leben presents several loan-words from English, many of which cannot be accounted for by the mapping principles of the language and all of which have tone melodies ending in H L. He then posits a lexical association for all these forms between the H and the word's penultimate syllable. Loan-words from English do not all demonstrate the same behavior with regard to tone, however. Presumably, lexical associations would not be assigned, for example, to such words as mìkì 'milk' and kɔ̀fí 'coffee' (from Dwyer (1978) and not discussed by Leben).

However, once the OCP is abandoned (as in an autosegmental analysis), only three of the forms introduced by Leben cannot be accounted for. Of these, Welmers (personal communication) notes that two (as transcribed by Leben)--klǎkì 'clerk' and plětì 'plate'--violate Mende syllable structure conditions and the vowel in the first syllable of the third--gɔ̀tà 'gutter'--is possibly long (as in its non-problematic variant gɔ̀átà), in which case this form, too, is non-problematic.

8. Leben (1978) presents the surface representations of mbû#í and nyàhâ#í as [mbû-í] and [nyàhê-í], respectively, on p. 204 but as [mbú-ǐ] and [nyàhé-ǐ] on p. 194. Inasmuch as Leben (1971) gives [mbû-í] as the surface form (p. 187), I have assumed that to be the correct surface representation and have further assumed that the parallel form [nyàhê-í] is correct.

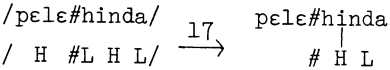
9. One difference between the input and the output of (17) is the addition of an association line. This use of an association line as part of the formalism and the absence of association lines in the input perhaps combine to suggest that the input is sensitive to associations and, therefore, that the rule is blocked from applying to forms already containing an association. In fact, this is not the case, as the following derivation (from Leben (1978:203)) illustrates:



Perhaps an adjustment of the formalism is in order.

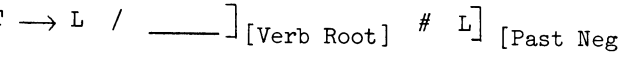
10. In a footnote (p. 201), Leben proposes a restatement of (4b); by this restatement, word-internal boundaries, too, are associated as a part of this mapping principle. Leben's restatement is of limited value inasmuch as, quite frequently, the association accomplished by the "new" (4b) is subsequently dismantled. Specifically, when no association of tone to syllable has occurred across a word-internal boundary prior to the operation of (4b) and when there are no tones on one side or the other of the word-internal boundary (the instances referred to in (20c)), Leben associates the boundaries as part of (4b) and dismantles the associations as part of (4c). (The procedure suggests a Las Vegas marriage followed by a Tijuana divorce.)

It should be noted further that, in Leben's analysis, the number of forms which lack tones on one side or the other of a word-internal boundary at the time of operation of the mapping principles is not confined to forms containing underlyingly toneless "postpositions." It can also include the output of (17), the Nominal-Compound Tone-Adjustment rule, e.g.



as well as the output of another of Leben's pre-mapping rules, the Convention on Tone Melodies, e.g.

Leben (1978) also contains a very brief discussion of verbs. His solution relies upon the treatment of boundaries described in (20). A solution consistent with the autosegmental analysis and its treatment of word-internal boundaries is to posit the boundary between the verb root and the past negative marker -nì as being a single word boundary and to posit the following morphologically conditioned pre-mapping rule:



11. That [mbă] is the form which obtains on the surface is confirmed by Dwyer (personal communication).
12. The controversy over the length of the vowel in mbâ (discussed in Dwyer (1978) and Leben (1973, 1978)) is not relevant here.

The function of ngɔ̀ has been subjected to a variety of interpretations; the salient point with regard to the present discussion is the assertion by Innes (1963) and by Spears (1967) that the form is a suffix (rather than a word). (That ngɔ̀ is a passivizer or, indeed, that Mende has a passive at all has not yet been effectively established.)

References

Dwyer, David. 1971. Mende tone. Studies in African Linguistics 2:117-30.

_____ 1973. The comparative tonology of Southwestern Mande nominals. Michigan State Ph.D. dissertation.

_____ 1978. What sort of tone language is Mende? Studies in African Linguistics 9:167-208.

Edmundson, T., and J. T. Bendor-Samuel. 1966. Tone patterns of Etung. Journal of African Languages 5:1-6.

Elimelech, Baruch. 1974. On the reality of underlying contour tones. The tone tome: Studies on tone from the UCLA Tone Project. UCLA Working Papers in Phonetics 27:74-83.

Fromkin, Victoria (ed.). 1978. Tone: A linguistic study. New York: Academic Press.

Goldsmith, John. 1976. Autosegmental phonology. MIT Ph.D. dissertation distributed by the Indiana University Linguistics Club.

Innes, Gordon. 1963. The structure of sentences in Mende. London: University of London, School of Oriental and African Studies.

_____ 1967. A practical introduction to Mende. London: University of London, School of Oriental and African Studies.

Leben, William. 1971. Suprasegmental and segmental representation of tone. Studies in African Linguistics Supp. 2:183-200.

_____ 1973. Suprasegmental phonology. MIT Ph.D. dissertation.

_____ 1978. The representation of tone. In Fromkin (ed.) 177-219.

Lightfoot, Nancy. 1974. Tones on Kru monosyllables. Anthropological Linguistics 16:425-41.

Singler, John. 1979. Tone in Klaọ. ms. UCLA.

Spears, Richard. 1967. Tone in Mende. Journal of African Languages 6:231-44.

Voorhoeve, Jan. 1975. Suprasegmental phonology. York Papers in Linguistics 21-31.