Studies in African Linguistics
Volume 24, Number 2, 1995

LEXICAL EXTRAPROSODICITY IN CHILUNGU*

Lee S. Bickmore
Michael T. Doyle
University at Albany, State University of New York

Nouns in Chilungu, a Bantu language spoken in Zambia, exhibit more tonal distinctions synchronically than exist in many modern Bantu languages. There exists a five-way distinction in nouns with CVCV stems and a four-way distinction in nouns with monosyllabic stems. We show that any synchronic analysis which assumes a two-way tonal distinction for each Tone Bearing Unit (e.g., H vs. L, or H vs. ø) cannot predict the attested number of surface tonal patterns. We avoid this dilemma by proposing that the final mora of certain noun roots is extraprosodic. This assumption not only correctly predicts the attested surface patterns, but results in rules which are well-motivated both theoretically and typologically (in Bantu). We argue that lexical conditioning of extraprosodicity is a natural outgrowth of prosodic theory, parallel to the use of lexical stress and lexical accent.

0. INTRODUCTION

In this paper we provide an autosegmental analysis which accounts for the complex array of surface tone classes found in the isolation forms of nouns in Chilungu, a Bantu language spoken in parts of the Northern province of Zambia.[1] Typologically, Chilungu nouns are interesting in that there appear to be more tone classes synchronically than exist in most modern Bantu languages which retain (at least) some of the Proto-Bantu tone patterns (many, of course, having

* We wish to thank our consultant, Alfred Sikazwe, for his time and patience during the elicitation of these forms. Additionally, we benefitted from comments and suggestions from Bruce Hayes, Larry Hyman, Sharon Inkelas, and Robert Botne. Of course, we remain responsible for any errors or omissions.

[1] According to Ohannessian and Kashoki [1978] there were 69,000 speakers of the language in 1969. Chilungu (M.14) is closely related to neighboring Zambian languages Fipa, Mambwe, Inamwanga, and Iwa. The data presented in this paper were elicited from Alfred Sikazwe, a native speaker of Chilungu. To the best of our knowledge, the only other study of the language is found in Kagaya [1987] which is non-generative and mainly descriptive.

even fewer tonal distinctions). For instance, there is a five-way tonal distinction in CV-CVCV nouns in Chilungu (formed by attaching a noun class prefix to a noun stem) whereas the Proto-language had four: the tone of the class prefix remaining constant and the tone pattern of the root being one of HH, HL, LH, or LL. There is a four-way tonal distinction in Chilungu nouns with monosyllabic stems (whereas the Proto-language had two: the tone pattern of the root being either H or L).[2]

(1) a. H-H L: *mú-lómò* 'mouth'
b. H-!H L: *lú-!límì* 'tongue'
c. H-L H: *má-sàká* 'sorghum'
d. H-L L: *mú-sànà* 'waist'
e. L-L L: *chì-zùlè* 'tobacco garden'

(2) a. H-L: *má-vì* 'excreta'
b. F-L: *kû-twì* 'ear'
c. L-L: *mù-nwè* 'finger'
d. H-!H: *chí-!pá* 'eyelid'

It will be shown below that the tonal distinctions, sometimes manifested in part on the noun class prefix (see examples (1d-e), (2a-c)), are completely due to the tonal specification of the root, as the class prefixes in (1) and (2) do not contrast, phonogically, in tone. It should be evident that a simple two-way underlying tonal contrast, e.g., H vs. L or H vs. ø, on Tone Bearing Units (TBU's) within the stem cannot account for all of the tone classes, as that type of system generates only 2^n tone patterns (where n = the number of stem TBU's). The challenge then becomes one of how to account for the forms above without adopting assumptions which vastly overgenerate (e.g., allowing underlying contours, or freely assigning H vs. L vs. ø, both of which will be addressed below in §3).[3]

---

[2] It should be noted that the 'extra' tonal class is not due to the merging of Proto Bantu *CVV and *CV syllables, as Chilungu maintains the phonemic vowel length distinction postulated for Proto Bantu.

[3] In the discussion which follows, we discuss and account for the tone patterns of Chilungu nouns as they occur in isolation. While we will not attempt to provide a complete description and analysis of the various nouns in phrasal contexts, we provide here an example of the nouns in (1) in a phrasal context: *mú-lómò ú-sùmà* 'good mouth', *lú-!límì lù-sùmà* 'good tongue', *má-sàká yá-sùmà* 'good sorghum', *mú-sànà ú-sùmà* 'good waist', *chì-zùlé chì-sùmà* 'good tobacco garden'. We note that the tone patterns of nouns (1a-d) remain the same in this phrasal context. The final mora of (1e) is raised to a High. This could be accounted for by a rule which inserts a High tone on the final mora of the first of two toneless words in a phonological phrase. The insertion of a High tone in this location within a phrase (sometimes subject to additional conditions) is attested elsewhere

In order to account for the tonal contrasts illustrated above, we propose that in addition to an underlying H vs. ø contrast on TBU's, the final TBU of a noun may be lexically extraprosodic. Crossing these two parameters provides the 'extra' tonal distinctions not found in Proto-Bantu, as illustrated schematically below for CVCV nouns.

(3) a. CVC<V>

b. CVC<V>
   |
   H

c. CVCV

d. CVCV
   |
   H

e. CVCV
      |
      H

While the positing of lexical extraprosodicity in noun roots runs counter to Inkelas's [1989:154] claim that "only those phonological elements belonging to affixes and clitics can be lexically invisible", we hope to demonstrate below that assuming lexical extraprosodicity of this kind provides a more explanatorily adequate analysis than alternative analyses which make no such assumption. We will return to Inkelas's claim in §4 below.

The structure of the rest of the paper is as follows. First, we will briefly discuss the syllabic and morphological structure of the forms to be analyzed (§1). We will then provide an analysis of all the tone classes found in Chilungu, formalizing all the tonological processes necessary to derive the surface forms (§2). Finally, we discuss the advantages of our analysis over other possible analyses (§3), and present the theoretical implications of our proposal (§4).

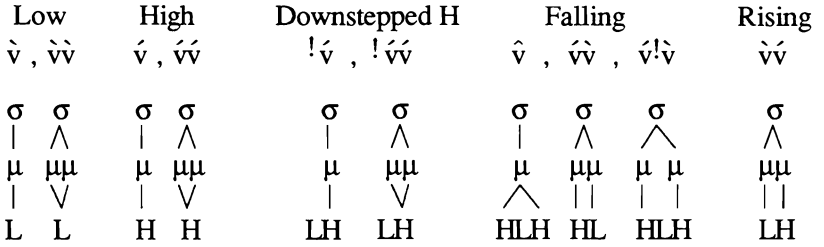
1. Preliminaries

The diacritics and autosegmental representations of the tones found in the language are given in (4) below, which presents an inventory of the possible tone/syllable types.

---

within Bantu, occuring in Kinyambo [Bickmore 1989], Runyankore [Johnson 1976], and Haya [Hyman and Byarushengo 1984].

(4) Tone/syllable types and their representations



Chilungu exhibits downdrift whereby a High tone which follows a Low tone is pronounced on a lower pitch than a previous High. When the Low tone is floating, the downstepping of the following H is indicated formally by a raised ! as shown in (4). We assume that the tone bearing unit (TBU) in Chilungu is the mora. As can be seen, a mora may bear either one or two tones, as there is a contrast in the language between a short and long Falling tone.[4] Furthermore, the fall on a bimoraic syllable can be one from High to Low or from High to downstepped High. A Falling tone on a short syllable always originates phonologically as a High followed by a downstepped High. (Instances of all of these types of Falling tones will be illustrated below.)

The essentials of Chilungu nominal morphology are as follows. All noun roots in the language fall into one of several morphological classes, usually consisting of a singular and plural pair, called a gender. Surface nouns consist minimally of a class prefix plus the root, e.g., *mú-lómò* 'mouth', where *mu* is the (singular) class prefix and *-lomo* is the root. Chilungu is one of those Bantu languages in which nouns may surface with a preprefix (in addition to the class prefix), as in *ú-mú-lómò* 'mouth'. The semantic and/or pragmatic factors which condition the appearance or absence of the preprefix in a particular context will not concern us here.[5] We provide a formal analysis capable of generating both forms.

2. Tonal analysis

First, as is commonly assumed in the analyses of most Bantu languages, we propose that Low tones are completely underspecified underlyingly (cf. Pulleyblank [1986], papers in Clements and Goldsmith [1984]). A late rule in the phonology (to be formalized below) will supply any toneless syllable with a default Low tone. As regards any 'automatic' linking of tones to tone bearing units, we follow

[4] An example of another Bantu language with a phonetic contrast between High and Falling tones on short vowels is Haya, a Tanzanian Bantu language described by Hyman and Byarushengo [1984].

[5] For an insightful treatment on the presence of the Preprefix in Haya, another Bantu language in which the Preprefix is used similarly, see Chagas [1977].

Pulleyblank [1986] in assuming a universal Tonal Association Convention (TAC) by which free tones link in a one-to-one fashion with free TBU's.[6] All other tonal associations are produced by tone rules to be formalized below.

(5) Association Convention (from Pulleyblank [1986:11])

Map a sequence of tones onto a sequence of tone-bearing units,
(a) from left to right;
(b) in a one-to-one relation.

We assume that class prefixes are High-toned underlyingly. The only exceptions are the prefixes of classes 1a and 2a—/ø/ (null) and /ya-/, respectively—which bear no tone underlyingly.[7] We assume that preprefixes are all underlyingly toneless. Both of these assumptions will be justified below.

As noted above, noun roots vary lexically on two parameters. First, the root can be either toneless or contain a maximum of one High tone prelinked to a single TBU (unless there is no TBU, in which case the High must be floating). It would also be possible to analyze the High tones which are linked to the root-initial mora as floating Highs which would then be associated to the leftmost TBU by the Association Convention (5). As nothing in our analysis seems to hinge on this point, we assume the prelinked forms for expository convenience. Second, the final TBU of the noun root may be extraprosodic.[8] We will show below that this extraprosodicity is in fact a lexical property of the root, being neither a general property of nouns nor predictable by some phonological or morphological property of the root.

The crossing of these two binary parameters generates four tone classes (where H=High tone and E=final mora extraprosodicity): [-H,+E], [+H,+E], [+H,-E], [-H,-E]. For expository purposes, we assign a roman numeral to these four possible 'Tone Classes' and provide examples of abstract monomoraic, bimoraic, and trimoraic forms in Table 1 below. It should be noted that different

---

[6] Even this, however, may not be universal. See Odden [1987] and Hyman and Ngunga [1994].

[7] In Guthrie's [1967-71] noun class system proposed for Bantu languages, Classes 1/2 generally consist of animate (usually human) nouns, marked in Chilungu by the class prefixes /mu-/ (sg.) and /a-/ (pl.). There are certain animate nouns in the language which are marked by the class prefixes /ø/ (sg.) and /ya-/ (pl.). Since these nouns take the regular gender 1/2 verbal agreement markers, we treat them as a special subclass of 1/2 and label them 1a/2a.

[8] We note that the extraprosodicity of a root consisting of a single mora does not violate Hayes's [1995] prohibition on total extraprosodicity, as Hayes's prohibition applies to prosodic words, while any Chilungu root must combine with a (nonextraprosodic) class prefix to become a prosodic word.

tone patterns are possible within polysyllabic roots found in Tone Classes II and III because the underlying High can be located in any one of several positions.[9]

Table 1. Chilungu tone classes

	I. [-H, +E]	II. [+H, +E]	III. [+H, -E]	IV. [-H, -E]
1 μ	<μ>	<μ> H	μ H	μ
2 μ	μ <μ>	μ <μ> H	μ μ H μ μ H	μ μ
3 μ	μ μ <μ>	μ μ <μ> H μ μ <μ> H	μ μ μ H μ μ μ H μ μ μ H	μ μ μ

Finally, we will assume that processes which affect vowel length precede the tonal rules to be discussed in detail below. Briefly, while vowel length in Chilungu can be lexically contrastive (e.g., *kú-ǃsúlà* 'to blacksmith', *kú-ǃsúúlà* 'to ignore'), it can also be derived via compensatory lengthening (in all positions except word-finally). As is the case in many Bantu languages, compensatory lengthening occurs a) after gliding (e.g., /mu-ana/ → *mwáànà* 'child'), b) after vowel deletion (e.g., /ma-ino/ → *míìnò* 'teeth'), and c) before NC clusters (e.g., /mu-ntu/ → *múúntù* 'person'). This latter process suggests that a nasal which follows a vowel and immediately precedes another consonant is moraic by Hayes's [1989] "Weight by Position" principle which assigns a mora to a conso-

[9] It turns out that due to a tonal rule to be motivated below (24), there is a neutralization in the surface tonal pattern of [+H, -E] forms where the High is linked to a pre-final TBU. Therefore, Chilungu has a 6-way distinction in trimoraic roots rather than a 7-way one.

nant which is tautosyllabic with a preceding syllable nucleus. A phonological rule then reassociates the nasal into the onset of the following syllable, and the floating mora gets reassociated to the previous vowel. When a nasal-consonant sequence is word-initial, the nasal is not a Tone Bearing Unit; rather, it forms part of the onset and is, hence, not moraic (e.g., *n-zóvù* 'elephant'). Let us now turn to the analysis of nouns falling within each of the four Tone Classes.

2.1 Extraprosodicity: Tone class I [-H, +E]: The first set of nouns which we address are those which phonetically begin with a High tone and stay High until the final mora, which is Low-toned (see (1a)). Some examples of this tone class are given in (6).[10]

(6) Examples of nouns in Tone Class I [-H, +E]

ú-múú-ntù	'person'	*ú-mú-lómò*	'mouth'	*ú-mú-zííngà*	'beehive'
á-má-vì	'excreta'	*í-ví-lézù*	'beard'	*í-cháálò*	'field'
ú-mú-zì	'village'	*íí-m-bázò*	'ribs'	*ú-lú-nyélélè*	'ant'
		í-chí-lézù	'chin'	*íí-m-bálámínwè*	'ring'
		í-chí-fúlà	'well'	*ú-mw-óóngólólò*	'backbone'

These suface forms can be produced by assuming that all of the class prefixes illustrated above have an underlying High tone. We propose that this High tone will spread by rule to the right as far as it can. By also positing that all of these nouns have an extraprosodic final TBU, we correctly predict that the spreading (when it occurs) will persist up to the penultimate syllable in each case. To accomplish the spreading we posit a rule of Iterative Rightward High Spread, formalized in (7), which has the effect of spreading a linked H tone to a following free mora. We assume the rule applies iteratively, and will thus continue to reapply until no further free mora is found. This type of rule has been used in the analysis of other Bantu languages, e.g., Tonga [Pulleyblank 1986], Shona [Myers 1987], and Xhosa [Downing 1994]).

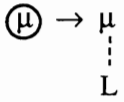
(7) *Iterative Rightward H Spread (RHS)*

A subsequent rule, already alluded to above and formalized in (8) below, assigns a default Low tone to any free mora(e). We assume that this rule of Low

[10] While the forms given in (6) include the preprefix, it should be noted that the tone pattern of the rest of the word remains the same when the preprefix is not present. This is true of all the data which will be presented below.

Default Insertion applies to all TBU's not associated with any tone. Since all TBU's must eventually bear a tone in the phonetic representation, we assume that at some point extraprosodic TBU's must become visible again. This step in the derivation, discussed further below, precedes Low Default Insertion and is labelled 'Visibility' in the derivation.

(8) *Low Default Insertion (LD)*



Two sample derivations are provided in (9) below to illustrate the effects of these two rules.

(9) Derivations of nouns of Tone Class I

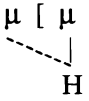
a.	b.	
mu-lom<o>	n-balaminw<e>	Underlying Rep (UR)
H	H	
	n-balaminw<e>	Association Convention (5)
	H	
mu-lom<o>	n-balaminw<e>	Rightward High Spread (7)
H	H	
mu-lomo	n-balaminwe	Visibility & Low Default (8)
H L	H L	
múlómò	mbálámínwè	Phonetic Representation (PR)
'mouth'	'ring'	

Visibility must not occur until after Rightward High Spread applies, insuring the invisibility of the final mora at the time the spreading rule applies. If this were not the case, Rightward High Spread would incorrectly produce a High on the final V in forms such as those in (9), in effect neutralizing the distinction between Tone Class I and Tone Class III (discussed in §2.3 below). The unbounded nature of the Rightward High Spread rule is aptly demonstrated in (9b)

where the High spreads to all visible morae. (A homorganic nasal assimilation rule accounts for the change of the Class 9 prefix /n-/ into a labial.)

As mentioned above, nouns must be generated with and without the preprefix. We will now account for the above forms with the preprefix. We assume a lexical phonological framework which provides Chilungu with two morphological levels (cf. Kiparsky [1982] and Mohanan [1986]). The class prefix is added at the first level, while the preprefix is added at the second level. As the tone of the preprefix is always identical to the (leftmost) tone associated to the class prefix, we propose a Level 2 phonological rule which spreads a linked H leftward across a morpheme boundary to a free mora.[11] This rule is formalized In (10) below.

(10) *Leftward High Spread (LHS)*



In (9) above we provided sample derivations of two nouns at Level 1. In (9') below, we continue the derivation of the nouns illustrated in (9), beginning with the output of the first morphological level.

We suggest that the extraprosodicity of the word-final TBU is lost as the form enters the second level of the lexical phonology. After the addition of the preprefix, Leftward High Spread will insure that any TBU's in the preprefix are associated with the High linked to the class prefix. Finally, Low Default applies and the tonification of the forms is complete. As the tonology of the preprefix is derived in just this way for all forms which exit Level 1 with a High tone on the leftmost TBU, we limit ourselves to the Level 1 morphology for the remainder of the forms to be discussed below.

[11] Reference to the morpheme boundary in the rule anticipates derivations of forms to be presented below. While a linked H must spread leftward to the preprefix in cases like (9'), it must not spread morpheme internally in cases like (15a-b). Additionally, the assumption that the Preprefix is added at a subsequent morphological level, while not crucial for the derivations in (9') will be justified below (see (19)).

(9') Derivation of nouns of Tone Class I: Level 2

a.	b.	
mu-lom<o>	n-balaminw<e>	Output of Level 1
H	H	
mu-lomo	n-balaminwe	Visibility
H	H	
u-mu-lomo	ii-n-balaminwe	Addition of Level 2 preprefix
H	H	
u-mu-lomo	ii-n-balaminwe	Leftward High Spread (10)
H	H	
u-mu-lomo	ii-n-balaminwe	Low Default (8)
H L	H L	
úmúlómò	íímbálámínwè	Phonetic Representation (PR)
'mouth'	'ring'	

2.2 More benefits of extraprosodicity: Tone class II [+H,+E]: We now turn to nouns whose surface tonal pattern differs from those just described only in that the first mora of the root is a downstepped High rather than a High pronounced at the same level as that of the class prefix. Examples of these are give in (11) and (12).

(11) a. *ú-lú-ˡlímì* 'tongue'
b. *á-má-ˡfútà* 'oil'
c. *í-chí-ˡlóótò* 'dream'
d. *ú-mú-ˡkázyáánà* 'girl'

(12) a. *ú-lú-ˡúzì* 'river'
b. *í-lí-ˡínò* 'tooth'
c. *í-lí-ˡínsózì* 'tear'

We suggest that like the nouns in (6), the nouns in (11) exhibit final mora extraprosodicity accounting for the Low tone on that TBU in each case. We propose that these nouns differ from those in (6), however, in that the root has a

High tone linked to the root-initial syllable. To account for the downstep we posit a rule of Low Tone Insertion, which inserts a Low tone between two High tones. This rule makes such forms consistent with the Obligatory Contour Principle and provides a phonological (versus a purely phonetic) account of downstep, as was argued to be the case in other African tone languages in Clements and Ford [1979] and Pulleyblank [1986]. We will present evidence later that the process is truly a phonological one, best handled by an ordered rule.The rule is formalized in (13).

(13) *Low Tone Insertion (LI)*

$$\emptyset \rightarrow L \;/\; H \_\_\_ H$$

The application of this rule is illustrated in the derivations in (14) below.

(14) Derivations of nouns of Tone Class II: root-initial H

a. lu - lim<i>	b. mu - kazyaan<a>	c. li - insoz<i>	
H H	H H	H H	UR
lu - lim<i>	mu - kazyaan<a>	li - insoz<i>	Low Insertion (13)
HL H	H L H	HLH	
	mu - kazyaan<a>	li - insoz<i>	RHS (7)
	H L H	HLH	
lu - limi	mu - kazyaana	li - insozi	Visibility & LD (8)
HL H L	H L H L	HLH L	
lú!límì	*mú!kázyáánà*	*lí!ínsózì*	PR
'tongue'	'girl'	'tear'	

In (14) we see exactly how a phonetic downstep is accounted for in the phonology. Because of the presence of the two H tones, Low Tone Insertion will apply. The Tonal Association Convention, as stated in (5), only provides for the automatic linking of a tone when there is a free TBU. As the L could not link without the crossing of association lines, it remains floating and is interpreted by the phonetic component as a downstep. The derivation in (14c) illustrates what happens when the root is vowel-initial. Low Insertion applies as it does in the C-

initial cases, creating a falling tone across a long vowel, from High to Downstepped High.[12]

We noted earlier that the High tone in a noun root is not always borne by the initial TBU. Consider, e.g., the forms *í-chí-tòlòókósì* 'jail' and *mùsátò* 'python', the second of which falls into gender 1a/2a which has a null class prefix in the singular and /ya-/ in the plural (see fn. 7). If we assume that the underlying High tone is linked to the leftmost TBU bearing a phonetic High, these tone patterns fall out straightforwardly as shown in (15) below.[13]

(15) Tone Class II with non-root-initial H

a.	b.	
chi-tolookos<i>	Ø-musat<o>	UR
H H	H	
chi-tolookos<i>	----------	Low Insertion (13)
H L H		
chi-tolookos<i>	----------	Tonal Assoc. Convention (5)
H L H		
chi-tolookos<i>	----------	RHS (7)
H L H		
chi-tolookosi	Ø-musato	Visibility & LD (8)[14]
H L H L	L HL	
chítòlòókósì	*mùsátò* (pl. yà-mùsátò)	
'jail'	'python'	

Forms in this tone class prevent an analysis in which nouns such as *ú-mú-lómò* 'mouth' (9b) are derived via a bi-directional H spreading rule (operating on the

---

[12] In listening to a slowed digital playback of such forms, it is clear that the phonetic Fall in pitch is indeed from High to downstepped High (i.e., a phonetic level between High and Low). This should be compared to cases presented later where the phonology produces Falls from High to Low (22b, 25).

[13] Words such as *í-chí-tòlòókósì* 'jail' provide further support for the claim that the TBU in Chilungu must be the mora. While usually associated with the syllable-initial mora (e.g., *í-cháálò* 'field'), an underlying H must occasionally be prelinked to the syllable-final mora (e.g., *kòóntwà* 'tick').

[14] We assume Low Default applies in such a way as to comply with the OCP.

High of the class prefix). While such a rule would account for the form, it would make an incorrect prediction in the cases above where the root H must not spread to the left. The plural form *yà-mùsátò* 'pythons' is accounted for in a manner parallel to the singular if we simply assume that /ya/ is underlyingly toneless. (It seems to be the only class prefix which is toneless.)

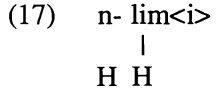
In (15a) we see that Low Insertion (and subsequent TAC) must crucially precede High Spread in order to bleed it. Were Rightward High Spread to apply before Low Insertion, the result would be the ungrammatical **chítóló!ókósì*.

The derivation in (15a) also aptly illustrates the phonological nature of downstep in Chilungu. Up to this point the only manifestation of the Low tone inserted by the rule in (13) was the phonetic downstepping of the second of two morae each linked to a High tone. Were this the only evidence for Low Insertion, one might assume that the downstepping took place in the phonetic component (whose input would be a representation in which the OCP did not apply to derived forms (cf. Odden [1986]). However, examples such as (15a) provide additional evidence that a real Low tone is inserted between two High tones in the phonology, as the Low, in conformity with the Association Convention (5), is phonetically realized on the leftmost free tone bearing unit, and blocks the High to its left from spreading rightward.

A final set of nouns which we will consider here is provided in (16).

(16) a. *íí-m-bîlà* 'announcement'
b. *íí-n-dôbò* 'fish-hook'
c. *íí-n-dîmì* 'tongues'
d. *í-kû-twì* 'ear'

Nouns in (16a-b) are formed with the gender 9/10 prefix /N/, a nasal unspecified for place of articulation. Example (16c) also has the class 10 prefix /N/, but its singular form is in class 11 (see 14a). The Falling tone of the root-initial syllable can be derived in a parallel manner to the one in (14c). As mentioned earlier, word-initial nasals are not moraic and therefore are not TBU's. Therefore, the underlying representation (UR) of (16c) is that in (17).

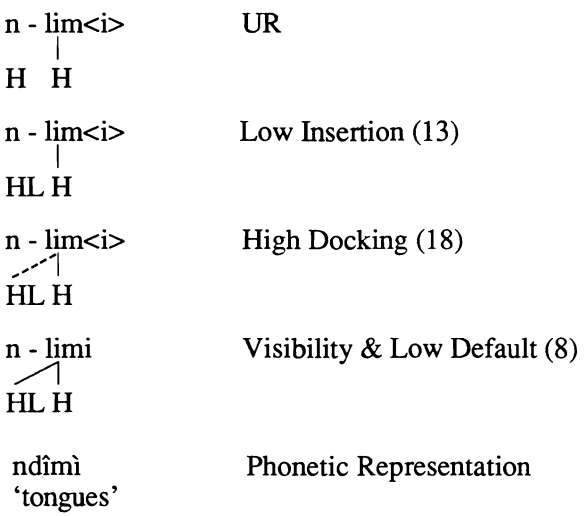
(17)


It appears that a floating High must link to some TBU, such that a Falling tone (from High to downstepped High) is derived in the same way it was in (14c). This rule, called High Docking, is formalized in (18).

(18) High Docking

We will see below that the High Docking rule can be as general as that stated in (18) because there always turns out to be only one TBU to which a floating H could dock without violating the prohibition on line crossing. The application of (18) in the derivation of (16c) is given in (19).

(19)



Comparing (19) and (14a), we see that the tonal allomorphy of High-toned gender 11/10 nouns (in this case /limi/ 'tongue') is accounted for straightforwardly. We note that High Docking applies to the prefixal floating High, associating it to the only available TBU. In the case of the preprefixed form: *íí-n-dîmì*, we note that adding the preprefix *i-* at the same morphological level as the root and class prefix would incorrectly predict that the High of the class 10 prefix /n-/ would link to the prefix instead of the root-initial mora which is necessary to create the Falling tone.[15] As mentioned earlier, nasals are not moraic when word-initial. It is at Level 2 when the preprefix is added that the nasal becomes a

[15] Since the Falling tone in the words in (16) is on a short syllable, it turns out to be quite difficult to tell whether it is phonetically from High to downstepped High, as the output of the phonology suggests, or from High to Low. If the latter turns out to be the case, an additional rule (perhaps in the phonetics) would be needed to make the adjustment.

coda consonant and would be assigned a mora by the Weight-by-Position principle.[16]

Finally, let us consider the example in (16d), in which a noun contains a monosyllabic root: *í-kû-twì* 'ear'. Assuming both final extraprosodicity and a lexical H, we posit the following underlying form and derivation.

(20)

ku - tw<i> | H H	Underlying Representation
ku - tw<i> | HL H	Low Insertion (13)
ku - tw<i> |`·····` HL H	High Docking (8)
ku - twi |`\` : HL HL	Visibility & Low Default (8)
kûtwì 'ear'	Phonetic Representation

In the derivation above we note that High Docking is again operative, this time associating a Root High to the only available TBU.

2.3 Tone class III. We now turn to the analysis of nouns which do not exhibit lexical extraprosodicity. We begin by considering nouns which have a High tone on their final mora.

(21) a. *á-má-sàká* 'sorghum'
í-chí-nùùngí 'porcupine'
ú-lú-tàándá 'star'
íí-n-táándá 'stars'
í-lí-ìndí 'grove'
ú-lw-áálá 'flat rock'

b. *í-chí-ǃpá* 'eyelid'
ú-mú-ǃsé 'basket'

---

[16] As an alternative to positing two morphological levels, it might be possible to analyze the preprefix as extraprosodic, ordering Leftward Spread (10) after Visibility but before Low Default (8). Though we will not pursue this analysis in detail here, it seems to make the same predictions as the one adopted.

If we assume that these nouns have an underlying High tone on their final mora, their derivations follow straightforwardly from the rules proposed so far, as illustrated by the derivations in (22) below.

(22) Derivations of nouns of Tone Class III (non-root-initial H)

a. lu-taanda	b. n-taanda	c. chi-pa	
H H	H H	H H	UR
-------	n-taanda H H	-------	Assoc. Conv. (5)
lu-taanda H L H	n-taanda HL H	chi-pa HLH	Low Insertion (13) & Assoc. Conv. (5)
lu-taanda H L H	-------	-------	Low Default (8)
lútàándá 'star'	*ntáándá* 'stars'	*chíǃpá* 'eyelid'	Phonetic Rep.

The nouns in (22a,b) are the singular and plural forms of the root *-taanda* 'star'. Since the plural class 10 prefix /n-/ is not moraic, the H of that prefix links to the initial mora of the root. This accounts for the Fall in the root-initial syllable of the plural, correctly accounting for the tonal allomorphy of this stem. For expository purposes we will refer to these roots which bear a High on their root-final TBU as Tone Class IIIa. Next, let us consider the nouns in (23).

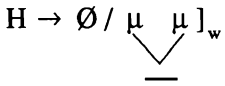
(23) a. *ú-mú-sànà* 'waist'
á-ká-lùùmbà 'lightning'
í-chí-pùtùlwà 'piece'
ú-lú-pèèmbè 'horn'
á-má-lìíndì 'graves'

b. *íí-m-péèmbè* 'horns'
íí-n-síîngò 'neck'
í-lí-índì 'grave'

In these forms, an underlying High on the class prefix does not spread to the right. For this reason, we posit an underlying High tone, associated with the initial TBU of the root, which prevents the prefixal High from spreading. These

nouns constitute what we refer to as Tone Class IIIb. We propose a rule of Final High Deletion which subsequently removes the root High.[17] To insure that such a rule does not delete the word-final High tones in the forms in (21), we stipulate that the High to be deleted must be multiply linked. This H-deletion rule is formalized in (24).

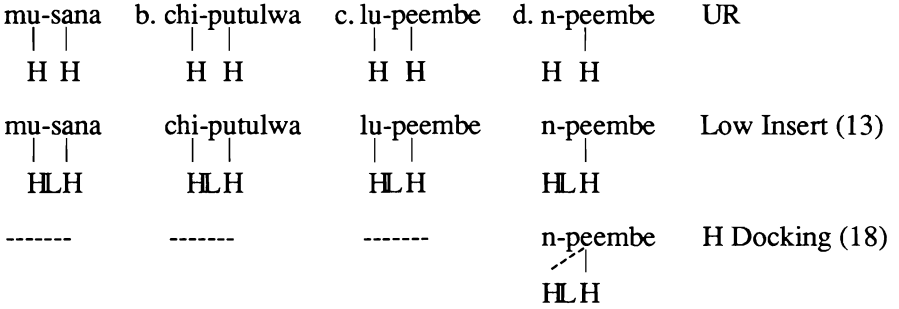
(24) *Final H Deletion (FHD)*



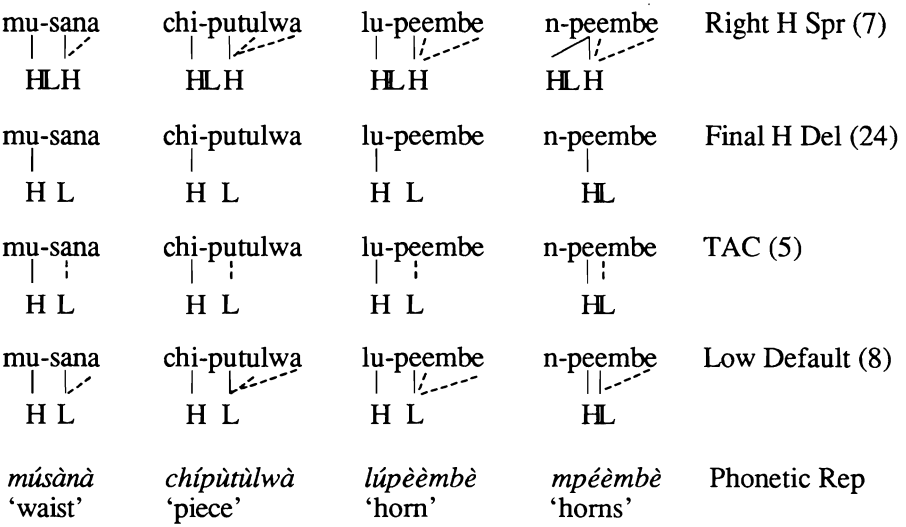
The application of this rule to several nouns is illustrated in (25) below.

In (25a-c) the root surfaces as all Low because the lexical High associated with the root becomes multiply linked and then subsequently deletes in virtue of the Fial H Deletion rule. The forms in (25c,d) are the singular and plural forms of the same root *-peembe* 'horn'. Since the class prefix is not moraic in the plural form, Association Convention (5) forces the H to link to the only available mora, the root-initial syllable. After Final H Deletion, the second mora of the initial syllable will be linked to an L, producing a long Fall.

(25) Derivations of sample nouns from Tone Class IIIb (root-initial H)



[17] Alternatively, the rule could simply change the High into a Low. The rule as given is quite similar to one proposed for Sukuma by Roberts [1992]. The differences are that in her rule: a) the domain of application is the phrase instead of the word, b) the H becomes (extra) L instead of deleting, and c) the H may be linked to *one* or more morae (see §2.4 for more discussion on this point.) Interestingly, the speaker on which Kagaya [1987] based his Chilungu study (who is younger than our consultant) appears to delete (or lower) H in the more general environment of linkage to one or more morae. (We infer this as Kagaya does not provide an autosegmental account of Chilungu tone.)



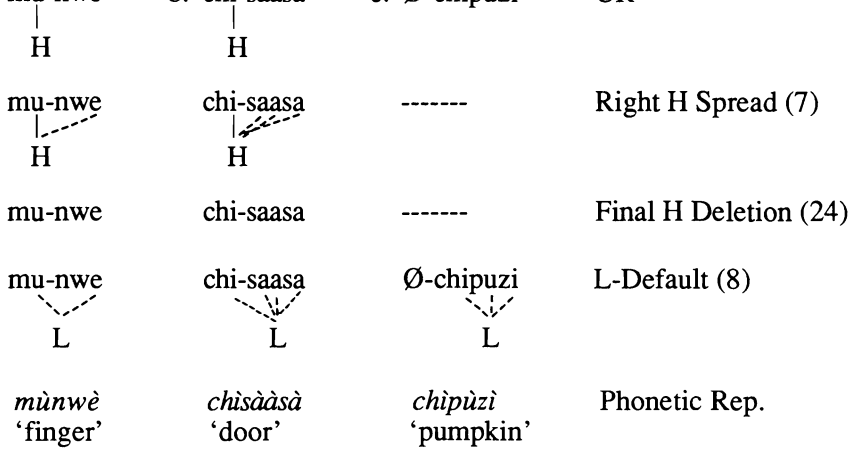
2.4 Analysis of tone class IV [-H, -E]: The final type of noun we will consider is that which is phonetically all Low-toned, as in (26). The nouns in (26b) are from class 1a, which has a null class prefix. (They form their plural with *yà-*.)

(26) Nouns of Tone Class IV

a.	*ìì-n-dà*	'stomach'	b.	*chìsàkà*	'maize'
	ù-mù-nwè	'finger'		*chìpùzì*	'pumpkin'
	ì-chì-zùlè	'tobacco garden'		*mùùmbùlwè*	'monitor lizard'
	ù-mù-yèèmbà	'green bean'		*chùùlà*	'frog'
	ì-chì-sààsà	'door'		*mùtùùmpè*	'peas'

In forms such as those in (26a), the underlying High tone of the class prefix has disappeared. This occurs straightforwardly, and without any additional rules, in virtue of Final High Deletion, if we assume that the roots in (26) are toneless, as illustrated in the sample derivations in (27).

(27) Derivations of nouns of Tone Class IV



Derivations such as those given in (27) can be contrasted with those given in (9a-b) previously in which the final mora was extraprosodic. We insure that the rule of Final H Deletion does not apply to the Tone Class I and Tone Class II forms by ordering it after Visibility. We also note that the rule of Final High Deletion is not one which is idiosyncratic and restricted to a single tonal class, but instead is applicable in two separate tonal classes (i.e., IIIb and IV).

One point of theoretical interest here is the Linking Constraint proposed in Hayes [1986:331] which states that "Association lines in structural descriptions are interpreted as exhaustive." Final High Deletion (24) appears to be a counter-example to the Linking Constraint in that it applies both when there are exactly two association lines present (27a) and when there are more than two association lines present (27b). We note here that Hayes [1986] based this constraint mainly upon examples involving single and multiple linkages between the timing tier (either in its CV, X, or moraic instantiation) and the segmental tier. No examples involving the tonal tier were presented.

Goldsmith [1990] makes a proposal similar to Hayes's, dubbed the "Conjunctivity Condition", which states (and we paraphrase here) that the association lines in a rule must be interpreted as exhaustive if the rule modifies or deletes a segment (as opposed to a rule which adds or modifies association lines—these latter rules not being subject to the Conjunctivity Condition). Goldsmith presents an analysis of Kihunde which involves a rule which affects a singly linked tone, but not a doubly-linked one.

While Final High Lowering violates the Linking Constraint and Conjunctivity Condition, it turns out that there are other precedents in the literature for interpreting tonal associations in rules not as exclusive associations, but as the

minimal associations. Roberts [1992] presents a convincing analysis of Sukuma which includes a rule (quite similar to ours) which lowers an utterance-final High tone (see fn. 18). Crucially, that High tone may be singly or multiply linked. Pulleyblank [1986] motivates a rule in Tonga which delinks the rightmost association line from a High tone, but only if that High tone is multiply linked. In light of these rules and ours, we suggest that the Linking Constraint and Conjunctivity Condition cannot be held to be universal constraints on tonal associations.

In summing up this section, Table 2 below provides both underlying and phonetic representations of nouns from each tone class whose stem contains one, two, or three morae.

Table 2. Sample nouns from each tone class

	I. [-H, +E]	II. [+H, +E]	III. [+H, -E]	IV. [-H, -E]
1 μ	ma-v<i> H [mávì]	ku-tw<i> H H [kûtwì]	chi-pa H [chí!pá]	mu-nwe H [mùnwè]
2 μ	mu-lom<o> H [múlómò]	lu- lim<i> H [lú!límì]	ma-saka H H [másàká] mu-sana H H [músànà]	chi-zule H [chìzùlè]
3 μ	lu-nyelel<e> H [lúnyélélè]	chi-loot<o> H H [chí!lóótò] musat<o> H [mùsátò]	lu-taanda H H [lútàándá] chi-putulwe H H [chípùtùlwè]	chi-saasa H [chìsààsà]

2.5 Evidence from verbs: This section concludes with a brief discussion of verbal infinitives (which are class 15 nouns), deverbal nominals, imperatives, and finite verbs. Verbal infinitives have the morphological structure: (Preprefix) +

Class prefix /ku-/ + Verb root + Final vowel /-a/. How then is extraprosodicity manifested? It cannot be a property of verbal roots, as the final mora in a root is never word-peripheral. What of the Final Vowel then? First, we recall that while some nouns have final extraprosodicity and some do not, for any given root, this extraprosodicity is found consistently in both the singular and plural (compare examples in (14a),(19); (22a,b); (25c,d)). Thus, while we permit a given morpheme to exhibit extraprosodicity, this property is never variable with respect to a single morpheme. Therefore, since the Final Vowel /-a/ is a separate morpheme from the root, it should consistently be either extraprosodic or not. This principle reduces the potential number of tone classes from four to two. It turns out that all verbal infinitives fall into Tone Classes I and II, and never into III or IV, a fact we can straightforwardly account for by assuming that the FV is always extraprosodic.

(28) a. Tone Class I

ú-kú-sh-à	'to leave'
ú-kú-vúl-à	'to be enough'
ú-kú-víímb-à	'to thatch'
ú-kw-íímb-à	'to dig'
ú-kú-fúlúmy-à	'to boil over'

b. Tone Class II

ú-kú-ˡsh-á	'to grind'
ú-kú-ˡvúl-à	'to inquire'
ú-kú-ˡvíímb-à	'to swell'
ú-kw-íìmb-à	'to sing'
ú-kú-ˡfísám-à	'to hide'

c. Tone Class III

*ú-kú-CvCv

*ú-kú-Cvˡ Cv

d. Tone Class IV

*ù-kù-CvCv

When toneless object markers are added to these verbal infinitives we observe tonal allomorphy in the object as seen in the examples below.

(29) a. *ú-kú-zíík-à* 'to bury'
ú-kú-mú-zíík-à 'to bury him'

b. *ú-kú-ˡtéék-à* 'to put down'
ú-kú-mù-téék-à 'to put him down'

This tonal allomorphy is accounted for straightforwardly by our analysis, illustrated in (30) below.

(30)

a.	b.	
ku-mu-ziik<a>	ku-mu-teek<a>	U.R.
H	H H	
-------	ku-mu-teek<a>	Low Insertion (13)
	H L H	
-------	ku-mu-teek<a>	Tonal Assoc. Convention (5)
	H L H	
ku-mu-ziik<a>	ku-mu-teek<a>	Right H Spread (7)
H	H L H	
ku-mu-ziika	ku-mu-teeka	Visibility & Low Def. (8)
H L	H L H L	
úkúmúzííkà	*úkúmùtéékà*	
'to bury him'	'to put him down'	

Next let us consider deverbal nominals and their corresponding verbal infinitives. In Chilungu deverbal nominals are formed by adding a noun class marker and nominalizing suffix onto a verb root. This is demonstrated in (31).

(31)

a.	*ú-kú-sáákúl-à*	'to comb'
	í-chí-sáákúl-ò	'comb' (Class 7/8)
b.	*ú-kú-ǃlúúng-à*	'to hunt'
	ú-mú-ǃlúúng-ì	'hunter' (Class 1/2)

It should be evident that if we assume that the root for 'comb' is toneless and the root for 'hunt' is High toned, the surface patterns follow straightforwardly from our rules above (see derivations of Tone Class I and Tone Class II nouns, respectively, above.) It turns out that it is also possible to create deverbal nouns with the prefix /ka-/ and suffix /-a/, as in (32). This prefix can be added to virtually any verbal root and differs from the class 12 prefix /ka-/ in that the former is toneless while the latter is High toned. (Additionally the class 12 prefix usually has a diminutive reading associated with it, whereas the nominalizing /ka-/ does not.)

(32) a. *ú-kú-tót-à* 'to stab'
kà-tòt-à 'one who stabs'

ú-kú-kóm-à 'to kill'
kà-kòm-à 'one who kills'

b. *ú-kú-!lóósh-à* 'to mourn'
kà-lóósh-à 'one who mourns'

ú-kú-!témw-à 'to love'
kà-témw-à 'one who loves'

The verbal infinitives in (32a) clearly belong to Tone Class I, which we have analyzed as toneless. Whereas these roots generally surface with a High-toned stem-initial syllable, as a result of the Rightward High Spread of a preceding High-toned prefix (see (28a)), we see in (32a) that when a toneless prefix is added, the underlying toneless nature of the root is evident phonetically. In (32b), containing verbal infinitives of Class II, we see that when a toneless prefix precedes, the root-initial mora surfaces as a High (instead of a High that is downstepped due to a preceding High, as in (28b)).

Further evidence that the Class I pattern is best analyzed as having a toneless stem-initial mora and not a High-toned one can be seen in verbal imperatives where again, in the absence of a High-toned prefix, the underlying nature of the root tone is revealed. In (33), imperatives for both Tone Class I and Tone Class II verbs are given.

(33) a. *kú-tót-à* 'to stab'
tòt-à 'stab!'

kú-kóm-à 'to kill'
kòm-à 'kill!'

b. *kú-!lóósh-à* 'to mourn'
lóósh-à 'mourn!'

kú-!témw-à 'to love'
témw-à 'love!'

The surface tonal patterns of both deverbal nominals and imperatives fall out straightforwardly from our analysis and argue against any analysis in which the initial mora of Tone Class I roots is underlyingly High.

While the focus of this paper is the range of tonal patterns in Chilungu nouns, we note that the rules developed here are also relevant for finite verbal morpho-

logy. This can be seen in the finite Remote Future Progressive forms in (34) of *kú-fúl-à* 'wash' and *kú-ǃsúl-a* 'hit'.[18]

(34) *tú- là-á-fúl-án-à* — *tú-là-á-ǃsúl-án-à*
we-F-P-wash-R-FV — we-F-P-hit-R-FV
'we will be washing each other' — 'we will be hitting each other'

If we assume that the subject marker /tu-/ and progressive prefix /-a-/ are High-toned and that the remaining verbal affixes are toneless, the phonetic forms are derived straightforwardly by our rules, as illustrated by the following derivations (35).

(35)

a.	b.	
tu-la-a-ful-an<a>	tu-la-a-sul-an<a>	UR
H H	H H H	
tu-la-a-ful-an<a>	tu-la-a-sul-an<a>	Low Insertion (13)
H L H	H L H L H	
tu-la-a-ful-an<a>	tu-la-a-sul-an<a>	Tonal Assoc. Con. (5)
H L H	H L H L H	
tu-la-a-ful-an<a>	tu-la-a-sul-an<a>	Right H Spread (7)
H L H	H L H L H	
tu-la-a-ful-an-a	tu-la-a-sul-an-a	Visibility & Low Def. (8)
H L H L	H L H L H L	
túlàáfúlánà	*túlàáǃsúlánà*	
'we will be washing each other'	'we will be hitting each other'	

We note in the derivation above that Low Insertion must be iterative as it applies twice in (35b). Additionally we see that the rule of Rightward High Spread is not confined to nominal roots and prefixes as it applies to the verbal tense/aspect prefix /a-/ in (35a).

[18] F=future, P=progres-sive, R=reciprocal, FV=Final Vowel.

3. Alternative analyses

We would now like to contrast briefly our approach with one which would not involve extraprosodicity. First, we have shown above that CVCV roots can have five possible stem tone patterns.[19]

(36) Tone patterns with bimoraic roots

a. (Class I) *ú-mú-lómò* 'mouth' (9a)

b. (Class II) *ú-lú-ǃlímì* 'tongue' (14a)

c. (Class IIIa) *á-má-sàká* 'sorghum' (21a)

d. (Class IIIb) *ú-mú-sànà* 'waist' (25a)

e. (Class IV) *ì-chì-zùlè* 'tobacco garden' (26a)

Monosyllabic noun roots have four, not two, possible tonal patterns.

(37) Tone patterns with monomoraic roots

a. (Class I) *á-má-vì* 'excreta' (6)

b. (Class II) *í-kû-twì* 'ear' (20)

c. (Class III) *í-chí-ǃpá* 'eyelid' (22c)

c. (Class IV) *ù-mù-nwè* 'finger' (27a).

It is therefore not possible to entertain analyses used commonly in the literature which assume that each mora is underlyingly either H or not, or even one

---

19 While the claims made in this paper are based solely on the synchronic data, we provide a brief summary here of the relationship between the Chilungu Tone Types for CVCV roots and Proto-Bantu forms reconstructed by Guthrie [1967-71]. (With regard to Proto-Bantu nominal prefixes, preprefixes have been reconstructed as High-toned, while class prefixes have been reconstructed as Low-toned.) While most Proto-Bantu *LL roots wind up in Tone Class I /ø<>/ (e.g., *-dòmò 'mouth' → *ú-mú-lómò*), a portion wind up in Tone Class IV /øø/ (e.g., *-pùḍ̀ → *chì-pùzì*.). Most Proto- Bantu *HL roots wind up in Tone Class II /H<>/ (e.g., *-dímì 'tongue' → *ú-lú-ǃlímì*), although a few wind up in Tone Class IIIb /Hø/ (e.g., *-cúngù 'poison' → *ú-sùùngù* 'pain from poison'). Nearly all Proto-Bantu *LH roots wind up in Tone Class IIIa /øH/ (e.g., *-càká 'kaffircorn' → *á-má-sàká* 'sorghum'). It turns out that Proto-Bantu *HH forms are somewhat evenly split between Tone Class II /H<>/ (e.g., *-kúnyú 'fig tree' → *ú-mú-ǃkúnyù*) and Tone Class IIIb /Hø/ (e.g. *-démá 'lame person' → *í-chí-lèmà*). In sum, Proto *H generally winds up being analyzed as High. The only exception in this regard is the second TBU in the *HH forms, though it should be noted that the synchronic /Hø/ forms become HH after Rightward High Spread. The most intriguing historical issue, though one clearly outside the scope of this paper, is how certain root-final Proto *L's became analyzed as underspecified while others became analyzed as extra-prosodic.

which assumes that each mora is underlyingly either H or L, as this type of analysis will only generate 2^n tonal classes (where n=number of morae in root), predicting a four-way distinction in (36) and only a two-way distinction in (37). Such an approach is clearly inadequate to the task of generating all the Chilungu patterns.

With regard to trimoraic roots, it turns out that there are six distinct tone patterns. The undergeneration of tonal patterns for such roots is not a problem in a system without extraprosodicity where each TBU has two tonal possibilities, since such a system generates eight tone classes. As can be seen in Table I (page 6), our analysis predicts that there should be seven possible underlying forms. It turns out that there are six distinct attested tone patterns in nouns with trimoraic roots. This result is straightforwardly predicted by our analysis since the distinction between two of the forms of Tone Class III, where the H is non-final, is neutralized by Final High Deletion, which deletes the root H in both cases. The six attested patterns are given in (38).

(38) Tone patterns with trimoraic roots

a.	(Class I)	*ú-lú-nyélélè*	'ant'(see (9b))
b.	(Class II)	*í-lí-ǃínsózì*	'tear' (14c)
c.	(Class II)	*mùsátò*	'python' (15b)
d.	(Class IIIa)	*ú-lú-tàándá*	'star' (22a)
e.	(Class IIIb)	*í-chí-pùtùlwà*	'piece' (25b)
f.	(Class IV)	*ì-chì-sààsà*	'door' (26)
		chìpùzì	'pumpkin' (26)

It should be noted that there is one respect in which our analysis is more restrictive than an analysis without extraprosodicity, in that an underlying High in all our underlying representations is associated to only one TBU. If we assume some morpheme structure constraint which permits a maximum of one TBU to be linked to an underlyingly High tone, then any purely binary distinction on TBU's (without extraprosodicity) would predict only 4 tonal patterns for trimoraic roots (one toneless, and three involving a High linked to a single TBU), failing to account for two of these six patterns.

One way to account for all the distinctions in (36)-(38) without extraprosodicity would be to allow contour tones underlyingly. We submit there are (at least) two major problems with this approach. First, allowing underlying High, Low, and Falling tones (or alternatively High, Low, and Rising) on any mora generates 3^n tonal classes. This approach would undergenerate in the case of monosyllabic forms, as it would only generate a three-way distinction. The

approach would overgenerate in the case of bimoraic nouns as it generates nine tonal classes, while only five are attested (36). In the case of trimoraic forms, 27 distinct forms would be predicted, while only six are attested. Secondly, even if the over-/undergeneration problem is ignored or partially remedied (e.g., by limiting underlying contours to a single prosodic position such as the penultimate syllable), in looking at the actual surface forms in (36)-(38) it does not seem obvious at all which forms should be analyzed as containing a Falling (or Rising) tone underlyingly. We conclude that while this approach would not involve lexical extraprosodicity, it overgenerates and seems an ad hoc solution to the problem.

A second alternative account of the Chilungu data not involving extraprosodicity would posit a three-way underlying distinction—High, Low, or nothing—for any mora (as was assumed, for example, in Pulleyblank's [1986] analysis of Tiv and Margi). Such an analysis would propose an underlying High where we posit High, an underlying Low where we posit extraprosodicity (effectively shielding the word-final syllable from the effects of Rightward High Spread), and underspecification everywhere else. This alternative analysis, like the previous one, suffers from over-/undergeneration in the exact way just described, as 3^n tonal classes are once again predicted to occur, but demonstrably do not. Crucially, what would be needed in this approach would be some Morpheme Structure Constraint, relegating underlying Low's to word-final morae. We submit, however, that this is clearly arbitrary and simply descriptive rather than predictive, as there is nothing inherent in Low tones which should limit their distribution in this way. In contrast, the special status of word-final morae is directly accounted for under an analysis assuming extraprosodicity which by definition may only be domain-peripheral (with the unmarked edge being the right).

Finally, let us consider a third alternative analysis in which extraprosodicity is not lexical, but rather, completely general. In an effort to overcome the overgeneration problem, let us assume that there is maximum of one linked underlying tone per morpheme, whether that be a Low or High tone. Plausible underlying representations for the five tone classes of CVCV roots would be as given in (39). (Surface forms are given in parentheses.)

(39) a. Tone Class I CVCV (cv́-cv́cv̀)

b. Tone Class II CVCV (cv́-!cv́cv̀)
|
H

c. Tone Class IIIa CVCV (cv́-cv̀cv́)
|
H

d. Tone Class IIIb CVCV (cv́-cv̀cv̀)
|
L

e. Tone Class IV CVCV (cv̀-cv̀cv̀)
|
L

Given these UR's, one could assume a general rule of extraprosodicity which applied to toneless word-final morae. Given the Rightward High Spread rule above, this would correctly predict that the final syllable in Tone Classes I and II surfaces as Low. The general extraprosodicity rule would not affect Tone Classes IIIa and IV as the final mora is linked to a tone. Final extraprosodicity would in fact apply to Tone Class IIIb, but its effect would be vacuous as the stem-initial Low serves to block the rightward spreading of any High to its left. It is the Tone Class IV forms, however, that seem problematic for this analysis. If, for example, we assume a word-final Low as shown in (39e), then we could posit a rule which spreads a word-final Low tone to the left. The rule would not only have to be iterative, but it would also have to be formulated such that the Low spreads onto a mora already linked to a High tone (e.g., the High of the subject marker in this case), after which the High tone would delete or delink. Alternatively, one could posit a rule which would delete or delink a High if followed by a word-final Low tone. Both of these approaches seem completely ad-hoc as they are not general processes which affect a Low tone. The deletion/delinking of the High must only be triggered by a word-final Low, and not any other Low such as the inserted one in (39c). This is especially odd as it turns out that the trigger Low must be the one *furthest away* from the target High.

Another drawback of the above analysis is evident when we consider the monomoraic roots, since a High vs. Low vs. ø distinction gives us three possible UR's instead of four. In the case of trimoraic roots, having a Low linked to the middle mora would predict a surface form where the class prefix is High and the root is High-Low-Low. Such patterns seem unattested. From a typological

perspective, while positing underlying Lows in a Narrow Bantu language is not unheard of (cf. Cassimjee [1983]), it is certainly extremely rare as most of these languages are analyzed in terms of an underlying H vs. ø distinction (where the TBU varies from the mora, syllable, or morpheme).

We therefore conclude that the problems entailed in the alternative analyses which we have considered outweigh any "gain" of excluding the kind of lexical extraprosodicity proposed here (and elsewhere as discussed above). Our account, assuming extraprosodicity yields the desired generation of tonal classes, and requires tonal rules which we have noted are attested elsewhere in the literature.

4. Lexical extraprosodicity within generative theory

The central and most innovative aspect of our analysis is the assumption that extraprosodicity can be lexically conditioned. The sub-theory of extraprosodicity as it was initially formulated allowed for peripheral constituents (e.g., a segment, mora or syllable) to be invisible for the purposes of stress placement (cf. Liberman and Prince [1977], Nanni [1977], and Hayes [1981]). First we wish to note that it is *not* the case that stress systems which exhibit extrametricality must exhaustively mark the final constituent of every word in the language as extrametrical. In English, final extrametricality is invoked for nouns, but not for verbs (accounting in part for pairs such as *rébel* (n.) vs. *rebél* (v.); *pérvert* (n.) vs. *pervért* (v.), etc.). Hayes [1995] lists other languages in which extrametricality is used in certain lexical classes, but not others, or to distinguish regular vs. exceptional forms. These include Spanish [Harris 1983], Polish [Franks 1985], Yawelmani [Archangeli 1984], Piraha [Everett 1988], Djingili [Chadwick 1975], and Chamorro [Chung 1983]. We would suggest that, as with many other phonological phenomena, what is systematic in one language may be found to be less systematic and more lexical in another. Stress is a case in point. While its placement is generally predictable, it nevertheless can be lexical (as, for example, in Russian). The same has been shown to be true of the placement of "accent". While its placement is generally predictable, certain accents must be lexically determined in Chaga [McHugh 1990], KiYaka [Kidima 1991], and Llogori [Goldsmith 1991]. We therefore suggest that our proposal that extraprosodicity can be lexically as well as phonologically determined is not an unnatural outgrowth of generative theory.

There is, of course, good precedent for positing extraprosodic elements in tone systems. Derived extratonality has been postulated in a variety of analyses. Pulleyblank [1986] suggests that the first vowel of toneless verb roots is extratonal in Tonga, while Goldsmith [1990] states that word-initial vowels are extratonal in Kirundi. Myers [1987] suggests that word-final syllables are extratonal in Shona, Odden [1988] that word-final TBU's in Safwa and Kinga are extraprosodic. And Kenstowicz [1994] asserts that pre-pausal vowels are extratonal in Makua.

With regard to lexical extratonality, Pulleyblank [1986] states that toneless subject prefixes in Tonga are all extratonal. In Margi, Pulleyblank's analysis assumes that the 2nd and 3rd person suffixed pronouns are extraprosodic, as well as the 2nd sg. and all plural subject enclitics. Poser [1984] assumes that certain suffixes in Japanese are lexically extratonal.

Perhaps the most explicit theory to date on the formalization of extraprosodicity within Generative Grammar is that given by Inkelas [1989]. In that work, Inkelas makes the strong claim that "only those phonological elements belonging to affixes and clitics can be lexically invisible." All the analyses involving extratonality mentioned above are consistent with her claims since the only unpredictable (and therefore lexical) marking of extraprosodicity are of nonlexical forms.[20]

Blevins' [1993] analysis of Lithuanian, however, seems to directly challenge Inkelas's claims. In Blevins' analysis, the four accent types described in the traditional literature on Lithuanian are accounted for by positing distinct underlying tonal representations for each tonal class. For our purposes here, we simply note that the formal difference between the traditional "acute" (long Falling) and the "circumflex" (long Rising) accents in word-initial position results from the absence or presence, respectively, of lexical extraprosodicity of the word-initial mora. The present analysis of Chilungu is quite parallel to Blevins' analysis of Lithuanian in that lexical extraprosodicity is not consigned to a handful of exceptional forms, but is used to distinguish an entire tonal class (specifically, one in Lithuanian, and two in Chilungu).[21] We conclude in this regard that Inkelas' claim that only affixes and clitics can be extraprosodic is too strong and must be loosened in the face of evidence provided by languages such as Lithuanian and Chilungu. As far as we can tell this does not invalidate or necessitate revisions in other aspects of Inkelas's [1989] theory of extraprosodicity.

---

[20] Interestingly, our proposal that the verbal Final Vowel is lexically extraprosodic is consistent with Inkelas's claims. Yet the rules necessitated by that assumption (e.g., (unbounded) Rightward High Spread) are applicable in the tonology of nouns only if certain final syllables can be made extraprosodic.

[21] One other instance where lexical extraprosodicity has been suggested in the analysis of a tone language can be found in Odden's [1988] analysis of Kimatuumbi where he parenthetically suggests that a certain subset of nouns have an extraprosodic final syllable. As the idea is not pursued there in any detail, however, we cannot elaborate upon it further here.

With regard to the claim that none of the Chilungu tonal classes can be treated as "exceptional", we found in our database that the percentage of nouns in the various tonal classes are as follows: 36% in Class I, 29% in Class II, 26% in Class III (15% in IIIa, 11% in IIIb), and 9% in Class IV. Therefore, while it is certainly true that more nouns exhibit final extraprosodicity than those which do not, if, e.g. the lack of final extraprosodicity (on toneless syllables) was 'exceptional' then a full 20% of the lexicon (Class IIIb & IV) would have to be marked as exceptional. Given these numbers, it seems more reasonable to us to treat these as tonal classes in their own right rather than 'exceptions'. In Appendix A, 171 representative nouns are given by tonal class.

5. Summary

We have argued above that the complex array of surface tonal patterns in Chilungu can be accounted for in a restrictive autosegmental model where 1) roots have a maximum of one High tone, 2) Low tones are completely underspecified underlyingly and 3) certain roots exhibit lexically marked final extraprosodicity. We have shown that the rules necessary to derive the surface forms are relatively few in number and are attested elsewhere in Bantu.

Several historical and theoretical points of interest have been raised. Diachronically, Chilungu is interesting because there are more phonemic tonal contrasts than were present in Proto-Bantu. While Proto-Bantu had a two way tonal distinction in nouns with monosyllabic roots, Chilungu has a four way distinction (compare Table I and the data in (37)), and while Proto-Bantu had a four way tonal contrast in nouns with CVCV, Chilungu has a five way contrast (compare Table I and the data in (36)). The "extra" distinctions were shown to be a result of the introduction of final extraprosodicity in certain roots.

Chilungu is interesting theoretically as well. First, we found evidence that downstep in Chilungu is not a late phonetic effect, but is best accounted for by an early rule in the phonology. This was particularly evident in the derivation in (15a) where the inserted Low links to a free TBU.

Second, we saw that the Linking Constraint does not seem to hold in Chilungu, at least as concerns the rule of Final High Deletion as formalized in (24). We suggested that perhaps this constraint might need to be viewed as cross-linguistically parametric or modified to interpret association lines in a rule as a 'minimal' requirement for tonal associations.

Finally and most importantly, while cases of predictable extraprosodicity are numerous, we submit that the nominal tonology in Chilungu is most insightfully analyzed by assuming that certain noun roots (as well as the Final Vowel *-a*) exhibit lexical extraprosodicity. We pointed out that this type of extraprosodicity (within a tone system) is not only attested elsewhere, but should be seen as a development quite parallel to the lexicalization of other formal elements which are generally predictable, such as stress and accent.

Appendix A

Nouns of Tone Class I

ámávì	'excreta'	*ítámà*	'cheek'
íbélì	'firstborn'	*ívílézù*	'beard'
ícháálò	'field'	*ízálà*	'hunger'
ìchífúlà	'well'	*ízéengò*	'wooden pole'
ìchíintù	'thing'	*móótókà*	'car'
ìchíláyò	'promise'	*úlálò*	'bridge'
ìchílézù	'chin'	*úlápò*	'oath'
ìchísáákúlò	'comb'	*úlípílò*	'payment'
ìchísáálì	'sugar-cane'	*úlúkwì*	'log of firewood'
ìchízúúngù	'English'	*úlúnyélélè*	'ant'
ífwà	'leaf'	*úlúpyà*	'brush fire'
íímbálà	'burn from fire'	*úlúsékò*	'laugh (n.)'
íímbálámínwè	'ring'	*úlwééndò*	'journey'
íímbávì	'paddle'	*úlyáámbà*	'fish scale'
íímbázò	'ribs'	*úmúlámù*	'brother-in-law'
íímfwéélè	'sheep'	*úmúlómò*	'mouth'
íímpálà	'baldness'	*úmúlyáángò*	'doorway'
íímpápà	'skin (animal)'	*úmúnjílì*	'warthog'
íímpéléémbè	'antelope'	*úmútì*	'tree'
íínkálà	'crab'	*úmúúnsì*	'mortar'
íínkóóndè	'banana'	*úmúúntù*	'person'
ííntólómílò	'windpipe'	*úmúzà*	'wind'
íínzóvù	'elephant'	*úmúzì*	'village'
íkásà	'arm'	*úmúzííngà*	'beehive'
ílúà	'flower'	*úmwéénzò*	'heart'
íng'óómbè	'cow'	*umwíílì*	'body'
ípúlà	'wax'	*úmwííyúlù*	'sky'
ísè	'hoe (large)'	*úmwóóngólólò*	'backbone'
ísótè	'grass'	*útóóngè*	'cotton'
ísúmò	'spear'	*wáángà*	'witchcraft'

Nouns of Tone Class II

ámá'fútà	'oil'	*ìchí'bálà*	'scar'
chí'tálà	'floor mat'	*ìchí'kózì*	'vulture'
í'wé	'stone'	*ìchí'lóótò*	'dream'
í'yááyì	'egg'	*ìchí'pútè*	'boil'

Tone Class II, continued

íchí!sáánzì	'broom'	*ílí!ínò*	'tooth'
íchí!símà	'well'	*ílí!ínsò*	'eye'
íchí!yé	'shoulder'	*ílí!ínsózì*	'tear'
íímbâlì	'side'	*íng'á!ándà*	'house'
íímbêzù	'seed'	*ínyó!óngà*	'snail'
íímbîlà	'announcement'	*ítú!úndù*	'back'
íímfûtì	'gun'	*mùsátò*	'python'
íímpêlà	'end'	*ú!túúlò*	'offering'
íímpûmì	'forehead'	*ú!úchì*	'honey'
íímvîmbò	'swelling'	*úlú!límì*	'tongue'
íímvûlà	'rain'	*úlú!péchè*	'kernel'
ííndîmì	'tongues'	*úlú!úzì*	'river'
ííndôbò	'fish-hook'	*úlwá!álà*	'fingernail'
íínká!ándà	'skin (human)'	*úmú!cháángà*	'sand'
íínkú!únkà	'pigeon'	*úmú!káátè*	'bread'
íínsí!ímbì	'iron'	*úmú!kázyáánà*	'girl'
íínsí!íngò	'neck	*úmú!kúnyù*	'fig tree'
íínsônyì	'shame'	*úmú!kúúndù*	'anus'
íínzó!ókà	'snake'	*úmú!lúúngì*	'hunter'
íkûtwì	'ear'	*úmú!únsúúndò*	'leech'
ílí!ínì	'egg'		

Nouns of Tone Class IIIa

ámásàká	'sorghum'	*úmúmpàká*	'boundary'
ámátùùnzí	'urine'	*úmúpèní*	'knife'
íchínùùngí	'porcupine'	*úmúsànó*	'chief wife'
íímbòó	'buffalo'	*úmúsànyá*	'day'
íímfììfí	'darkness'	*úmúsàzí*	'calabash bottle'
ííntáàndá	'grove'	*úmúsèlú*	'nausea'
ínyúùngú	'pot'	*úmúyììndá*	'loin cloth'
ítáàngá	'cattle pen'	*úmwéèlé*	'knife'
úlúkùùngú	'dust'	*úmwíìpá*	'nephew'
úlúòyá	'bee sting'	*wààzí*	'blood'
úlútààndá	'star'	*wíìná*	'pit'
úlwààlá	'flat rock'	*wóòngó*	'brain'
úmú!sé	'basket'		

Nouns of Tone Class IIIb

ákálàándà	'misfortune'	*úlúnyèèlè*	'hair'
ákálùùmbà	'lightning'	*úlúpèèmbè*	'horn'
ámálìíndì	'graves'	*úlúpèènzù*	'cockroach'
ícHílèmà	'lame person'	*úlútùùngù*	'hip'
ícHípùtùlwà	'piece'	*úmúlàándù*	'fault; debt'
ícHísìkì	'tree stump'	*úmúlùùndù*	'raised ground'
ícHíùùmbà	'wall'	*úmúsànà*	'waist'
ícHíùùngù	'caterpillar'	*úmútùùmpè*	'stupid person'
ílíìndì	'grave'	*úsùùngù*	'pain from poison'
úlúkòpyò	'eyelash'		

Nouns of Tone Class IV

chìmànì	'left hand'	*ìíndà*	'stomach'
chìpùzì	'pumpkin'	*mpàángà*	'forest'
chìsàkà	'maize'	*mùkòlò*	'hoe'
chìtìíndì	'dung'	*mùtùùmpè*	'peas'
chìtìítì	'mashed eggplant'	*mùùmbùlwè*	'monitor lizard'
chùùlà	'frog'	*ùmùnwè*	'finger'
ìchìsàásà	'door'	*ùmùyèèmbà*	'green bean'
ìchìzùlè	'tobacco garden'	*yèèmbà*	'lake'

REFERENCES

Archangeli, Diana. 1984. "Extrametricality in Yawelmani." *The Linguistic Review* 4: 101-120.

Bickmore, Lee. 1989. *Kinyambo Prosody*. PhD dissertation, UCLA.

Blevins, Juliette. 1993. "A tonal analysis of Lithuanian nominal accent," *Language* 69: 237-273.

Cassimjee, Farida. 1983. "An autosegmental analysis of Venda nominal tonology." *Studies in the Linguistic Sciences* 13: 43-72.

Chadwick, Neil 1975. *A Descriptive Study of the Djingili Language*. Canberra: Australian Institute of Aboriginal Studies.

Chagas, J. E. 1977. "The preprefix." In E.R. Byarushengo, A. Duranti, and L.M. Hyman (eds.), *Haya Grammatical Structure*: *SCOPIL 6:* 35-44. Los Angeles: University of Southern California.

Chung, Sandra. 1983. "Transderivational relationships in Chamorro phonology." *Language* 59: 35-66.

Clements, G. N. and K. Ford. 1979. "Kikuyu tone shift and its synchronic consequences." *Linguistic Inquiry* 10: 179-210.

Clements, G.N. and J. Goldsmith (eds.). 1984. *Autosegmental Studies in Bantu Tone*. Dordrecht: Foris.

Downing, Laura. 1994. "Local and metrical tone shift in Nguni." *Studies in African Linguistics* 21: 261-317.

Everett, Daniel. 1988. "On Metrical Constituent Structure in Piraha." *Natural Language and Linguistic T* 6: 207-246.

Franks, Steven. 1985. "Extrametricality and Stress in Polish." *Linguistic Inquiry* 16: 144-151.

Goldsmith, John. 1976. *Autosegmental Phonology*. Bloomington: Indiana University Linguistics Club. [Published by Garland Press, 1979.]

Goldsmith, John. 1990. *Autosegmental and Metrical Phonology*. Oxford: Basil Blackwell.

Goldsmith, John. 1991. Tone and accent in Llogori. In Francis Katamba (ed.) *Lacustrine Bantu Phonology (AAP #25)*, pp. 7-30. Cologne: University of Cologne.

Guthrie, Malcolm. 1967-71. *Comparative Bantu.* (4 volumes). Farnborough: Gregg.

Harris, James. 1983. *Syllable Structure and Stress in Spanish: A Nonlinear Analysis*. Cambridge, MA: MIT Press.

Hayes, Bruce. 1981. *A Metrical Theory of Stress Rules*. Bloomington: Indiana University Linguistics Club.

Hayes, Bruce. 1986. "Inalterability in CV Phonology." *Language* 62: 321-351.

Hayes, Bruce. 1989. "Compensatory Lengthening in Moraic Phonology." *Linguistic Inquiry* 20: 253-306.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.

Hyman, Larry M. and E. Byarushengo. 1984. A model of Haya tonology. In G.N. Clements and J. Goldsmith (eds.), *Autosegmental Studies in Bantu Tone*, pp. 53-104. Dordrecht: Foris.

Hyman, Larry and Armindo Ngunga. 1994. "On the Non-Universality of Tonal Association 'Conventions': Evidence from Ciyao." *Phonology* 11:25-68.

Inkelas, Sharon. 1989. *Prosodic Constituency in the Lexicon*. PhD dissertation, Stanford University. [Published 1990 by Garland Press, New York.]

Johnson, Lawrence. 1977. "Devoicing, tone, and stress in Runyankore." In E.R. Byarushengo, A. Duranti, and L.M. Hyman (eds.), *Haya Grammatical Structure*: *SCOPIL 3:* 207-216. Los Angeles: University of Southern California.

Kagaya, Ryohei. 1987. A tonal study of Chilungu nouns. In *Bantu Linguistics Vol. 1: Studies in Zambian Languages*, pp. 269-352. Tokyo: Institute for the Study of Languages and Cultures of Asia and Africa.

Kenstowicz, Michael. 1994. *Phonology in Generative Grammar*. Cambridge, MA: Blackwell.

Kidima, L. 1991.*Tone and Accent in KiYaka*. PhD dissertation, UCLA.

Kiparsky, P. 1982. "Lexical Phonology and Morphology." In I. S. Yang (ed.), *Linguistics in the Morning Calm*, pp. 3-91 Seoul: Hanshin.

Liberman, Mark and A. Prince. 1977. "On stress and linguistic rhythm." *Linguistic Inquiry* 8: 249-336.

McHugh, Brian. 1990. *Cyclicity in the Phrasal Phonology of Kivunjo Chaga*. PhD dissertation, UCLA.

Meyers, Scott. 1987. *Morphology and Phonology in Shona.* PhD dissertation. Amherst: Graduate Linguistic Students Association, University of Massachusetts.

Mohanan, K.P. 1986. *The Theory of Lexical Phonology.* Dordrecht: Reidel.

Nanni, Debbi. 1977. "Stressing words in -ative." *Linguistic Inquiry* 8: 752-763.

Odden, David. 1986. "On the role of the Obligatory Contour Principle in phonological theory," *Language* 62: 353-383.

Odden, David. 1987. "Predicting Tone in Kikuria." In D. Odden (ed.) *Current Approaches to African Linguistics: vol. 4,* pp. 311-326. Dordrecht: Foris.

Odden, David. 1988. "Predictable tone systems in Bantu." In Harry van der Hulst and Norval Smith (eds.), *Autosegmental Studies in Pitch Accent.*, pp. 225-251. Dordrecht: Foris.

Ohannessian, Sirarpi and Mubanga Kashoki. 1978. *Language in Zambia.* London: International African Institute.

Poser, W.J. 1984. *The Phonetics and Phonology of Tone and Intonation in Japanese.* Ph.D. dissertation. Massachusetts Institute of Technology.

Pulleyblank, Douglas. 1986. *Tone in Lexical Phonology.* Dordrecht: Reidel.

Roberts, Ruth. 1992. "A non-metrical theory of Sukuma tone." *Ohio State University Working Papers in Linguistics* 41, 135-148. The Ohio State University.

Department of Anthropology
University at Albany
State University of New York
Albany, NY 12222
lb527@cnsunix.albany.edu

[Received January 30, 1995;
revision received June 30, 1995;
accepted November 14, 1995]