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LOCAL AND METRICAL TONE SHIFT IN NGUNI[1]

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In this paper I argue that the Nguni languages have both a metrical tone shift rule and a non-metrical (local) tone shift rule which precedes and feeds assignment of metrical prominence (accent). As Goldsmith, Peterson, and Drogo [1986] and Peterson [1989b] have argued, a metrical tone shift rule best accounts for the fact that the rightmost high tone in most words surfaces on the antepenult. Not all high tones shift to the antepenult, however; instead, they shift one syllable to the right. Earlier metrical analyses accounted for (some) of these cases by proposing rules of accent shift. The present analysis accounts for all these cases by a local tone shift rule ordered before accent assignment. This approach not only is more general and more natural than the accent shift analyses, but it also straightforwardly accounts for a number of tonal phenomena which were inadequately treated in earlier analyses.

0. Introduction

Zulu, Xhosa, and Ndebele are members of the Nguni sub-family of Southeastern Bantu, spoken mainly in South Africa and Zimbabwe.[2] A problem of Nguni tone which has been widely discussed in the literature (see, for example, Clark [1988]; Claughton [1983]; Goldsmith, Peterson, and Drogo [1986]; Khumalo [1987]; Laughren [1984]; Louw [1971]; Peterson [1989b]; Rycroft [1963, 1979; 1980a,b; 1983]) is that the rightmost high tone in a word generally

[1]I would like to thank a number of people for comments on this paper. First of all, I owe special thanks to James Khumalo, who not only provided hours of lively discussion on Zulu tone, but also patiently provided me with the Zululand Zulu data discussed here. Karen Peterson's very detailed comments on an earlier version of this paper [Peterson 1989a] were especially helpful in shaping the present analysis. Others whose comments helped me improve my understanding and presentation of the Nguni data were C. Bundrick, J. Goldsmith, J. Hualde, M. Kenstowicz, C. Kisseberth, N. Mutaka, R.G. Schuh, and an anonymous reviewer. Any errors of data or interpretation are, of course, my own.

surfaces on the antepenultimate syllable, even though that high tone may be underlyingly associated several syllables leftward, so that, for example, underlying *si-ya-wá-namathelisa* 'we make them stick' surfaces as *si-ya-wa-namathélisa*. Following Goldsmith, Peterson, and Drogo [1986] and Peterson [1989b], I will show in §1 that the attraction of high tones to the antepenult may be accounted for by a metrically conditioned rule which allows spread of a high tone to the antepenult once that syllable has been assigned metrical prominence in a word.

A problem with these earlier metrical accounts of Nguni tone is that they do not adequately account for the fact that high tones originally associated with the antepenult generally shift one syllable rightward, namely to the penultimate syllable, so that, for example, underlying *u-ya-bá-hleka* 'you laugh at them' surfaces as *u-ya-ba-hléka*. In §2, I account for antepenult to penult tone shift by arguing that Nguni has not only a metrical tone shift rule, but also a rule of local tone shift which spreads a high tone one syllable to the right; this rule applies before metrical structure is assigned.[3] Although this analysis conflicts with other models of the interaction of tone and accent, e.g. Goldsmith [1982] and Sietsema [1989] which postulate that all metrical, i.e. accentual, rules should precede all local tone rules, I will show that local tone rules must precede metrical rules not only in Nguni, but also in the tonal systems of other Bantu languages. Further, the rule of local tone shift will be argued to provide both a more general and a more natural account of the Nguni data than the accent shift rules of previous metrical analyses.

Finally, in §3, I discuss some apparent exceptions to local tone shift and show that most have a straightforward phonological explanation. In particular, I argue that one set of synchronic exceptions can be accounted for, if local tone shift applies to these forms before an underlying, historically-motivated vowel length contrast is neutralized.

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[2] The Zulu data discussed in this paper comes from my work with James Khumalo, a native speaker of the Zululand Zulu dialect. Only Zululand Zulu data is cited in the paper; the few references to Natal Zulu are based on data presented in Cope [1970] and Rycroft [1963]. The Xhosa verb data is taken mainly from Claughton [1983]. Xhosa noun data and additional verb data come from Westphal and Notschweleka [1967], supplemented by Lanham [1958], Louw [1971], and Westphal [1951]. The Ndebele data comes from two papers by Rycroft [1980b] and [1983].

[3] Zulu and Ndebele have another well-known rule which has the effect of shifting high tones rightward in some contexts, namely, depressor-consonant induced shift. Since depressor shift applies after local and metrical shift, and depressor consonants do not seem to block either rule, I will not discuss this issue in the present paper. I refer the interested reader to Khumalo [1987], Lieber [1987], Laughren [1984], Peterson [1989b], and Rycroft [1979, 1983] for relevant data and discussion. The effect of depressor consonants in Xhosa is described briefly in Louw [1971] and Westphal and Notshweleka [1967].

1. Antepenult Shift

1.1. Preliminaries. The first point I will discuss is that of high tone shift to the antepenult. But before introducing an analysis of this problem, some background on Nguni morphology and tone is necessary.

Nouns and verbs in Nguni are composed of root morphemes to which suffixes and prefixes may be added. I shall refer to the noun or verb root followed by all suffixes (including the final vowel) as the "stem". Derivational suffixes cited in this paper are, for nouns, the diminutive -(*y*)*ana* and, for verbs, the so-called "extensions", which include the causative *-is-*, the benefactive *-el-*, and the reciprocal *-an-*. Prefixes for nouns are the class agreement prefix (in the "short" form) and, in the "long" form, an additional pre-prefix. The infinitive also has these nominal prefixes. Verb prefixes in the data cited include subject agreement prefixes (SP), tense-aspect markers (TM), and object prefixes (OP), which occur in that order preceding the verb stem.

Nguni noun and verb stems contrast in that some have high tones and some are entirely low-toned. This contrast is illustrated in the "short" forms of the Nguni infinitives cited below:

(1) "Short" form of the infinitive (*ku-* is the infinitive prefix; this form would appear in phrases like *akúkho* ... 'there is no___')[4]:

A. **High-toned verbs**

Zulu

(a) *ku-phakámisa* 'to lift up'

(b) *ku-thengisélana* 'to sell to (recip.)'

Xhosa

(c) *ku-bónísisa* 'to show clearly'

(d) *ku-nyínyíthékisa* 'to make slippery'

Ndebele

(e) *ku-lethísana* 'to help bring (recip.)'

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[4] In this and all following data, hyphens separate morphemes, and underlyingly high-toned vowels are underlined. In the Xhosa data, all vowels between (and including) the underlyingly high-toned vowel and the target of tone spread are marked with a high tone, but, according to Claughton [1983], only the rightmost high-toned vowel is obligatorily realized with a high tone; the others are only optionally high-toned. If one of these vowels is realized with a high tone, however, then all rightward vowels must also be high.

B. **Low-toned verbs**

Zulu

(f)	*ku-khethisa*	'to help choose'
(g)	*ku-hlekisana*	'to amuse (recip.)'

Xhosa

(h)	*ku-shukumisa*	'to shake'
(i)	*ku-namathelisa*	'to cement'

Ndebele

(j)	*ku limisisa*	'to plow intensively'

Since low tones do not play any role in most of Nguni tonology, I assume an underspecified representation for Nguni in which only high tones appear underlyingly and low tones are filled in by a default rule applying late in the phonology. This type of underspecified approach has been previously argued for in Nguni (see Clark [1988] and Khumalo [1987] on Zulu, Goldsmith, Peterson, and Drogo [1986] on Xhosa, and Peterson [1989b] on Ndebele) as well as in a number of other Bantu languages, such as Digo [Kisseberth 1984], ChiZigula [Kenstowicz and Kisseberth 1990], Haya [Hyman and Byarushengo 1984], LuGanda [Stevick 1969], Shona [Myers 1987], the SeSotho/SeTswana group (ongoing research under C. Kisseberth at the University of Illinois), and Tonga [Pulleyblank 1986], to name only a few. The argument in all these cases for eliminating low tones from the underlying representation is the one just mentioned, namely, that low tones are neither the target nor the context of most of the tone rules of these languages. (Following traditional terminology, I will continue to refer to the underlyingly toneless stems as "low-toned" in this paper, however.)

1.2. Evidence for antepenultimate prominence in Nguni. To turn to the problem of antepenult shift, if we look again at the tone pattern of the stems in (1), we notice that the high tone surfaces on the antepenult of these stems even though it is often originally associated several syllables leftward. I will assume in this paper that the high tone of most morphemes is unlinked underlyingly, and associated early in the phonology to the first syllable of the morpheme by the Universal Association Convention (UAC), defined in (2):

(2) **Universal Association Convention** (following Pulleyblank [1986])

Map a sequence of tones onto a sequence of tone-bearing units (TBU) one-to-one from left to right.

When the stem-initial syllable is in pre-antepenultimate position, as in (1), its high tone shifts to the antepenult. If high-toned prefixes are added to low-toned stems, we likewise find that pre-antepenultimate high tones shift to the antepenult. The class agreement preprefixes of nouns and infinitives, for example, have a high tone, which shifts rightwards to the antepenult preceding low stems, as illustrated by the data below:

(3) "Long" form of low-toned infinitives (with preprefix, *ú-*; structure of the words is preprefix-prefix-stem)

Zulu

(a) *u-kú-bala* 'to count'
(b) *u-kú-hleka* 'to laugh'
(c) *u-ku-hlékisa* 'to amuse'
(d) *u-ku-hlabélela* 'to sing'
(e) *u-ku-hlekísana* 'to amuse (recip.)'
(f) *u-ku-namathélisa* 'to make stick'

Xhosa

(g) *ú-kú-bala* 'to count'
(h) *ú-kú-bálisa* 'to recount'
(i) *ú-kú-shúkúmisa* 'to shake'
(j) *ú-kú-námáthélisa* 'to cement'

Ndebele

(k) *ú-kú-khetha* 'to choose'
(l) *ú-kú-khéthisa* 'to help choose'
(m) *ú-kú-límísisa* 'to plow intensively'

(4) "Long" form of low-toned nouns (all class agreement preprefixes have a high tone; the structure of Nguni nouns is identical to infinitives)

Zulu

(a) *a-bá-ntw-ana* 'child'
(b) *a-ba-ntw-ány-ana* 'small child'

Xhosa and Ndebele

(c) *á-bá-ntw-ana* ‘child’

(d) *á-bá-ntw-ány-ana* ‘small child’

(Note that in the Ndebele data, if the high tone is originally associated with a word-initial syllable, not only is the antepenult high-toned, but also the initial syllable and all intervening syllables remain high-toned.)

The same alternations occur when other high-toned prefixes are added to low stems. For example, third person subject prefixes are high-toned, as shown by the paradigm in (5):

(5) Indicative tense, paradigm of low verb, *u-kú-ñiba* ‘to retreat’ (verb has form: SP-TM-Stem; this example is from Zulu, but equivalent paradigms are found in Xhosa and Ndebele)

ngi-ya-ñiba	‘I retreat’	*si-ya-ñiba*	‘we retreat’
u-ya-ñiba	‘you retreat’	*ni-ya-ñiba*	‘you (pl.) retreat’
u-yá-ñiba	‘he retreats’	*ba-yá-ñiba*	‘they retreat’

The data in (6) show that the high tone of the subject prefix shifts to the antepenult if it is underlyingly on a pre-antepenultimate syllable:

(6) Low verb stem with high-toned subject prefix, Indicative tense (verb has form: SP-TM-Stem):

Zulu

(a) *u-yá-bala* ‘s/he counts’

(b) *u-yá-hleka* ‘s/he laughs’

(c) *ba-ya-límisa* ‘they help plow’

(d) *u-ya-hlékisa* ‘s/he amuses’

(e) *u-ya-shukúmisa* ‘s/he shakes’

(f) *u-ya-namathélisa* ‘s/he makes stick’

Xhosa [Claughton 1983]

(g) *lí-yá-bala* ‘s/he counts’

(h) *lí-yá-bálisa* ‘s/he recounts’

(i) *lí-yá-shúkúmisa* ‘s/he shakes’

(j) *lí-yá-námáthélisa* 's/he cements'

Ndebele [Rycroft 1983]

(k) *ú-yá-khetha* 's/he chooses'

(l) *ú-yá-khéthisa* 's/he helps choose'

(m) *ú-yá-límísisa* 's/he plows intensively'

Object prefixes also have a high tone, which shifts to the antepenult from pre-antepenultimate syllables, as shown in (7):

(7) Low verb stem with a low-toned subject prefix and a high-toned object prefix, Indicative tense (verb has form: SP-TM-OP-stem):

Zulu

(a) *si-ya-m-límisa* 'we help him plow'

(b) *u-ya-ngi-hlékisa* 'you amuse me'

(c) *si-ya-wa-shukúmisa* 'we shake them'

(d) *si-ya-wa-namathélisa* 'we make them stick'

Xhosa [Claughton 1983]

(e) *ni-ya-wa-bálisa* 'I recount to them'

(f) *ni-ya-wa-shúkúmisa* 'I shake them'

(g) *ni-ya-wa-námáthélisa* 'I cement them'

Ndebele [Rycroft 1983]

(h) *u-ya-ba-khétisa* 'you help them choose'

(i) *u-ya-yi-límísisa* 'you plow it intensively'

1.3. Metrical analysis of antepenultimate prominence and tone shift. There is plenty of evidence, then, that the antepenult in Nguni attracts high tones, at least in nouns, infinitives, and verbs in the Present Continuous Tense. (I will confine my discussion to these forms, since they are the ones for which underlying tone patterns are most transparent and for which I have the most data in all three languages.) This ability of a particular syllable to attract a high tone has parallels in other Bantu languages. Kisseberth [1984] and Sietsema [1989] have argued that the final syllable of words in Digo attracts high tones, for example. Kenstowicz and Kisseberth [1990] have shown that the penult attracts high tones in ChiZigula, and Peterson [1987] and Goldsmith [1987] have argued that stem-initial and stem-final syllables attract high tones in other Bantu languages, as well. As argued by Goldsmith [1987], metrical rules, which are designed to assign prominence to certain syllables of words or phrases, seem a phonologically natural way to pick out which syllables will attract high tones, and all of the analyses just mentioned (except Kisseberth [1984]) have therefore adopted a metrical approach.

A metrical analysis of Nguni antepenult tone shift has, in fact, been proposed by Goldsmith, Peterson, and Drogo [1986] for Xhosa and extended to Ndebele and Zulu by Peterson [1989b], who point out that the antepenult is a common, natural location for prominence to be realized. In their analysis, the antepenult is assigned an accent by metrical rules like those given in (8) (a schematic representation of the effect of the rules is also given):

(8) **Accent Placement Rules** (Preliminary Version)

(a) Mark final syllables extrametrical (i.e., invisible to metrical rules (Hayes (1982)) by enclosing them in angled brackets. Word-final syllables are extrametrical in Xhosa, but only phrase-final syllables are extrametrical in Zulu and Ndebele.

(b) Construct a left-headed binary foot at the right edge of a word.

(c) Assign an accent (*) to the metrically strong syllable.

x
x x
σ σ <σ>]$_{phrase}$
*

The domain of spread of the rightmost high tone can now be defined with reference to the accented syllable:

(9) **Metrical Tone Spread**

Spread a high tone rightwards to the metrically prominent (accented) syllable.

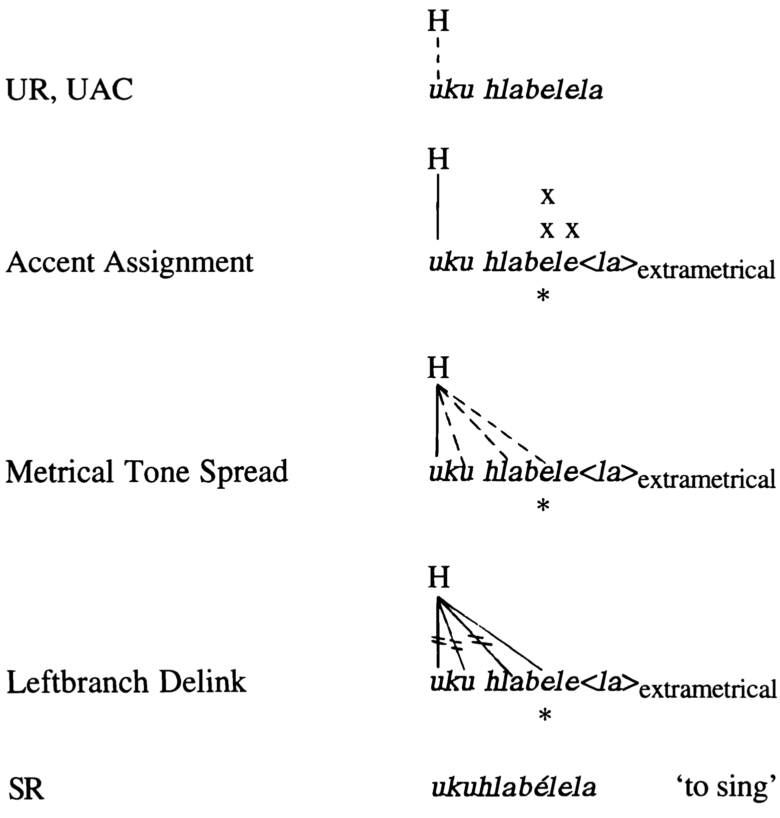
In Zululand Zulu only the antepenult surfaces with a high tone, so one might propose that the high tone associates directly to the accented syllable. But the other Nguni languages provide evidence that high tones are associated by the UAC to the morpheme-initial syllable and then spread to the accented syllable, instead of associating directly to it. In Xhosa [Claughton 1983] and in the Natal dialect of Zulu [Rycroft 1979], the vowels between the underlyingly high-toned vowel and the accented target of Metrical Spread (9) may optionally be realized with a high tone. Further, in Ndebele delinking does not apply if the high tone subject to Metrical Spread is originally linked to the word-initial syllable (as in (3, 4, 6), above). To account for the fact that in all the languages the antepenult is often the only syllable which surfaces with a high tone, however, a delinking rule must apply to the outcome of Metrical Tone Spread (9) to disassociate all except the rightmost branch of the resulting multiply-linked high tone. The minor variations among the three languages in the application of delinking are listed as conditions on the rule as follows:

(10) **Leftbranch Delink**

Delink all but the rightmost branch of a multiply-linked high tone. (Optional in Xhosa and Natal Zulu; does not apply if the leftmost branch is linked to a word-initial syllable in Ndebele.)

The application of rules (8-10) is illustrated in the derivation of (3d) given in (11):

(11) Derivation of (3d) *u-ku-hlabélela* 'to sing'



1.4. Metrical Shift as a phrase-level rule. One last point I would like to make about antepenult tone shift is to explain why I argue, following Peterson [1989b], that it is a post-lexical rule for Zulu and Ndebele and claim that only the phrase-final syllable is marked extrametrical for the grid-building rules in those languages (but word-final syllables are always extrametrical for the data discussed here in Xhosa). The evidence for this comes from the data in (12):

(12) Low verb stem with high-toned subject prefix, Indicative tense, phrase-medial forms (verb has form: SP-stem)

Zulu

(a)	*ba-limísa*	'they help plow'
(b)	*u-hlekísa*	's/he amuses'
(c)	*u-shukumísa*	's/he shakes'
(d)	*u-namathelísa*	's/he makes stick'

Ndebele

(e)	*ú-hlákúla*	's/he weeds'

Xhosa

(f)	*lí-bálisa*	's/he recounts'
(g)	*lí-shúkúmisa*	's/he shakes'

These are the phrase-medial forms of the low verbs with high-toned subject prefixes given in (6). If we compare the two sets of verbs, we note that the tense/aspect marker *-ya-* is absent from the forms in (12) and that the rightmost high tone surfaces on the penult in Zulu and Ndebele, instead of on the antepenult as it did in (6). Since word-final syllables are always extrametrical in Xhosa, the antepenult is still assigned the accent in phrase-medial forms like those in (12) and pre-antepenultimate high tones shift to the antepenult in both phrase-medial and phrase-final forms. The phrase-medial shift to the penult in Zulu and Ndebele is also straightforwardly accounted for by the rules given so far. While every high-toned word is assigned prominence by the rule of Accent Placement (8), as a post-lexical rule it may be sensitive to phrase boundaries which are only visible at that level of the phonology. Since only phrase-final syllables are extrametrical for Accent Placement, then phrase-medially the final syllable of the words in (12) is no longer on the periphery of a metrical domain. It is thus no longer invisible to metrical rules [Hayes 1982], and accent is assigned to the penult. This is shown in the derivation of (12a) given in (13):

(13) Derivation of (12a) *ba-limísa* 'they help plow' (phrase-medial form)

	H
UR, UAC	*ba limisa*
Extrametricality	Not applicable
	H x x x
Accent Placement	*ba limisa* *
	H
Metrical Tone Spread	*ba limisa* *
	H
Leftbranch Delink	*ba limisa*
SR	*balimísa* 'they help plow'

The derivation of (12e) *ú-hlákúla* 's/he weeds' (Ndebele) would also proceed as in (13), except that Left Delink (10) would not apply since the high tone is originally linked to a word-initial syllable.

More research is necessary to determine what exactly constitutes a phonological phrase in Zulu and Ndebele, but the "short" form of a Present Continuous verb and the following word, at least, seem to form a phrase, making the final syllable of the verb exempt from extrametricality.

2. Local Tone Shift

2.1. Evidence in favor of Local Shift. In this section, I will argue that antepenult shift is not the only tone shift process applying in Nguni. Evidence for this comes from the data below, in which a high tone originally linked to the antepenult has shifted to the penult even though, as I argued in the preceding section, the antepenult is a metrically strong position:

(14) Antepenult to penult shift (all of the following examples are from Zulu, but Ndebele and Xhosa cognates are identical, except for variations in Left Delink (10))

1. Preprefix or subject prefix before monosyllabic N or V

(a)	*u-kú-lwa*	'to fight'
(b)	*u-yá-lwa*	'he fights'
(c)	*u-lú-hla*	'row, line'
(d)	*u-mú-ntu*	'person'

2. Object prefix (high-toned) preceding low CVCV (disyllabic) verb stem

(e)	*u-ya-wa-bála*	'you count it'
(f)	*si-ya-yi-líma*	'we plow it'

3. Stem-initial syllable of a trisyllabic high verb or noun

Underived stems

(g)	*ku-sebénza*	'to work'
(h)	*ku-khatháTla*	'to get tired'
(i)	*si-sebénzi*	'worker'
(j)	*si-phambáno*	'cross, crucifix'

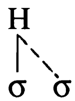
Derived stems

(k)	*ku-theng-ísa*	'to sell'
(l)	*ku-bon-ísa*	'to show'
(m)	*m-buz-ána*	'small goat'
(n)	*si-boshw-ána*	'small cord'

In Nguni monosyllabic stems are relatively rare, but the other two cases of antepenult to penult shift are very common. Disyllabic verb stems are the canonical type of Bantu verb, so low-toned disyllabic verbs preceded by an object prefix make up a very large group of forms to account for. Underived trisyllabic stems are less common than disyllabic, but trisyllabic stems may be derived from disyllabic stems by adding suffixes. The verbal suffixes, or extensions, are especially productive, and in Zulu and Ndebele the high tone on the antepenult of all derived and underived trisyllabic verb stems systematically shifts to the penult. In Xhosa verbs and nouns, and in Zulu and Ndebele nouns, too, the antepenult high tone shifts in all underived stems and in most derived stems.

There are, then, a sizeable number of cases in the Nguni languages where a high tone on the antepenult predictably shifts one syllable to the right. To account for antepenult to penult shift, Nguni must have not only a metrical tone spread rule (10), but also a rule of local tone spread, formulated below:

(15) **Local Spread**



This rule spreads a high tone one syllable to the right, and then the rule of Leftbranch Delinking (10), which applies under the same conditions mentioned above, deletes the leftmost branch of the multiply-linked high tone to derive shift. Since high tones associated with the penult do not shift to the final syllable either phrase-finally or medially, the word-final syllable would appear to be extratonal, that is, invisible for tone spread (but this will be revised in §3.2). Even if an accent is assigned to the antepenult after Local Shift (but this, again, will be revised in §2.5), Metrical Spread (9) will not be able to apply to the high tone placed on the penult by Local Shift because tones may only spread rightwards to the accented syllable.

The application of local shift is illustrated by the derivation of (14f), given in (16) (note that syllables in parentheses are extratonal, while those in angled brackets are extrametrical):

(16) Derivation of (14f) *si-ya-yi-líma* 'we plow it'

	H (linked to *yi*, dashed)
UR, UAC	*si ya yi lima* we TENSE it plow
	H (linked to *li*)
Extratonality	*si ya yi li*(*ma*)$_{ex}$

Local Shift — H
si ya yi li(ma)$_{ex}$

Accent Assignment — H
* |
si ya yi li<ma>$_{ex}$
x x
x

Metrical Tone Spread — Not applicable

SR — *si-ya-yi-líma* 'we plow it'

The other cases of antepenult to penult shift illustrated by the data in (14) would have an analogous derivation.

Local Spread must apply before Metrical Spread, since the rule does not apply to high tones shifted to the antepenult, but only to those originally associated with the antepenult. If Local Spread applied after Metrical Spread, all high tones would be shifted to the penult, as shown by the incorrect derivation of (3d) given in (17) (compare with (11)):

(17) Incorrect Derivation of (3d) *u-ku-hlabélela* 'to sing' (Metrical Shift preceding Local Shift)

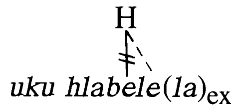
UR, UAC — H
uku hlabelela

Accent Assignment — H
x
x x
uku hlabele<la>$_{ex}$
*

Metrical Tone Spread — H
uku hlabele<la>$_{ex}$
*

Left Delink

Local Shift



SR **uku hlabeléla* 'to sing'

The rules which I have proposed to account for Nguni tone so far are summarized below:

(18) Tone Rules for Nguni

Local Tone Rules

Extratonality (word-final syllable)
Local Tone Spread (15)
Leftbranch Delink (10)

Metrically-Conditioned Tone Rules

Extrametricality (word-final syllable in Xhosa; phrase-final syllable in Zulu and Ndebele)
Assignment of Accent (8)
Metrical Tone Spread (9)
Leftbranch Delink (10)

2.2. Earlier metrical analyses. An important difference between this analysis and other recent autosegmental analyses of Nguni tone (Clark [1988]; Khumalo [1987]; Goldsmith, Peterson, and Drogo [1986]; Peterson [1989b]) is that this analysis has two rules shifting high tones rightward: a local rule, which shifts high tones one syllable to the right, and a metrical rule, which shifts a high tone to a metrically prominent syllable, i.e. the antepenult, after local shift has applied. In this section, I will show that the analysis proposed here, in which a local tone shift rule precedes assignment of metrical structure, provides a more general and more natural account of the Nguni data than the earlier metrical analyses presented in Goldsmith, Peterson, and Drogo [1986] and Peterson [1989b]. These two analyses provide an insightful account of metrical tone shift in Nguni, and, as mentioned in §1 above, I have adopted their formulation of metrical tone shift in the present paper. They have problems, however, in treating cases of antepenult to penult shift which the present analysis has accounted for using the rule of local shift. The drawbacks of each of these approaches will be discussed in turn.

2.2.1. Goldsmith, Peterson, and Drogo's [1986] analysis of Xhosa. Goldsmith, Peterson, and Drogo [1986] present an analysis of some of the Xhosa verb forms published in Claughton [1983] and are the first, as far as I know, to give a metrical analysis of antepenult tone shift in an Nguni language. This paper discusses two cases of antepenult to penult tone shift: first, shift of the high tone of some trisyllabic verb stems from the initial (antepenult) to the second (penult) syllable, and, second, shift of the high tone of OP's to the initial syllable of low-toned CVCV (disyllabic) verb stems. An example of each of these cases is cited below:

(19) Antepenult to penult shift in Xhosa verbs [Claughton 1983]

1. Trisyllabic high verb stems
   (a) *ku-bó̲nísa* 'to show'

2. OP preceding low CVCV stem (verb has form: SP-TM-OP-stem)
   (b) *ni-ya-wa̲-bála* 'I count them'

Although Claughton [1983] only cites these two examples of Local Shift, other available Xhosa literature (Westphal and Notschweleka [1967], Louw [1971] and Lanham [1958]) confirms that they are systematic.

Goldsmith, Peterson, and Drogo [1986] analyze both of these cases of antepenult to penult tone shift as cases of accent shift rather than tone shift. That is, all trisyllabic stems like those in (19a) and all disyllabic stems like those in (19b), which represent, in fact, the vast majority of disyllabic and trisyllabic verb stems in Xhosa, are lexically marked to trigger the following rule of accent-hopping, which shifts the accent from the antepenult to the penult after the antepenult has been assigned prominence by rules like those in (8):

(20) **Accent Hopping** [Goldsmith, Peterson, and Drogo 1986], fig. (6)

```
*          *
V V   →   V V
```

A rule of Attraction to Accent, formulated like Metrical Spread (9), will then apply, allowing the underlying antepenultimate high tones of words like those in (19) to spread to the penult. Thus, in this analysis, both low-toned and high-toned verbs include a class of lexically-marked "Accent Hoppers", which are predicted to always attract high tones preceding the accent to the penult instead of the antepenult by triggering rule (20).[5]

This prediction is incorrect in the case of the low CVCV (disyllabic) "Accent-Hopping" stems, however. In fact, these disyllabic low stems only trigger accent hop when they are preceded by an OP. Other high tones preceding the stem which are in pre-antepenultimate position, such as the high tone on the subject prefix (SP) *lí-* in (6g) *li-yá-bala* 's/he counts' or the high tone on the infinitival pre-prefix *ú-* in (3e) *u-kú-bala* 'to count', shift only to the antepenult, not to the penult. As shown in the derivation of (6g) *li-yá-bala* 's/he counts', the accent hop analysis allows these pre-antepenultimate high tones to surface one syllable to the right of where they actually occur:

(21) Incorrect derivation of (6g) *li-yá-bala* 's/he counts', Accent Hop Analysis

UR, UAC	H *li ya bala* s/he TM count [+Accent Hop]
Accent Placement	H x x x *li ya ba*<*la*>$_{ex}$ *
Accent Hop	H *li ya ba*<*la*>$_{ex}$ *
Metrical Tone Shift (9, 10)	H *li ya ba*<*la*>$_{ex}$ *
SR	**liyabála* 's/he counts'

[5] Another problem with having Accent Hop be a lexically-triggered rule is that it fails to explain why words derived from the "accent-hopping" stems do not also trigger accent hop as would be expected if this is truly a lexical property of the stems. For example, *-bonísa* 'to show' triggers Accent Hop (20), but when an extension is added to derive *-bonísisa* 'to show clearly', the high tone surfaces on the antepenult. Likewise, in the low stems, *-wa-bála* 'count them' triggers Accent Hop (20) to the penult, but the derived stem + OP, *-wa-bálisa* 'recount to them' does not.

The Local Shift analysis, on the other hand, accounts for this form straightforwardly. As shown below, Local Shift (15, 10) will apply first to shift the high tone of *lí-* one syllable rightward. Accent Placement (8) will then assign metrical prominence to the antepenult, but since the antepenult is already linked with a high tone after Local Shift, Metrical Spread (9) is inapplicable and the high tone correctly surfaces on the antepenult:

(22) Derivation of (6g) *li-yá-bala* 's/he counts', Local Shift Analysis

```
                         H
                         ¦
UR, UAC                  li   ya   bala
                         s/he TM   count

                         H
                         ‡ ` ` .
Local Shift              li   ya   ba(la)ex

                              H
                             (  x
                             (  x    x
Accent Placement         li   ya   ba<la>ex
                              *

Metrical Tone Spread     not applicable

SR                       liyábala      's/he counts'
```

In short, although a single rule of local tone shift, applying before accent placement, accounts correctly for all the Xhosa data, a single rule of accent shift applying after accent placement does not.[6] In positing a class of accent-hopping

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[6] In fact, there is an accent shift rule which could correctly predict the Nguni data, namely one which shifted an accent off a vowel which was (underlyingly) associated with a high tone onto the next vowel rightwards:

```
*          *
V V  →  V V
|       |
H       H
```

low verb stems, Goldsmith, Peterson, and Drogo [1986] incorrectly predict that all high tones preceding the stems will shift to the penult (stem-initial) syllable, while in fact only high tones originally associated (by the UAC) to the antepenult shift to the penult.

2.2.2. Peterson's [1989b] analysis of Ndebele and Zulu. Peterson [1989b] extends the metrical analysis of Xhosa tone presented in Goldsmith, Peterson, and Drogo [1986] to two other Nguni languages, Ndebele and Natal Zulu, taking as her sources Rycroft [1983] for the former and, chiefly, Cope [1970] for the latter. Prominence in both languages is still assigned to the antepenult by accent placement rules like those given in (8), above, but antepenult shift (see data in 19) is no longer accounted for by a single rule of Accent Shift. Instead, Accent Shift is formulated to move the accent placed on the antepenult to the penult just in case the stem is trisyllabic and high-toned:

(23) **Accent Shift** [Peterson 1989b], fig. (7)

```
     * →
stem[V V V]
     |
     H
```

Metrical Spread (Attraction to Accent, in Peterson's terminology) then spreads the high tone to the accented penult. Peterson [1989b] does not discuss the noun data presented in her source, Rycroft [1983], but presumably this same rule could apply to the trisyllabic noun stems which undergo local shift (see (14), above). Since in Xhosa some trisyllabic verb stems undergo Accent Shift while others do not, those which do undergo the rule are to be marked in the lexicon, just as they were in the previous analysis.

To derive shift of the high tone of an OP before disyllabic low-toned verbs, Peterson [1989b] abandons the accent shift approach and instead proposes that a rule of high tone displacement applies to place the high tone of the OP on the following (i.e. verb stem initial) syllable before metrical prominence is assigned to the word. Although this rule is not formalized in Peterson [1989b], note that it has the effect of Local Shift (15, 10) in this context and is likewise ordered before accent placement. Since high-toned penults receive metrical prominence in this analysis, the high tone displacement rule leads to assignment of prominence to the penult of low disyllabic stems which follow an OP,[7] as illustrated by the

While this accent shift rule would derive the correct results, it has theoretical drawbacks which will be discussed in §2.4.

[7] It is not clear from Peterson's [1989b] discussion why OM Displacement does not feed Accent Shift (23) when the object prefix precedes a low-toned trisyllabic stem as in *u-ya-bá-khetisa* → *u-ya-ba-khéthisa* 'you help them choose'. After OM high tone displacement, *-khéthisa* is a

following derivation (based on Peterson's [1989b] discussion of the Ndebele form, *u-ya-yi-khétha* 'you choose it'):

(24) Derivation of *u-ya-yi-khétha* 'you choose it'

UR, UAC	H (linked to *yi*) *u ya yi khetha* you TM it choose
OM High Displacement	H (shifted from *yi* to *khe*) *u ya yi kheta*
Accent Placement	H (linked to *khe*) *u ya yi kheta* * (under *khe*)
Attraction to Accent	not applicable
SR	*u-ya-yi-khétha* 'you choose it'

In sum, while Peterson's [1989b] analysis derives the correct results, she is forced to propose two processes which account for the same facts that the single process of local shift accounts for, one of which (Object Marker High Displacement) has the effect of a local tone shift rule applying before metrical prominence is assigned. Since the Local Shift analysis argued for in this paper provides a more general account of Nguni tone, it is clearly to be preferred.

2.3. Arguments against the accentual rules first hypothesis (Goldsmith [1982] and Sietsema [1989]). Peterson seems to have rejected having an explicitly formulated tone shift rule applying before Accent Placement, because she [Peterson 1989a] adopted the hypothesis, proposed in Goldsmith [1982] and also defended in Sietsema [1989], that tone and accent form independent systems in tone languages, with all metrical rules preceding all local (non-metrical) tonal rules. Under this hypothesis, all accent rules apply to the UR, so that initial tone association in accentual languages is mediated by accents, i.e. accented tones associate with accented syllables or, to rephrase this according to the

---

trisyllabic stem with an initial high tone and so meets the structural description for Accent Shift. If Accent Shift did apply, it would yield the incorrect, **u-ya-ba-khethísa*, of course, but nothing in Peterson's analysis blocks the derivation of the incorrect form.

current interpretation of accent [Goldsmith 1987], unassociated high tones associate to metrically prominent (accented) syllables. It is only after tones are associated to accented syllables that non-metrical tone rules may apply to derive the surface tone patterns. This approach is too restrictive, however, because non-metrical tone rules can be shown to precede metrical rules both in the other metrical analyses of Nguni and in other Bantu tone languages.

First, it is evident that in Nguni, accent/metrical prominence (I have been using these two terms interchangeably) does not mediate initial tonal association. Instead, high tones are either linked underlyingly (when association is not predictably to the morpheme-initial syllable, as in the case of nouns like *si-khathí* 'time') or by the UAC (when association is predictably with the morpheme-initial syllable, as in verb stems). Accent rules apply after tonal association to define the domain of spread of (certain) high tones. Since association conventions and, in Peterson [1989b], a high tone displacement rule must apply before metrical rules do, a model in which all tone linking and displacement occur after all accentual rules apply cannot be maintained for Nguni.

Secondly, the Nguni languages are not the only Bantu languages in which a non-metrical tone rule can be argued to precede metrical rules. ChiZigula, an Eastern Bantu language spoken in Tanzania, has received a similar analysis [Kenstowicz and Kisseberth 1990]. In ChiZigula, it is the penult which is argued to be assigned metrical prominence, since, as illustrated in (25) below, the rightmost high tone generally surfaces on that syllable even though it may originally be associated several syllables to the left:

(25) ChiZigula high-toned infinitives

ku-lo̲mbéza	'to ask'
ku-lo̲mbez-éz-a	'to ask for'
ku-lo̲mbez-ez-án-a	'to ask each other for'

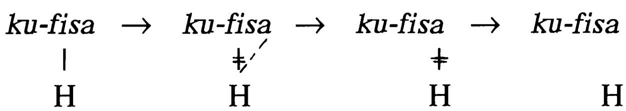
However, high tones underlyingly associated with the penult do not surface on the penult, so that disyllabic high and low stems are neutralized, both surfacing as low. (In ChiZigula, as in Nguni, the verb's high tone associates with the stem-initial syllable.) Only when extensions are added to the stems does the high-low contrast become apparent, as illustrated in (26):

(26) Neutralization of ChiZigula disyllabic stems

Low stem		High stem	
ku-guh-a	'to take'	*ku-fis-a*	'to hide'
but			
ku-guh-il-a	'to take for'	*ku-fis-íz-a*	'to hide for'

Kenstowicz and Kisseberth [1990] argue that penult high tones come to be deleted as the result of the application of two rules, both of which are shown to have independent motivation. First, the high tones shift to the final syllable, and then final high tones are deleted from a metrically weak position, as shown in the derivation of *kufisa* 'to hide' given in (27):

(27) ChiZigula: Derivation of *ku-fis-a* 'to hide'



In ChiZigula, as in Nguni, then, a high tone originally associated with the normally accented syllable (in this case the penult) shifts rightward one syllable. The ChiZigula local tone shift rule must apply before the metrical "attraction to accent" rule because otherwise the rightmost high tone would always be shifted to the final syllable and then deleted. Instead, only high tones underlyingly on the penult spread to the final syllable.

The tone system of Digo, another Eastern Bantu language spoken in Tanzania, shows many similarities to that of ChiZigula. As Kisseberth [1984] showed, the rightmost high tone in Digo induces a rise-fall tone pattern over the last two syllables of a word, even though the high tone may originally have been associated several syllables to the left:

(28) Digo high-toned infinitives

ku-chekěchâ	'to sift'
ku-chekechěrâ	'to sift for/with'
ku-chekecherănâ	'to sift for one another'

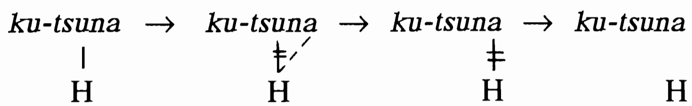
Kisseberth [personal communication] would now analyze the attraction of the high tone towards the end of the word in Digo as in the analysis of ChiZigula just discussed, by assigning metrical prominence to the penult. (Note that this contrasts with Kisseberth's [1984] analysis of Digo which posits that the final syllable attracts high tones.) Another similarity with ChiZigula is that in Digo disyllabic high and low stems are neutralized, both surfacing as low. The high-low contrast is evident, however, when extensions are added to the stems:

(29) Neutralization of Digo disyllabic stems

Low Stem		High Stem	
ku-rima	'to cultivate'	*ku-tsuna*	'to skin'
but			
ku-rimira	'to cultivate for'	*ku-tsunǐrâ*	'to skin for/with'

Neutralization of disyllabic stems in Digo may be analyzed as resulting from the same two-step process as was found in ChiZigula. First, penult high tones shift to the final syllable, and then final high tones are delinked, as shown in the derivation of *ku-tsuna* 'to skin', given in (30):

(30) Digo: Derivation of *ku-tsuna* 'to skin'



While I could find no other clear cases of local tone shift (though indirect support for a local tone shift rule will be presented in §3.2), independent evidence for final high tone deletion comes from the fact that CV stems, like *ku-tya* 'to eat', which Kisseberth [1984] argues have an underlying stem high tone on the final syllable, also surface as low.

In Digo and ChiZigula, too, then, a high tone associated with the normally accented syllable shifts rightward one syllable. Just as we found in Nguni, this local tone shift rule must apply before a metrical tone spread rule because otherwise the rightmost high tone would always be shifted one syllable too far to the right. To account for these cases, phonological theory must allow non-metrical tone rules to precede metrical (accentual) rules. A model, like that proposed by Goldsmith [1982] and Sietsema [1989], in which all metrical rules must precede all non-metrical rules, cannot account for these cases and thus cannot be maintained as a universal principle of grammar.

2.4. The Naturalness of Local Shift vs. Accent Shift. Another reason for preferring the local tone shift analysis of Nguni tone presented here over the accent shift analyses of Goldsmith, Peterson, and Drogo [1986] and Peterson [1989b] is that tone shift provides a simpler, more natural way of accounting for shift of high tones to an immediately adjacent syllable than Accent Shift (20, 23) does. Since accents in tone languages represent prominence assigned by metrical stress rules, we would expect Nguni accent shift to be motivated by the same factors which generally condition stress shift. In fact, the rules of accent shift proposed for Nguni would represent quite unusual examples of stress shift.

For one thing, even though in both accent shift analyses of Nguni high-toned syllables must be metrically heavy and attract prominence in order for high-toned penults to be assigned an accent (as, for example, after OM High Displacement, discussed in §2.2.2., above; see also discussion in §2.5., below), the rule of accent shift ((20), (23), and see note 6) moves the accent off a heavy (high-toned) syllable onto a light (low-toned) syllable. While it is common [Hayes 1980] for heavy syllables to attract prominence, it is certainly unusual for heavy syllables to repel prominence in the absence of any other motivating factors.

Indeed, another striking thing about the proposed Nguni accent shift rules is that they are lexically-triggered and not motivated by the factors which commonly induce stress shift. Hayes's [1980] and Halle and Vergnaud's [1987] surveys of stress in a number of languages show that stress shift is generally motivated by metrical structure or by a change in the segmental material available for metrical parsing. A type of stress shift motivated by metrical structure is stress clash. The English Rhythm Rule [Halle and Vergnaud 1987], for example, shifts a main word stress to the left in compounds with adjacent main stresses, so that:

```
                                   x
          x    x                   x       x
  x       x    x                   x   x   x
  x   x   x    x  x                x x x   x x
Tennessee + Williams   →   Tennessee Williams
```

An example of stress shift motivated by a change in the segmental material available for metrical parsing is found in Tiberian Hebrew (for details, see Halle and Vergnaud [1987]). In this language reduction or deletion of a stressed vowel causes stress shift to the right, so that:

```
   x             x
 x x x        x  x
kaatabuu → kaat'buu        'write (3 pl.)'
```

Neither of these conditions motivate Accent Shift (20, 23) in Nguni.

Since there is no metrical motivation for Accent Shift in Nguni, one wonders why Peterson [1989b] accounts for antepenultimate to penult tone shift by an accentual rule in the case of trisyllabic high stems but by a tone displacement rule in the case of object prefixes preceding low CVCV stems. (While it is true that OM High Displacement applies to object prefixes in other contexts as well, the only context in which it has an effect different from metrical tone shift is when the object prefix precedes a low CVCV stem.) As we have seen in §2.2.1., positing that both trisyllabic high stems and low CVCV stems trigger accent shift would give the wrong results, but no criteria are presented for choosing *a priori* when tone displacement rather than accent shift is the appropriate device for shifting high tones rightward. Metrical factors, in any case, do not seem to be decisive, and Accent Hop and Accent Shift (20, 23) remain unusual prominence shift rules.

Tone spread and tone shift (spread followed by delinking), on the other hand, are extremely common tonal rules. Hyman and Schuh [1974] list them as among the most natural and frequently found tone rules. Indeed, in the domain of Bantu tone alone, language after language has been analyzed as having a rule of non-metrical tone spread or tone shift: ChiZigula [Kenstowicz and Kisseberth 1990], Jita [Downing 1990], Nyamwezi [Nurse 1979], Qhalaxari (Sotho) [Dickens 1984], Rimi [Schadeberg 1979], Ruri [Goldsmith 1986], Shambala [Meeussen 1955], Shona [Myers 1987], Setswana [Kisseberth and Mmusi 1989], and Tsonga [Louw 1983], to name only a few. (It is worth noting that most of these languages do not have a rule of metrically-conditioned tone spread or tone shift, suggesting that local spread or shift is the older Bantu rule, while metrical spread is an innovation.) The local shift analysis proposed here for Nguni has ample parallels in other Bantu languages, then, supporting a claim that non-metrical tone shift is a more natural way of displacing a high tone one syllable to the right than accent shift in the absence of any metrical factors which might condition accent shift.

2.5. Do local rules feed metrical rules in Nguni? If local tone rules precede metrical rules in Nguni, one final question which arises is how the metrical rules apply to the output of local shift. That is, after local shift has applied, do the metrical rules still assign prominence to the antepenultimate syllable as shown in derivation (16)? If the antepenult is assigned prominence, this predicts that, in a word with two high tones like

(32) a. *ú̲-ku-sé̲benza* ‘to work’

once the rightmost high tone shifted to the penult by local shift, the other would shift to the prominent antepenult, to derive

(32) b. **u̲-ku-sé̲bé̲nza*
 *

But this form does not occur in any of the Nguni languages. Instead, the leftward high tone may only spread one syllable to the right in Zululand Zulu (the comparable Xhosa and Ndebele tone patterns will be discussed in the next section), i.e. it undergoes local shift to derive

(32) c. u̲-kú-se̲bénza
*

We need, then, to block Metrical Spread from applying to any except the rightmost high tone of a word in order to avoid deriving incorrect forms like (32b) above. One way of doing this would be to add a stipulation to the rule of Metrical Spread such that the rule only applied to the rightmost high tone of a word:

(33) Possible revision of Metrical Spread

The rightmost high tone of a word spreads rightwards to the accented syllable.

The disadvantage of this approach is that Metrical Spread is now so narrowly defined that the accent is assigned to the antepenult vacuously in most cases (as in (16) and (32c), above). Further, the prominent syllable is no longer the one bearing the rightmost high tone, either, which was one generalization we wanted to capture with the metrical approach to antepenult shift.

A way to maintain the generalization that the rightmost high tone is associated with the prominent syllable would be to complicate the rules assigning metrical prominence. As mentioned above, Goldsmith, Peterson, and Drogo [1986] and Peterson [1989b] have suggested that in Nguni high-toned penult syllables may be considered heavy for the assignment of prominence. Hayes [1980] noted that treating high-toned syllables as heavy for stress assignment is also necessary in Fore [Nicholson and Nicholson 1962] and Golin [Bunn and Bunn 1970], so this strategy does have cross-linguistic motivation. In this approach, the metrical rules for Nguni would be similar to those for Latin: stress the penult if it is heavy (high-toned), otherwise stress the antepenult. Adapting Halle and Vergnaud's [1987:55-59] stress rules for Latin, the rules for Nguni prominence would be as follows:

(34) Accent Assignment in Nguni (Revised)

a. Mark the (phrase-) final syllable extrametrical.

b. Assign a line 1 asterisk to high-toned syllables.

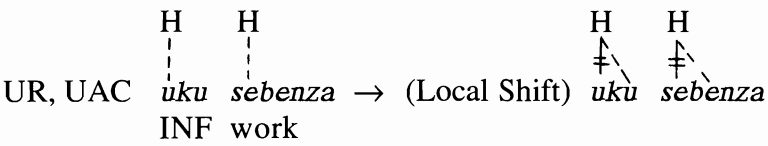
c. Construct binary, left-headed feet right to left.

d. Assign a line 2 asterisk to the rightmost asterisk on line 1.

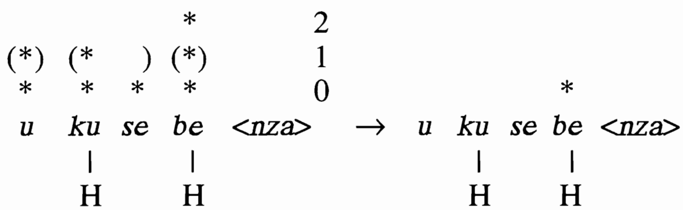
e. Assign an accent to the syllable bearing the line 2 asterisk.

A word with two high tones like (32a) in which the rightmost high tone is originally associated with the antepenult would be assigned metrical structure as follows:

(35) Metrical Prominence Assignment, *ú-ku-sébenza* 'to work'



Metrical Rules (34a-e)



In cases where the rightmost high tone is associated with the antepenult or a preceding syllable after Local Shift, the antepenult would still be assigned prominence and, if unassociated, attract a high tone by Metrical Spread as in the derivation in (12), above.

Zulu and Xhosa do not exactly parallel the Latin prominence system, however, because the few trisyllabic noun stems with a high tone on the final syllable also block prominence assignment to the antepenult. As shown in the example below, the high tone of the preprefix shifts only one syllable to the right:

(36) *á-ma -shininí* → *amá-shininí* 'factories' (Zulu and Xhosa)
Cl.6 factory

If the final syllable were extrametrical so that the antepenult were assigned prominence, this word would surface as **a-ma-shíniní*. To account for the fact that local shift, not metrical shift, applies to the leftmost high tone of words like these, we may revise (34a) so that only light, i.e. low-toned, final syllables are marked extrametrical. (See Downing [1989] for a similar condition on extrametricality.) This would allow the high-toned final syllable of words like (36) to be assigned prominence, so only Local Spread could apply to the leftward high tone.

In order for these rules to derive the correct results, I am assuming that Metrical Spread will not apply if the accented syllable is already associated with a high tone. This condition on a similar rule of Attraction to Accent was postulated for ChiZigula [Kenstowicz and Kisseberth 1990], and it may well be a universal constraint on this type of rule. Otherwise, we may revise Metrical Spread as follows:

(37) **Metrical Spread** (Final Version)

A high tone spreads rightwards to an adjacent accented syllable (which is not already linked with a high tone).

3. Exceptions to Tone Shift

3.1. Words with Two High Tones. I have just shown that in some Zulu and Xhosa words with two high tones, the leftmost high tone may undergo local shift, as in the following examples:

(38) Local Shift in Words with Two High Tones

a. Zulu infinitives: *ú ku sébenza* → *u kú sebénza* 'to work'

b. Zulu and Xhosa nouns: *á ma shininî* → *amá shininí* 'factories'

Local shift does not apply to the leftmost high tone of every word with two high tones, but, as I will show in this section, these apparent exceptions to local shift have a straightforward phonological explanation.

3.1.1. Meeussen's Rule. The first set of apparent exceptions to local shift discussed in this section involves words in which the two high tones are adjacent, such as high-toned verb stems preceded by an OP or high-toned SP. In Nguni, all Object Prefixes have a high tone, as shown by the data below:

(39) Low verb stem with object prefix, Indicative tense (form of verb is SP-TM-OP-stem):

<u>Zulu</u>

(a)	*u-ya-w<u>a</u>-bála*	'you count them'
(b)	*u-ya-ng<u>i</u>-hlékisa*	'you amuse me'
(c)	*si-ya-w<u>a</u>-shukúmisa*	'we shake them'
(d)	*si-ya-w<u>a</u>-namathélisa*	'we make them stick'

Xhosa [Claughton 1983]

(e) *ni-ya-wá-lwa* ‘I fight them’

(f) *ni-ya-wa-bála* ‘I count them’

(g) *ni-ya-wa-bálisa* ‘I recount to them’

(h) *ni-ya-wa-shúkúmisa* ‘I shake them’

(i) *ni-ya-wa-námáthélisa* ‘I cement them’

Ndebele [Rycroft 1983]

(j) *u-ya-yi-khétha* ‘you choose it’

(k) *u-ya-ba-khéthisa* ‘you help them choose’

(l) *u-ya-yi-limísisa* ‘you plow it intensively’

Since the verb stems and subject prefixes are toneless, the only high tone in the above data must be contributed by the object prefix. Local shift applies to shift the high tone of the object prefix onto the initial stem vowel of the verb, and in quadrisyllabic or longer stems (39c, d, h, i, l), Metrical Spread (8) applies to shift the object prefix (OP)'s high tone to the antepenult. (Note that in Xhosa, Left Delink (10) is obligatory for high tones linked to an OP.)

In cases where a high-toned OP precedes a high-toned verb stem, only one high tone surfaces, as shown by the data in (40):

(40) High-toned infinitives (short form) with and without high-toned object prefixes

A. Without object prefixes

(a) *ku létha* ‘to bring’

(c) *ku béka* ‘to put’

(e) *ku lethéla* ‘to bring to’

(g) *ku bonísa* ‘to show’

(i) *ku khulúmisa*

B. With object prefixes

(b) *ku zi létha* ‘to bring them’

(d) *ku wa béka* ‘to put them’

(f) *ku ba lethéla* ‘to bring to them’

(h) *ku wa bonísa* ‘to show them’

(j) *ku ba khulúmisa*

'to speak to'	'to speak to them'
(k) *ku nyi̱nyithékisa* 'to make slippery'	(l) *ku wa̱ nyi̱nyithékisa* 'to make them slippery'

These data show that when two high tones are adjacent in Nguni, one high tone seems to be deleted.

The deletion of a high tone if it is adjacent to another high tone is a widespread process in Bantu and has been given the name Meeussen's Rule by Goldsmith [1984]. As Myers [1987] argues, Meeussen's Rule can be motivated by the Obligatory Contour Principle (OCP) which prohibits identical adjacent feature specifications within certain morphological domains [Leben 1973]. Since many Object Prefixes are high-toned in Bantu languages and the Object Prefix usually immediately precedes the verb stem, a high-toned verb stem preceded by a high-toned Object Prefix is a common context for the application of Meeussen's Rule. Often, it is the stem high tone which is deleted by Meeussen's Rule (see Goldsmith [1984] for examples), but the Object Prefix's high tone may also be deleted, as it is in ChiZigula [Kenstowicz and Kisseberth 1990]).

The deletion of one of the two adjacent high tones in the data in (40B) may then be attributed to Meeussen's Rule, and the trisyllabic stems (40e, g) provide evidence that it is the OP's high tone which deletes. If the stem high tone deleted, neither Local Spread (15) nor Metrical Spread (8) could spread the OP's high tone past the stem-initial (antepenultimate) syllable, and both low- and high-toned verb stems would have identical tone patterns when preceded by an object prefix. Instead, in high-toned trisyllabic verbs, the high tone surfaces on the penult, as is predicted if the OP's high tone is deleted and local shift applies to the remaining stem-initial high tone. To account for the data in (40), Meeussen's Rule in Nguni must delete the first of two adjacent high tones, as shown below:

(41) **Meeussen's Rule** (preliminary version)

```
H  H          H
|  |   →      |
σ  σ       σ  σ
```

Note that the longer stems (40e, g, i, k) provide further evidence that the stem high tone is originally associated to the initial syllable by the UAC and not directly associated to the accented syllable. Otherwise the OP high tone and the stem high tone would not be adjacent in these cases, and it would be very difficult to generalize about the context in which the OP's high tone is deleted.

Complications with the formulation of Meeussen's Rule in (41) arise when we look at further data, however. In the phrase-medial form of the Present Indicative, discussed above (see (12)), the tense/aspect marker is absent, so the subject prefix is added directly before the verb stem (or "super-stem", which includes the OP). If high-toned subject prefixes (SP) are added to high-toned verb stems or super-stems in this tense, up to three adjacent high tones result, as shown in the words below:

(42) Short form of the Present Indicative (verb has form: High-toned SP (-OP) -High Verb Stem)

Zulu

(a)	*u-ba-phakamísa*	's/he lifts them'
(b)	*ba-khulumisána*	'they speak to, recip.'
(c)	*u-si-fundísa*	's/he teaches us'
(d)	*si-yi-níka*	's/he (Cl. 6) gives it'

Xhosa

(e)	*li-wa-béka*	's/he puts them'
(f)	*li-wa-bónísa*	's/he shows them'
(g)	*li-wa-bónísisa*	's/he shows them clearly'

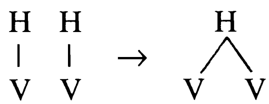
Ndebele [Rycroft 1983]
(no examples with OP were cited)

(h)	*bá-létha*	'they bring'
(i)	*ú-sébénza*	's/he works'
(j)	*bá-bónísána*	'they show each other'

The penult is accented in the phrase-medial form of the Present Indicative in Zulu and Ndebele (see §1.4., above), so the data from those languages cannot tell us which high tone(s) have been deleted: the surviving high tone would spread to the penult in any case. Only the Xhosa trisyllabic form (42f) shows clearly that it is the rightmost of the underlying high tones which survives, since only Local Spread (15) of the rightmost underlying high tone may account for the high tone on the penult instead of the antepenult (compare (42f and g)). Meeussen's Rule (41) must then be allowed to apply iteratively left to right in order to derive the correct results for all the Zulu and Xhosa words in (42). The Ndebele data in (42i-l) still present complications for the rule in (41), however, because the subject prefix (and following syllables) surface with a high tone. As noted above, in Ndebele Leftbranch Delinking (10) is always blocked if the leftmost branch of a multiply-linked high tone is associated with a word-initial syllable, and it appears that this same constraint must be extended to block application of Meeussen's

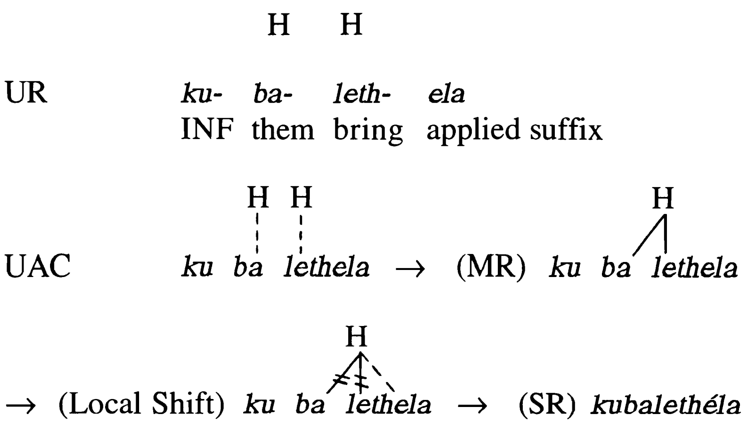
Rule: it does not apply if the target of deletion is linked to a word-initial syllable. A way of unifying these two observations about the special status of word-initial high tones in Ndebele is to propose that Meeussen's Rule does not delete all but the rightmost of a series of adjacent high tones. Instead, Meeussen's Rule should be formulated like the OCP Tone Fusion Rule proposed by Kisseberth and Mmusi [1989] for Setswana to fuse a series of adjacent high tones (e.g., that of the OP and verb stem) into a single, multiply-linked high tone, as shown below:

(43) **Meeussen's Rule** (Tone Fusion Version)



Local Spread (15) next applies to this multiply-linked high tone to spread it one more syllable rightward, and finally Left Delink (10) applies to all except its rightmost branch. The usual constraint on delinking word-initial high tones would apply in Ndebele to derive the tone patterns in (42h-j). Since the Tone Fusion version of Meeussen's Rule also derives the correct tone patterns for the Xhosa and Zulu data, it is the version I will adopt in this paper. The application of Meeussen's Rule (43) is illustrated by the derivation of (40f) *ku-ba-lethéla* 'to bring to them', below:

(44) Derivation of (40f) *ku-ba-lethéla* 'to bring to them' (short form)



3.1.2. OCP-motivated delinking. In many words with two high tones in Zulu and Xhosa, the leftmost does not seem to undergo local shift, even though both high tones surface and the context for the rule is met. For example, in Xhosa, local shift never applies to the high tone of the nominal/infinitival agreement preprefix or to the subject prefix before a stem with a high tone on the stem-initial syllable, as illustrated below:

(45) Xhosa nouns and verbs with two high tones (no shift)

Verbs

(a)	*ú̲-ku-bé̲ka*	'to put'	*lí̲-ya-bé̲ka*	's/he puts'
(b)	*ú̲-ku-bó̲nísa*	'to show'	*lí̲-ya-bó̲nísa*	's/he shows'
(c)	*ú̲-ku-bó̲nísisa*	'to show clearly'	*lí̲-ya-bó̲nísisa*	's/he shows clearly'

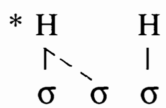
Nouns

(d)	*á̲-ma-sé̲la*	'thieves'
(e)	*á̲-ba-fú̲ndisi*	'teachers'

Even in Zulu, local shift only optionally applies in forms like those cited in (45b,c) in which the stem high tone undergoes local shift (see (32c), above). Otherwise, the tone patterns are identical to Xhosa with no spread of the leftmost high tone.

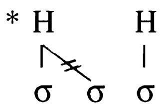
The generalization we can make about the data in (45) is that Local Spread fails to apply when the syllable following the target for spread has a high tone. That is, Local Spread does not apply in the following configuration:

(46) **Constraint on Local Spread**



In fact, other Southern Bantu languages, including Shona [Myers 1987] and the SeSotho/Tswana group (ongoing research under C. Kisseberth at the University of Illinois), have a similar constraint on Local Spread. Myers [1987] has argued for Shona that this constraint may be motivated by the OCP, since, if the first high tone spreads, it will create two adjacent high tones. Local Spread may be blocked in this context by having the constraint in (46) act as a condition on Local Spread (this is the approach taken by Myers [1987]). Alternatively, Local Spread may be allowed to apply, and a rule of OCP-motivated Right-Branch Delinking (OCP Delink) could undo the effects of spread, as shown below (this is the approach taken by Kisseberth and Mmusi [1989] for Setswana):

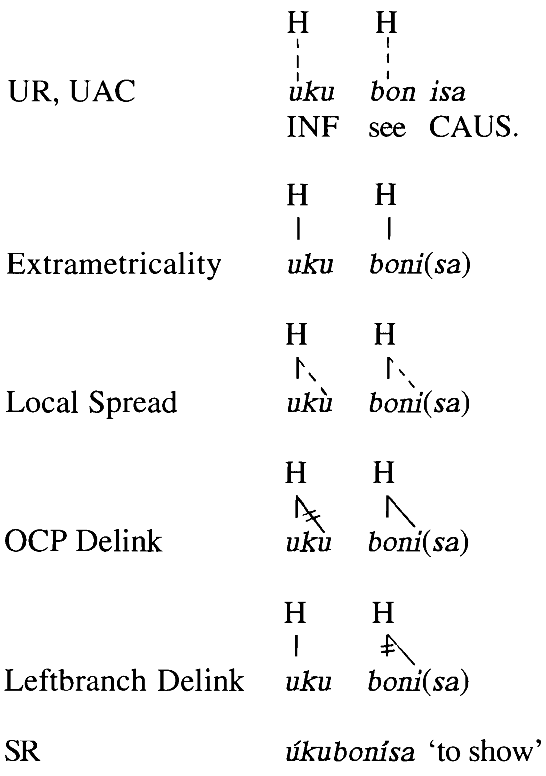
(47) **OCP (Rightbranch) Delink**



I will adopt the OCP Delink approach in this paper, but no empirical evidence favors that approach over a constraint on spread as proposed by Myers [1987].

The application of OCP Delink to account for the surface lack of spread of the leftmost high tone in (45) is illustrated by the derivation of (45b) below:

(48) Derivation of (45b) *ú-ku-bonísa* 'to show' (Xhosa)



OCP Delink must apply before Leftbranch Delink in Xhosa, because otherwise Leftbranch Delink (10) would bleed OCP Delink by disassociating the conditioning high tone, as shown by the incorrect derivation of (45b) given below:

(49) Incorrect derivation of (45b) *ú-ku-bonísa* 'to show' (Xhosa)—Leftbranch Delink before OCP Delink

UR, UAC	H H *uku bonisa*
Local Spread	H H *uku bonisa*
Leftbranch Delink	H H *uku bonisa*
OCP Delink	not applicable
SR	**ukú bonísa* 'to show'

In order for local shift to be able to apply optionally in the Zulu cognates of words with longer high-toned stems like (45b,c; 32c), however, Leftbranch Delink must precede and bleed OCP Delink. To account for this difference between Zulu and Xhosa, Left Delink (10) could be ordered before OCP Delink in Zulu, so that the derivation of (32c) *u-kú-sebénza* 'to work' would proceed like the incorrect derivation for the Xhosa form given in (49), above. Alternatively, Local Spread and the two delinking rules could apply cyclically, as illustrated in the derivation of (32c) given in (50):

(50) Derivation of (32c) *u-kú-sebénza* 'to work' (cyclic application of Local Shift and Right Branch Delink)

UR	H H *uku sebenza*

<u>Cycle 1</u>

UAC, Extrametricality	H *sebe*(*nza*)$_{ex}$

	H
Local Spread	*sebè(nza)*$_{ex}$
OCP Delink	not applicable
	H
Leftbranch Delink	*sebe(nza)*$_{ex}$
<u>Cycle 2</u>	
	H H
UAC, Local Spread	*ukù sebe(nza)*$_{ex}$
OCP Delink	not applicable
	H H
Leftbranch Delink	*uku sebe(nza)*$_{ex}$
SR	*ukúsebénza* 'to work'

A potential problem with having these rules apply cyclically is that they apply within non-derived roots, like *-sebénza* 'work', appearing to violate the strict cycle condition (SCC) [Kiparsky 1985]. However, these stems with an initial high tone do not have the high tone linked underlyingly, since the Universal Association Convention (2) associates the high tone with the morpheme-vowel automatically. Only non-initial high tones need to be lexically linked. As Levergood [1984] has argued, the application of association conventions like the UAC may create a derived environment and thus feed the morpheme-internal application of cyclic prosodic rules like tone spread. The cyclic analysis proposed in (50) would therefore be consistent with the SCC. The difference between Xhosa and Zulu which accounts for the different tone patterns in (45b) and (32c), then, could either be that in Zulu Local Spread and the delinking rules are cyclic rules, while in Xhosa they are non-cyclic, or simply that in Zulu Left Delink precedes OCP Delink, while in Xhosa the rules apply in the opposite order.

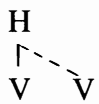
In Ndebele words with two high tones, we find different tone patterns from those in Zulu and Xhosa. While Meeussen's Rule applies to delete the leftmost of two adjacent high tones (see the data in (40), above), in the case of non-adjacent high tones, the leftmost high tone spreads iteratively up to the syllable immediately preceding the high tone linked to the accented syllable, as shown by the data below [Rycroft 1983]:

(51) Ndebele, High Prefix + H stem, N and V

a. *ú̲-kú-lé̲thísa*	'to help bring'
b. *ú̲-yá-lé̲tha*	's/he brings'
c. *ú̲-yá-hló̲lísisa*	's/he examines intensively'
d. *í̲sí-há̲mbi*	'traveller'
e. *í̲sí-khwá̲mána*	'small bag'

Thus, it appears that constraint (46) does not hold in Ndebele, since high tones may spread onto a syllable adjacent to another high tone. The leftmost high tone also may spread over several syllables in these words, not just one, as in Zulu and Xhosa, so some rule other than Local Spread seems to be applying. Following Peterson [1989b], I account for these facts by proposing that Ndebele has an iterative tone spread rule, formulated below, which is ordered after Metrical Spread (9) and Leftbranch Delink (10):

(52) **Iterative Spread**



i.e. a high tone not linked to a metrically prominent syllable spreads iteratively to a toneless vowel.[8]

Left Delinking (10) does not reapply to the output of this rule. This could fall out from the fact that Iterative Spread (52) is ordered after Delinking (10). Alternatively, it could be due to the fact that, in all the data available to me, Iterative Spread applies to word-initial high tones, so the context for Delinking (10) is not met.

Having three ordered tone spread rules may make Ndebele seem unusually complex, but ChiZigula [Kenstowicz and Kisseberth 1990] has also been analyzed as requiring a local tone shift rule, a metrical shift rule and an iterative spread

[8] In Ndebele there is some evidence that final high-toned syllables are still extrametrical, unlike in Zulu and Xhosa (see §2.5., above). Prefixal high tones in the antepenult preceding monosyllabic stems do not undergo iterative tone spread: *ú-ya-phá* → *ú-ya-phá* 's/he gives'. This can be accounted for if the final syllable is extrametrical and the antepenult is assigned an accent. Since iterative spread (52) does not apply to high tones linked to the accented syllable, the leftmost high tone fails to spread.

rule, applying in that order. The Ndebele system thus has parallels in another Bantu language. Also, in this analysis, Ndebele is actually only minimally different from Zulu and Xhosa. Local Spread is restricted to apply within the domain of the "super-stem" in Ndebele (this is again like ChiZigula). High tones not linked to a metrically prominent syllable after metrical shift (and local shift, of course) undergo a third spread rule, Iterative Spread (52).

To sum up this section, some apparent exceptions to local shift in words with two high tones in Zulu and Xhosa may be easily accounted for by postulating that Meeussen's Rule fuses a series of adjacent high tones before Local Spread and Delink Apply. Other apparent exceptions likewise receive a straightforward explanation if a delinking rule (47) undoes Local Spread in Zulu and Xhosa when its output creates two adjacent high tones. This constraint on Local Spread is, in fact, widespread in Southern Bantu, and has been argued by Myers [1987] to be motivated by the OCP which prohibits adjacent identical feature specifications within a single morphologically-defined domain. Left Delink (10) was able to bleed OCP Delink (47) in some environments in Zulu, however, leading to many more apparent exceptions to Local Spread in Xhosa than in Zulu. Ndebele was shown not to have this constraint on Local Spread, and further to have an iterative tone spread rule (52) which applied to the leftmost of two high tones after local shift and metrical shift had applied. Thus, although the surface tone patterns of Ndebele, Xhosa and Zulu are quite different from one another in words with two high tones, these differences can be shown to result from relatively minor differences in their grammars. Another important point about these apparent exceptions is that the analysis presented here allows us to see clear parallels between Nguni and other Bantu languages, including ones (Shona, SeSotho/Tswana) not analyzed as having metrical tone rules. Even if a purely accentual analysis of these Nguni facts proves to be possible (and none has, to my knowledge, been attempted), it would surely obscure these similarities.

3.2. High-toned stems with (underlying) long vowels. Another context in which local shift apparently fails to apply is when the initial high tone of some derived trisyllabic stems does not shift to the penult as predicted by local shift. In Zulu and Ndebele, only some trisyllabic noun stems are exceptions, while all trisyllabic verb stems regularly undergo local shift; but in Xhosa exceptions can be found among both noun and verb stems. The data below give examples of shifting and non-shifting trisyllabic noun and verb stems in Nguni:

(53) Nguni Trisyllabic Noun and Verb Stems (short form of the infinitival or nominal prefix)

Zulu and Ndebele

Verb Stems (all trisyllabic verb stems undergo local shift)

(a) *ku-sebénza* 'to work'

(b) *ku-bon-ísa* 'to show'

(c) *ku-leth-ísa* 'to help bring'

(d) *ku-fund-ísa* 'to teach'

Shifting Noun Stems

(e) *si-sebénzi* 'servant; worker'

(f) *si-khwam-ána* 'small bag'

Non-Shifting Noun Stems

(g) *n-tw-ány-ana* 'tiny thing'

(h) *ma-sél-ana* 'small thieves'

Xhosa

Shifting Verb Stems

(i) *ku-bón-ísa* 'to show'

(j) *ku-sébénza* 'to work'

Non-Shifting Verb Stems

(k) *ku-búl-isa* 'to greet'

(l) *ku-fúnd-isa* 'to teach'

Shifting Noun Stems

(m) *si-sébénzi* 'servant; worker'

(n) *si-khwám-ána* 'small bag'

Non-Shifting Noun Stems

(o) *n-tw-ány-ana* 'tiny thing'

(p) *ma-sél-ana* 'small thieves'

As discussed in §2.1.1 above, Goldsmith, Peterson, and Drogo [1986] accounted for the two patterns in Xhosa by arguing that the non-shifting stems (53 g, h, k, l, o, p), in which the rightmost high tone surfaces on the antepenult, were the regular pattern, while the shifting stems were lexically marked to undergo a rule of Accent Hop (20). Peterson [1989b] has taken the position that in Ndebele, all trisyllabic stems undergo Accent Shift (23), and presumably (since she did not discuss nominal tone) the non-shifting noun stems would be lexically marked as exceptions to Accent Shift. In this section I will argue that all the non-shifting stems historically - and underlyingly - have long stem-initial vowels, and in fact, do undergo Local Shift.

An important point about the non-shifting trisyllabic stems is that only some derived stems are exceptions to local shift. Non-derived trisyllabic stems all undergo local shift, so that there are no non-derived trisyllabic stems which surface with the stem high tone on the stem-initial syllable [J. Khumalo, personal communication]. If we examine the stems from which the data in (53) are derived, we find that there is a corresponding contrast in their tone patterns. Instead of the more typical (see, for example, Greenberg [1948]) Bantu contrast between low- and high-toned disyllabic verb stems, Nguni has a further two-way split in the high-toned stems. In Zulu and Xhosa, some stems have a level high tone on the stem-initial syllable, while others have a falling contour, while in Ndebele the split is between stems whose initial high-toned syllable is optionally realized with a low tone and stems whose initial syllable is always high-toned. This is shown by the data below:

(54) Nguni disyllabic high-toned infinitives

Zulu

(a) *ku-bôna* 'to see'

(b) *ku-khûla* 'to grow up'

vs.

(c) *ku-létha* 'to bring'

(d) *ku-fúnda* 'to learn'

Xhosa

(e) *ku-mêma* 'to invite'

(f) *ku-bôna* 'to see'

vs.

(g) *ku-béka* 'to put'

(h) *ku-fúnda* 'to learn'

Ndebele

(i) *ku-bó̲na/ku-bo̲na* ‘to see’

vs.

(j) *ku-lé̲tha* ‘to bring’

As illustrated in (55) below, the shifting trisyllabic stems are derived from disyllabic stems which, in Xhosa and Zulu, have a falling contour on the penult phrase-finally and in Ndebele have a level high tone optionally pronounced with a low tone (55b, d). The non-shifting trisyllabic stems, on the other hand, are derived either from monosyllabic stems (55f) or from disyllabic stems with a level high tone on the penult in all three languages and no optional low-toned pronunciation in Ndebele (55h, j).

(55) Sources of Shifting vs. Non-Shifting Trisyllabic Stems (Ndebele pronunciation follows ~; words have form: Class Agreement prefix-root-suffix(es))

Shifting

(a) *si-khwam-ána* ‘small bag’

(b) *si-khwâma ~ si-khwáma/si-khwama* ‘bag

(c) *ku-bon-ísa* ‘to show’

(d) *ku-bôna ~ ku-bóna/ku-bona* ‘to see’

Non-Shifting

(e) *n-tw-ány-ana* ‘tiny thing’

(f) *n-tó ~ n-tó/n-to* ‘thing’

(g) *ma-sél-ana* ‘small thieves’

(h) *ma-séla ~ ma-séla* ‘thieves’

(i) *ku-fúnd-isa ~ ku-fúnd-isa* ‘to teach’

(j) *ku-fúnda ~ ku-fúnda* ‘to learn’

As Westphal [1951] and Rycroft [1980a] have argued, the split in high-toned disyllabic stems in Nguni between those with a level high tone and those with a falling contour (or level high tone with optional low tone in Ndebele) on the penult has an historical explanation. The disyllabic stems with a level high tone are regularly derived from Proto-Bantu roots with stem-initial long vowels (“long initial vowel” roots), while the stems with a falling contour (or high alternating with low tone in Ndebele) are derived from Proto-Bantu roots with stem-initial short vowels ("short initial vowel" roots). Some examples from Rycroft [1980a] are cited below:

(56) Proto-Bantu roots and Nguni cognates (Ndebele pronunciations which differ from Zulu and Xhosa follow ~)

	Proto-Bantu	Nguni	
(a)	**-béek-*	*-bék-*	'put'
(b)	**-búudi-*	*-búz-*	'ask'
(c)	**-dáad-*	*-lál-*	'sleep, lie down'
(d)	**-déet-*	*-léth-*	'bring'
(e)	**-bón-*	*-bôn- ~ -bón-/-bon-*	'see'
(f)	**-kúd-*	*-khûl- ~ -khúl-/-khul-*	'grow up'
(g)	**-dúm-*	*-lûm- ~ -lúm-/-lum-*	'bite'
(h)	**-tún-*	*-fûn- ~ -fún-/-fun-*	'desire'

An interesting point about the short initial vowel roots is that, in some contexts, they undergo a rule of high tone deletion which otherwise only applies to words with a high tone on the final syllable. In Zulu, final high tones are deleted phrase-medially, and in Ndebele Rycroft [1983] states that final high tones may be deleted in all contexts, so that in many instances, it is only when the root is extended by adding suffixes that the underlying high tone is realized (compare (55a,b, 55c,d, 55e,f)). Final High Tone Deletion in Zulu and Ndebele is illustrated by the data below (insufficient data was available for Xhosa):

(57) Final High Tone Deletion (applies phrase-medially in Zulu; the phrase-medial forms may occur in all contexts in Ndebele)

	Phrase-Final	Phrase-Medial	
(a)	*si-khathí*	*si-khathi*	'time'
(b)	*ku-phá*	*ku-pha*	'to give'
(c)	*zi-njá*	*zi-nja*	'dogs'

Short initial vowel roots also have their high tone deleted phrase-medially in Zulu, and do so optionally in all contexts in Ndebele, showing the same sort of neutralization with low stems already seen in ChiZigula and Digo (see §2.3., above):

(58) Final High Deletion, short initial vowel roots (applies phrase-medially in Zulu; the phrase-medial forms may occur in all contexts in Ndebele; ~ precedes Ndebele forms)

	Phrase-Final	Phrase-Medial	
(a)	*ma-bûtho ~ ma-bútho*	*ma-butho*	'warriors'
(b)	*si-khwâma ~ si-khwáma*	*si-khwama*	'bag'
(c)	*n-kâbi ~ n-kábi*	*n-kabi*	'ox'
(d)	*ku-fûnda ~ ku-fúnda*	*ku-funda*	'to want'

Data like those in (58) have led many Nguni scholars (Clark [1988], Claughton [1983], Khumalo [1987], Peterson [1989a]) to posit that the short initial vowel stems have a high tone both on the penult syllable and the final syllable. The high tone on the penult is needed to derive the fall (in Zulu and Xhosa) or level high tone (in Ndebele verb stems—see (55d)) on that syllable and to account for the fact that OCP Delink applies before these stems (the long form of (55d), for example, is *ú-ku-bôna* 'to see'), as does Meeussen's Rule (32) (*ku-wá-bôna* → *ku-wa-bôna* 'to see them', short form). The high tone on the final syllable explains why these stems undergo Final High Deletion in Zulu and Ndebele. Clark [1988] and Khumalo [1987], to take the most recent autosegmental analyses which discuss this problem, therefore propose that the difference between the disyllabic high-toned stems with a level high tone (55h,j) and those with a falling contour (or high alternating with low, in Ndebele) (55b,d) is that the high tone of the former is unlinked in underlying representation, while that of the latter is underlyingly linked to the penult and final syllables, as shown below:

(59) Representation of high-toned stems in Nguni

a. Level High on Penult (→ non-shifting stems)

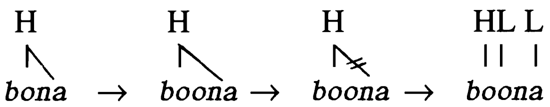
```
      H

ku [letha]    →  ku-létha          'to bring'
              →  ku-léth-isa       'to help bring' (Xhosa)
```

b. Falling contour or optional all low (→ shifting stems)

```
      H
      |\
ku [bona]     →  ku-bôna (Zulu and Xhosa)    'to see'
                 ~ ku-bóna/ku bona (Ndebele)
              →  ku-bo̲n-ísa                  'to show'
```

The derivation of a falling contour from the representation in (59b) seems to be triggered by stress-induced lengthening of the penult. Although I have not indicated this in the transcriptions, phrase-penult syllables are lengthened in Nguni as in many other Southern Bantu languages [Doke 1954], so the falling contour (the phrase-final tone pattern) is realized only on lengthened penults. When stress-induced lengthening applies, penults with a singly-linked high tone simply undergo spread of that high tone to the second mora of the lengthened vowel. But when stress-induced lengthening applies to the representation in (59b), an ill-formed representation is derived, since the high tone is no longer linked to adjacent moras. Tone spread to the second mora of the lengthened vowel is blocked in this case, and instead the rightbranch of the high tone delinks. Default low tones are associated with the free vowels, deriving the falling contour,[9] as shown in (60):

(60) Derivation of the falling-contour from (59b)



(For other possible derivations of the falling contour, see Clark's [1988] and Khumalo's [1987] discussions of Zulu tone.) In any case, the representation in (59b) does not undergo Leftbranch Delinking in the cases where the penult is realized with a falling contour (Zulu and Xhosa) or a level high tone (Ndebele), but it does in the contexts (phrase-medially in Zulu, optionally everywhere in Ndebele) where Final High Tone Deletion applies,[10] so that Leftbranch Delinking may feed Final High Tone Deletion to derive neutralization with low-toned stems:

---

[9] Kisseberth [personal communication] suggests that rightward delinking of the high tone might be triggered by the presence of a phrase-final (boundary) low tone. (Peterson [1989] has also suggested that a boundary low tone could be somehow responsible for the contour tone in these forms, but she did not explicitly formulate rules to derive the contour.) This is an appealing hypothesis, and future research may well show it to be well-motivated. For example, Downing [1989] has argued that investigating the tone pattern of questions is a fruitful method of testing processes attributed to the presence of phrase-final low tones.

[10] It is worth noting here that there is one apparent exception to the general condition in Ndebele that Leftbranch Delinking does not apply if the leftmost branch of the high tone is linked to a word-initial syllable, namely, when the word-initial syllable is also the penult. Rycroft [1983] notes that the form *úphá* 'he gives' (phrase-medial form) surfaces as *upha*. This may be accounted for as follows: Meeussen's Rule (43) would fuse the high tone on the subject prefix (*ú-* 'he') with that of the stem (*-phá* 'give'), and then Leftbranch Delinking would apply, even though the leftmost branch of the high tone is linked to the word-initial vowel. Final High Deletion would delete the remaining high tone, deriving the surface tone pattern.

(61) Derivation of (58a) *ma-butho* 'warriors' (phrase-medial form)

```
                H                         H
                |\                        ‡\
(UR)   ma   butho   →   (Left Delink)   ma   butho

                   H
                   ‡
→  (Final H)  ma   butho   →   (SR)    ma butho
```

Although the representations in (59a, b) do account for some of the differences between the two types of high-toned stems in Nguni, one problem with these representations is that they do not give any insight into the historical development of the two different tone patterns. Why would the less common long initial vowel roots have come to have the simpler representation in (59a), while the majority of disyllabic stems (namely, the short initial vowel roots) came to have the complex representation in (59b)? Further, why should (some) trisyllabic stems derived from disyllabic stems with the representation in (59a) fail to undergo local shift? The fact that those which are derived from stems with the representation in (59b) do undergo local shift is accounted for by allowing the multiply-linked representation to carry over to words derived from these stems. After Leftbranch Delink (11) applies, the effect of local shift is achieved (see Clark [1988], Khumalo [1987] for details). But there is nothing about the representation in (59a) which could block local shift in derived trisyllabic stems.

The key to the split in Nguni high-toned stems and the trisyllabic exceptions to local spread can be found by looking at similar facts in other Bantu languages. According to Meeussen [1955], Shambala also has a two-way split in the high-toned verb stems which may be traced to the Proto-Bantu vowel length contrast. Due to a very general local tone spread rule found in Shambala, most disyllabic high-toned stems surface with a high tone on both syllables, as shown below:

(62) Local Spread in Shambala disyllabic stems

```
 H               H
 |               |\
[tuma]stem  →  [tuma]stem  →  -túmá        'send'
```

Other verbs with this tone pattern are

(a) *-lóghá* 'to fish'

(b) *-víná* ‘to dance’

(c) *-téghá* ‘to trap’

But some high-toned disyllabic stems surface with a high tone only on the first syllable. That is, they seem not to undergo local spread:

(63) Shambala stems which fail to undergo spread [Meeussen 1955]

(a) *-léta* ‘to bring’

(b) *-lóta* ‘to dream’

(c) *-lála* ‘to lie down’

(d) *-úza* ‘to ask’

Meeussen [1955] argues that the stems in (63) all developed from Proto-Bantu long initial vowel roots (note that (63a) is a cognate of Nguni *-létha* ‘bring’ (see (56d), above). He proposes that local spread did apply to these stems when they still retained the Proto-Bantu length contrast, the high tone spreading from the first to the second mora of the initial syllable. The long vowel of the stem was shortened after local spread had applied, leaving a high tone only on the initial syllable:

(64) Derivation of *-léta* [Meeussen 1955]

```
H                      H
|                      |\
[leeta]stem   →   [leeta]stem   →   léta      ‘bring’
```

Shambala is not the only Bantu language for which it may be argued that a two-way split in the high-toned verbs resulted from historically long initial vowel roots failing to undergo a rule of high tone spread. In Qhalaxari, a Sotho language in the South Bantu group analyzed in Dickens [1984], some high verbs (High 1) have a high tone only on the first syllable of the stem, while others (High 2) have a high tone on the first two syllables of the stem:

(65) Qhalaxari high-tone verb patterns [Dickens 1984:110, Table 2]

High 1 verbs		High 2 verbs	
(a) *-já*	‘eat’	(e) *-bóná*	‘see’
(b) *-búzha*	‘ask’	(f) *-xúpúla*	‘remember’

(c) *-húmula*	'rest'	(g) *-khúrúmula*	'uncover'
(d) *-húmulela*	'rest in/at'		

The high tone on the second syllable of the verbs in the High 2 group is derived by a rule of High Spread like the Shambala rule illustrated in (62). The stems in the High 1 group apparently fail to undergo this High Spread rule, but, as Dickens argues, these verbs are regularly derived from long initial vowel Proto-Bantu roots (note that (65b) is a cognate of (63d)). The failure of High 1 verbs to undergo High Spread can be accounted for like Meeussen does for the Shambala data: High Spread applied to these stems before the Proto-Bantu vowel length contrast was lost in Qhalaxari.

Digo [Kisseberth 1984] provides yet another example of a language in which words derived from Proto-Bantu long initial vowel roots fail to undergo tone spread. As shown in (29), above, in Digo most disyllabic high stems neutralize with the low stems due to the rules of local shift followed by final high tone deletion also found in ChiZigula. But in Digo, unlike ChiZigula, some high stems are exceptions to local shift and subsequent final high deletion and surface with the same rise-fall pattern on the last two syllables as longer high stems (compare with (28), above):

(66) Digo disyllabic exceptions to neutralization [Kisseberth 1984:117, fig. 14]

a. *ku rě̲hâ* 'to bring'

b. *ku kwě̲râ* 'to climb'

c. *ku fǔ̲ndâ* 'to teach'

As Kisseberth [1984] showed, these exceptions are regularly derived from Proto-Bantu long initial vowel roots (note (66a) is a cognate of (56d)). Again, it could be argued that in Digo, as in Shambala and Qhalaxari, the exceptional tone pattern of the stems in (66) may be accounted for if local shift applied to them before Proto-Bantu vowel length was lost. The stem high vowel would only shift from the first to the second mora of the long initial syllable, and the context of final high deletion would not be met.

A final example of a Bantu language in which words derived from Proto-Bantu long initial vowel roots fail to undergo a regular rule of tone shift is Rimi [Schadeberg 1979]. Rimi, like Shambala, Qhalaxari, and Digo, has a two-way split in its high-toned verb stems. As shown by the data below, some (67A) undergo a rule of local shift and surface with a high tone on the second syllable of the stem, while others (67B) do not and surface with a high tone on the first stem syllable:

(67) Rimi High Tone Verb Patterns [Schadeberg 1979]

A. Verbs undergoing local shift

(a) *-o̱ná*	'see'
(b) *-ru̱má*	'bite'
(c) *-i̱mbá*	'sing'
(d) *-tu̱má*	'send'

B. Verbs showing no tone shift

(e) *-ó̱tea*	'dream'
(f) *-é̱ta*	'bring'
(g) *-hí̱ta*	'refuse'

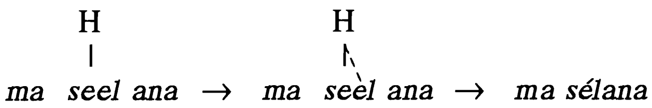
(Note that the data in (67A) are phrase-medial forms. Phrase-finally, Final High Deletion applies to these disyllabic stems, leading to neutralization with low stems by the same two-step process (Local Shift followed by Final High Deletion) already seen in ChiZigula and Digo.)

As Schadeberg [1979] demonstrates, all the stems which fail to undergo shift (67B) are derived from Proto-Bantu long initial vowel roots, while the stems which do undergo shift (and neutralize phrase-finally) derive from the short initial vowel roots. The lack of surface shift in the stems in (67B) can again be accounted for if their high tones shifted from the first to the second mora of the long initial syllable before Proto-Bantu vowel length was lost.

The split in Nguni high-toned stems and the exceptions to local shift may now be understood as having arisen in the same way as has been argued for in Shambala, Qhalaxari, Digo, and Rimi. Notice, first, that the result of local spread in (62), above, gives us the identical representation which is postulated as underlying for short initial vowel verb stems like *-bôna* 'see' in Nguni. That is, the representation in (59b) could be derived by allowing Local Spread to apply regularly to stems derived from short initial vowel roots (note that final syllables would no longer be extratonal in this analysis). Neutralization of short initial vowel disyllabic stems (see (58), above) in Nguni would then be derived by the same two-step process found in ChiZigula, Digo, and Rimi: penult high tones shift to the final syllable and then are deleted by a rule of final high tone deletion. Local Shift would also apply regularly to trisyllabic stems derived from short initial vowel roots (55a,c). In contrast, if historically long initial vowel roots were still bimoraic when Local Spread (15) applied to them, the result would be a level high tone on the initial syllable of disyllabic stems just like in the Shambala, Qhalaxari, and Rimi cognates in (63), (65), and (67B) above. The lack of shift in some trisyllabic noun stems can then be accounted for by positing that in all the

Nguni languages underlyingly long initial vowels in noun stems remain bimoraic when roots have suffixes added to them. Local Spread again just applies from the first to the second mora of the initial syllable before the vowel is shortened, giving the appearance of lack of spread, as illustrated below:

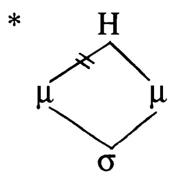
(68) Derivation of (55g) *ma-sélana* 'small thieves'



Trisyllabic verb stems also retain the tonal contrast between long and short initial vowel roots in Xhosa, but the contrast is neutralized in Zulu and Ndebele (see (55), above). To account for the Zulu and Ndebele verb data, the underlying long vowels in verb stems must be shortened when they are not in the penult syllable before Local Spread applies. In all other cases, long vowels are shortened only after Local Spread applies.

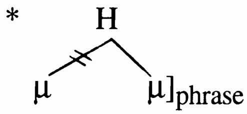
A complication with the analysis proposed here is that Leftbranch Delinking now does not apply to all multiply-linked high tones. Long initial vowel roots have a level high tone, not a rising contour as might be expected if delinking applied to them. Also, as mentioned above, the derivation of the falling contour in Zulu and Xhosa and the level high tone in Ndebele in some contexts on short initial vowel disyllabic stems depends on their not undergoing Leftbranch Delinking. Thus, Leftbranch Delinking must be constrained, first, from applying when both morae to which the high tone is linked are constituents of the same syllable:

(69) Constraint #1 on Leftbranch Delinking



Leftbranch Delinking must also not apply (at least in Zulu—it does apply optionally in Ndebele) to a multiply-linked high tone whose rightmost branch is linked to the phrase-final syllable:

(70) Constraint #2 on Leftbranch Delinking (phrase-finally)



These conditions on delinking are admittedly complex, but they reflect a complex and evolving situation in Nguni. Only in Xhosa is the underlying vowel length contrast maintained consistently in trisyllabic stems. In Zululand Zulu and Xhosa the short initial vowel disyllabic stems are pronounced with a falling contour on the penult only in some conjugations, but in many others are pronounced with a level high tone in the penult just as the long initial vowel stems are. In Natal Zulu, it appears [J. Khumalo, personal communication] that the two-way split has disappeared entirely, so that disyllabic verb stems in all conjugations are realized with a level high tone, e.g. *-bôna* 'see' is pronounced *-bóna*). That is, the direction of change in Zulu and Xhosa is for all disyllabic stems to be acquiring the long initial vowel tone pattern. In Ndebele disyllabic high-toned stems also neutralized with the long initial vowel roots and are realized with a level high tone. But, according to Rycroft [1983], for younger speakers the disyllabic stems derived from short initial vowel roots are merging with toneless stems due to Final High Deletion (see (58), above). Derived trisyllabic Zulu and Ndebele verb stems all undergo shift, indicating that all stems are merging with the short initial vowel stems once the stem-initial long vowel is no longer in the penult.

This general tendency for disyllabic stems to acquire the long initial vowel tone pattern and for trisyllabic stems to acquire the short initial vowel pattern in the development of Nguni might be attributable to the fact that the only surface long vowels are in the penult [Doke 1926]. As in most Southern Bantu languages [Doke 1954], the penultimate syllable is lengthened in Nguni (most noticeably phrase-finally) due to regular stress on that syllable. As Dickens [1984] suggests for Qhalaxari (Sotho), another Southern Bantu language, this could have eventually caused the original underlying vowel length contrast to be neutralized on the surface, since both long initial vowel and short initial vowel disyllabic stems would have come to have a long vowel in the penult. Trisyllabic long initial vowel stems would have lost underlying vowel length on the unstressed antepenult, leading to the present surface pattern of non-contrastive, stress-induced vowel length only in the penult. It would then be a rather natural development for all disyllabic stems, with a stem-initial syllable in penult position, to acquire the long initial vowel tone pattern since this syllable would always have a lengthened vowel. For trisyllabic stems, on the other hand, the stem-initial syllable is in the antepenult, where surface long vowels do not occur. It would then also be a natural development for trisyllabic stems to come to have the short initial vowel tone pattern.

One last question to be answered is why trisyllabic stems which are derived from monosyllabic (CV) stems (like (55e) *n-twányana* 'tiny thing') should fail to undergo local shift. An obvious solution is to posit that monosyllabic stems are also underlyingly bimoraic. This position does, in fact, have support from other Bantu languages. Hyman and Katamba [1990], for example, have argued that monosyllabic stems are bimoraic in LuGanda, and Hyman [personal communication] suggests that in Kinande (confirmed by Mutaka [personal communication]) and in Chaga evidence can also be found that monosyllabic stems are bimoraic. The derivation of the trisyllabic stems derived from monosyllabic stems given in (55e), above, would thus be parallel to that of (55g) given in (68).

The fact that some trisyllabic high stems undergo local shift while others do not is, then, fairly easily accounted for once we ascertain that the non-shifting stems historically (and, I posit, underlyingly) have long initial vowels, while the shifting stems have short initial vowels. The apparent exceptions to Local Spread among trisyllabic stems actually do undergo Local Spread from the first to the second mora of the underlyingly long initial syllable. Assuming that Local Spread applies at a point in the derivation when the underlying vowel length contrast still remains also accounts for the two-way split in Nguni high tone stems and for the fact that short initial vowel stems undergo Final High Deletion. All high-toned stems may have an unassociated high tone underlyingly, as in (59a), above, in this analysis, and none need to be lexically marked to undergo (or not undergo) Local Spread (or Accent Shift/Hop as in Peterson [1989b] or Goldsmith, Peterson, and Drogo [1986]), since this falls out from the underlying vowel length contrast. Finally, not only does this analysis provide a simple, general analysis for Nguni tone patterns, but it also shows that the apparently anomalous two-way split in the high-toned stems, (other) apparent exceptions to local tone spread/shift, and neutralization of (some) disyllabic stems in Nguni actually have clear parallels in other Bantu languages, where similar facts can be accounted for with very similar rules. These relationships were obscured, at best, in previous analyses.

3.3. Other exceptions. There is one class of exceptions to local shift within the (super-)stem in Zululand Zulu and Xhosa (the corresponding data were not available to me for Ndebele) which my analysis cannot account for. Claughton [1983] and Louw [1971] remark for Xhosa, and Khumalo [personal communication] has confirmed for Zulu, that the high tone on an OP fails to shift onto a disyllabic low stem in one context, namely, when the disyllabic stem may be analyzed as an extended (derived) monosyllabic stem. In (71b), below, for example, *-wisa* 'to drop' is transparently derived by adding the causative suffix, *-isa*, to the monosyllabic (CV) root, *-w(a)* to fall' and (71c), *-lwisa* is the causative form of *-lw(a)* 'to fight.' Local Spread also fails to apply to high tones on object prefixes preceding the low CV stems themselves, as shown by (71a). (Remember that final syllables are *not* extratonal for Local Spread in this analysis.) High tones on object prefixes preceding trisyllabic stems derived from the low CV stems do undergo Metrical Spread, however, as shown in (71d):

(71) CV Low Stems + OP's showing no Local Spread (verbs have form: Inf. Prefix (short form)-OP-[root-suffixes]$_{stem}$) [Claughton 1983, Louw 1971]

a. *ku-yí̲-[lwa]*	'to fight it'
b. *ku-yí̲-[w-isa]*	'to drop it'
c. *ku-yí̲-[lw-isa]*	'to help fight it'
d. *ku-yi̲-[lw-ísisa]*	'to help fight it well'

Since there are only a handful of the low CV stems, they may be marked as exceptions to Local Spread in the lexicon. As is predicted if this is a lexical property, the verbs derived from the low CV stems (71b,c) retain this exceptionality marking.

For the sake of completeness, it is necessary to mention that there are a few other exceptions to local shift. For example, high tones linked to certain nominal agreement pre-prefixes do not undergo local shift, although they do undergo metrical shift, as illustrated below:

(72) Exceptions to Local Shift from nominal preprefixes

a. *í:-thanga*	'pumpkin'
b. *í̲-zi-ngululé̲*	'leopards'
but	
c. *i̲:-thang-ány-ana*	'tiny pumpkin'
d. *i̲-zi-tshúdeni*	'students'

The class agreement prefix in (72a,c) is often transcribed with a long vowel, as I have done, so lack of apparent shift in that case may be accounted for in the same way as for the long initial vowel stems. I do not have an explanation for why Local Spread fails from the preprefix in cases like (72b), though. Finally, Local Spread does not apply outside the domain of the super-stem (OP + verb stem) in all verb conjugations, although it applies regularly to subject and object prefixes in the present indicative tense. Since these exceptions are all morphologically conditioned, Local Spread seems to be a lexical rule which applies within certain morphological domains. More research is necessary to determine exactly how the domain of local shift may best be defined. In any case, the fact that there is some evidence that Local Shift is a lexical rule, while Metrical Shift may be argued to be a phrasal (post-lexical) rule (see §1.4., above) is a further argument that Local Shift must be ordered before Metrical Shift [Rubach 1984].

4. Conclusion

In sum, I have argued that Nguni has two tone shift rules: a local rule, which shifts a high tone one syllable to the right, and a metrical rule, which shifts a high tone to the antepenult after that syllable has been assigned metrical prominence. The local rule must apply before the metrical rule, because it may shift high tones which are originally associated with the antepenult to the penult, but it never applies to high tones associated with the antepenult by the metrical spread rule. One advantage of this analysis is that it unifies all the cases of antepenult to penult shift which were treated as separate sets of exceptions to antepenult shift by earlier analyses (Khumalo [1987], Goldsmith, Peterson, and Drogo [1986], Peterson [1989b]). Furthermore, the current two-way split in Nguni high-toned verb stems can be explained if we assume that Local Spread applies to the stems before they lose their underlying (and historically-motivated) vowel length contrast. The underlying vowel length contrast was also shown to account for many apparent exceptions to Local Spread.

Ordering a local tone rule before metrical rules, as in the present analysis, conflicts with a hypothesis (Goldsmith [1982] and Sietsema [1989]) which consigns metrical and non-metrical tonal rules to separate blocks in the grammar, with all metrical rules preceding all non-metrical tonal rules. However, I have argued that allowing non-metrical tone rules to precede metrical rules is not only necessary for Nguni but may be argued for in other Bantu languages, as well. To account for all these cases, our model of phonology must allow non-metrical rules to precede, and even feed, metrical rules in the grammar.

REFERENCES

Bunn, G. and R. Bunn. 1970. "Golin Phonology." *Pacific Linguistics*, Series A, 23:1-7.

Clark, Mary M. 1988. "An accentual analysis of the Zulu noun." In H. van der Hulst and N. Smith (eds.), *Autosegmental Studies on Pitch Accent*, pp. 51-79. Dordrecht: Foris.

Claughton, John S. 1983. *The Tones of Xhosa Inflections.* Communication no. 13, Department of African Languages, Rhodes University, Grahamstown, S. A.

Cope, A. T. 1970. "Zulu tonal morphology." *Journal of African Languages* 9(3):111-152.

Dickens, P. 1984. "Qhalaxari verb tone classes." *African Studies* 43:109-118.

Doke, C. M. 1926. "The phonetics of the Zulu language." *Bantu Studies* 2 (Special Number).

Doke, C. M. 1954. *The Southern Bantu Languages.* London: Oxford University Press for the International African Institute.

Downing, L. J. 1989. "The interaction of tone and intonation in Jita yes/no questions." In E.G. Bokamba (ed.), *Proceedings of the 20th ACAL. Studies in the Linguistic Sciences* 19(2):91-113.

Downing, L. J. 1990. "Problems in Jita tonology." Ph.D. dissertation, University of Illinois.

Goldsmith, J. 1982. "Accent systems." In H. van der Hulst and N. Smith (eds.), *The Structure of Phonological Representations*, Part 1, pp. 47-63. Dordrecht: Foris.

Goldsmith, J. 1984. "Meeussen's Rule." In M. Aronoff and R. T. Oehrle (eds.), *Language Sound Structure*, pp. 245-259. Cambridge, MA: The MIT Press.

Goldsmith, J. 1986. "Tone in the CiRuri present continuous." In K. Bogers, H. van der Hulst, and M. Mous (eds.), *The Phonological Representation of Suprasegmentals*, pp. 95-108. Dordrecht: Foris.

Goldsmith, J. 1987. "Tone and accent and getting the two together." *Proceedings of the Berkeley Linguistics Society* 13.

Goldsmith, J., K. Peterson, and J. Drogo. 1986. "Tone and accent in the Xhosa verbal system." ms., University of Chicago.

Greenberg, J. H. 1948. "The tonal system of Proto-Bantu." *Word* 4:196-208.

Halle, M. and J.-R. Vergnaud. 1987. *An Essay on Stress.* Cambridge, MA: The MIT Press.

Hayes, B. 1980. "A metrical theory of stress rules." Ph.D. dissertation, Massachusetts Institute of Technology.

Hayes, B 1982. "Extrametricality and English stress." *Linguistic Inquiry* 13:227-276.

Hyman, L. and E. R. 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 Publications.

Hyman, L. and R. G. Schuh. 1974. "Universals of tone rules: evidence from West Africa." *Linguistic Inquiry* 5:81-115.

Katamba, F. X. and L. Hyman. 1990. "Final vowel shortening in LuGanda." *Studies in African Linguistics* 21:1-59.

Kenstowicz, M. and C. Kisseberth. 1990. "Chizigula tonology—the word and beyond." In D. Zec and S. Inkelas (eds.), *Proceedings of the Stanford Conference on the Syntax-Phonology Interface*, pp. 163-194.

Khumalo, James S. M. 1987. "An autosegmental account of Zulu phonology." Ph.D. dissertation, University of the Witwatersrand, R. S. A.

Kiparsky, P. 1985. "Some consequences of Lexical Phonology." *Phonology Yearbook* 2:83-136.

Kisseberth, C. W. 1984. "Digo tonology." In G. N. Clements and J. Goldsmith (eds.), *Autosegmental Studies in Bantu Tone*, pp. 105-182. Dordrecht: Foris Publications.

Kisseberth, C. W. and S. Mmusi. 1989. "The tonology of the object prefix in Setswana." Paper presented at the 20th Annual Conference on African Linguistics, University of Illinois at Urbana-Champaign.

Lanham, L. W. 1958. "The tonemes of Xhosa." *African Studies* 17(2):65-81.

Laughren, M. 1984. "Tone in Zulu nouns." In G. N. Clements and J. Goldsmith (eds.), *Autosegmental Studies in Bantu Tone*, pp. 183-234. Dordrecht: Foris Publications.

Leben, W. 1973. "Suprasegmental phonology." Ph.D. dissertation, Massachusetts Institute of Technology. [Published, New York: Garland, 1979.]

Levergood, B. 1984. "Rule-governed vowel harmony and the strict cycle." *NELS* 14:275-293.

Lieber, R. 1987. *An Integrated Theory of Autosegmental Processes.* (SUNY Series in Linguistics.) Albany, NY: SUNY Press.

Louw, J. A. 1971. "The tonal paradigm of the verb in Xhosa." In V. Six et al (eds.), *Afrikanische Sprachen und Kulturen: ein Querschnitt.* Hamburger Beiträge zur Afrika-Kunde, 14. Hamburg: Deutsches Institut für Afrikaforschung.

Louw, J. A. 1983. "Some tone rules of Tsonga." *Afrika und Übersee* 46:13-24.

Meeussen, A. E. 1955. "Tonunterschiede als Reflexe von Quantitäts-unterschieden im Shambala." In J. Lukas (ed.), *Afrikanistische Studien*, pp. 154-156. Berlin: Akademie Verlag.

Myers, S. P. 1987. "Tone and the structure of words in Shona." Ph.D. dissertation, University of Massachusetts-Amherst.

Nicholson, R. and R. Nicholson. 1962. "Fore phonemes and their interpretation." *Oceania Linguistic Monographs* No. 6, pp. 128-148. Studies in New Guinea Linguistics.

Nurse, D. 1979. "Description of sample Bantu languages of Tanzania." *African Languages* 5(1):iv-150.

Peterson, K. 1987. "Accent in the Chichewa verb." In A. Bosch, B. Need, and E. Schiller (eds.), *23rd Annual Regional Meeting of the Chicago Linguistics Society, Part 2: Parasession on Autosegmental and Metrical phonology*, pp. 210-222. Chicago: Chicago Linguistics Society.

Peterson, K. 1989a. "Review of 'Local and Metrical Tone Shift in Zulu and Xhosa'." Ms., University of Chicago.

Peterson, K. 1989b. "A comparative look at Nguni verbal tone." In I. Haik and L. Tuller (eds.), *Current Approaches to African Linguistics*, vol. 6, pp. 115-137. Dordrecht: Foris Publications.

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

Rubach, J. 1984. *Cyclic and Lexical Phonology: The Structure of Polish.* Dordrecht: Foris Publications.

Rycroft, D. K. 1963. "Tone in Zulu nouns." *African Language Studies* 4:43-68.

Rycroft, D. K. 1979. "Tonal formulae for Nguni." *Limi* 7:5-44.

Rycroft, D. K. 1980a. "Nguni tonal typology and Common Bantu." *African Language Studies* 17:33-76.

Rycroft, D. K. 1980b. "Ndebele and Zulu: some phonetic and tonal comparisons." *Zambezia* 7(2):109-128.

Rycroft, D. K. 1983. "Tone patterns in Zimbabwean Ndebele." *Bulletin of the School of Oriental and African Studies* 46(1):77-135.

Schadeberg, T. C. 1979. "Über die Töne der verbalen Formen im Rimi." *Afrika und Übersee* 42:288-313.

Sietsema, B. M. 1989. "Metrical Dependencies in Tone Assignment." Ph.D. dissertation, Massachusetts Institute of Technology.

Stevick, E. W. 1969. "Tone in Bantu." *IJAL* 35(4):330-341.

Westphal, E. 1951. "The tone of verb stems in Xhosa." *African Studies* 10(3):107-112.

Westphal, E. and M. Notschweleka. 1967. *Tonal Profiles of Xhosa Nominals and Verbo-Nominals.* Communications from the School of African Studies, Series 32.

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CONTEXTUAL LABIALIZATION IN NAWURI*

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A spectrographic investigation into the non-contrastive labialization of consonants before round vowels in Nawuri (a Kwa language of Ghana) supports the notion that this labialization is the result of a phonological, feature-spreading rule and not simply an automatic transitional process. This assumption is further warranted in that it allows for a more natural treatment of some other phonological processes in the language. The fact that labialization before round vowels is generally not very audible is explained in terms of a principle of speech perception. A final topic addressed is the question of why (both in Nawuri and apparently in a number of other Ghanaian languages as well) contextual labialization does tend to be more perceptible in certain restricted environments.

0. Introduction

This paper deals with the allophonic labialization of consonants before round vowels in Nawuri, a Kwa language of Ghana.[1] While such labialization is generally not very audible, spectrographic evidence suggests that it is strongly present,

* The spectrograms in this study were produced at the phonetics lab of the University of Texas at Arlington using equipment provided through a grant of the Permanent University Fund of the University of Texas system. I would like to thank the following people for their valuable comments and suggestions: Joan Baart, Don Burquest, Mike Cahill, Jerry Edmondson, Norris McKinney, Bob Mugele, Tony Naden, and Keith Snider. I would also like to express my appreciation to Russell Schuh and an anonymous referee for this journal for their helpful criticism of an earlier version, and to Mary Steele for some helpful discussion concerning labialization in Konkomba. Any shortcomings in the present paper are my own responsibility. I am grateful to the people of the village of Kitare in the Northern Region of Ghana for their hospitality during the time (December 1985 to April 1988) when the fieldwork behind this paper was being conducted. A special vote of thanks is due to Chris Okumtey-Oklas of Kitare, who provided most of the data on which this study is based.

[1]This study is based on the dialect of Nawuri spoken in the village of Kitare. Snider [1989c] includes Nawuri in his Oti Guang branch of the North Guang sub-group of Guang. Guang is itself part of the Tano family, which falls within Stewart's [1989] (New) Kwa.

and indeed that consonants which occur before round vowels may surface phonetically with a degree of lip-rounding comparable to that of the contrastively labialized consonants which occur in the language before non-round vowels. On the basis of this evidence, I propose that contextual labialization in Nawuri should be accounted for with a phonological rule that assigns a [+round] feature specification to consonants occurring before round vowels, rather than treated as a purely low-level transitional process. This analysis is further supported in that it allows for a plausible explanation of some phonetically labialized consonsnts that arise in connection with two other phonological processes occurring in the language.

After discussing my phonological analysis and its implications, I turn to the question of why allophonic lip-rounding, though physically present to a significant degree, is rarely very audible, a question made more interesting by the facts that (1) the environments in which contextual labialization does tend to be somewhat more perceptible are not the kinds of environments in which we might expect (through a consideration of purely articulatory factors) greater lip-rounding and that (2) contextual labialization in a number of other Ghanaian languages is also reported to occur more readily or more strongly in these same kinds of environments.

1. Background

There is surface contrast in Nawuri between the labialized consonants *kʷ*, *čʷ*, *sʷ*, *bʷ*, *pʷ*, *fʷ*, and *mʷ*,[2] and the non-labialized consonants *k*, *č*, *s*, *b*, *p*, *f*, and *m*, as exemplified in (1). In presenting data throughout this paper I omit certain phonetic details irrelevant to the main issues. A fuller description of Nawuri phonology is found in Casali [1988].

(1)

	labialized		non-labialized	
a.	*kʷɩ:*	'to differ'	*kɩ:*	'to look'
b.	*gada:čʷɛ:*	'gecko'	*čɛ:gɩ*	'to change'
c.	*sʷa:*	'to be wounded'	*sa:*	'to draw water'
d.	*bʷɩ:*	'to wither'	*bɩ:*	'to sing'
e.	*pɷpʷɛ:*	'new'	*pɩpɛ:*	'red'
f.	*fʷa:la*	'to greet'	*fa:ra:*	'to start'
g.	*gɩlamʷɛ:*	'tiger nut'	*gɩmɛ:*	'duck'

[2]Contrast between [*č*] and [*čʷ*] and between [*m*] and [*mʷ*] is marginal. In a wordlist of about 1500 items, the forms in (1b) and (1g) are the only examples I have of [*čʷ*] or [*mʷ*] before non-round vowels.

All of these examples show contrast before a following non-round vowel, and this is in fact the only environment in which labialized and non-labialized consonants contrast in Nawuri.[3] Whatever (allophonic) labialization exists on consonants occurring before round vowels is usually not very audible; moreover, native speakers do not appear to distinguish these consonants from ordinary non-labialized consonants,[4] e.g. they identify the *s* of *sɔ:* 'to buy' with the non-labialized *s* of *sa:* 'to draw water' and not with the labialized s^w of *s^wa:* 'to be wounded'. Despite the fact that such labialization is not easy to hear, however, spectrographic evidence (presented below) indicates that consonants occurring before round vowels in Nawuri may actually bear a significant degree of lip-rounding.

2. Phonological and Phonetic Rules

Many current approaches to phonology assume a distinction between *phonological* rules, which fill in or alter the values of binary features, and *phonetic* implementation rules, which convert the representations resulting from the application of the phonological rules into more detailed representations in which scalar (multi-valued) features may appear in place of binary ones. In recent years much attention has been focused on the factors which determine whether a rule is phonological or phonetic (cf. Kiparsky [1985], Mohanan [1986], Pulleyblank [1986]). While a clear consensus has yet to emerge, processes that operate in gradient fashion are typically regarded as phonetic, especially where they involve universal tendencies that are directly attributable to the mechanics of speech production, e.g. the tendency for any vowel to have at least a slight degree of nasalization when adjacent to a nasal consonant. On the other hand, processes that operate categorically to change one contrastive segment into another, e.g. a "morphophonemic" process that lowers *i* to *e* in a language in which these two vowels contrast, are generally assumed to be phonological.

Since the labialization of consonants before round vowels in Nawuri is not very audible and since a certain amount of anticipatory rounding before round vowels is almost certainly inevitable in any language, it would be natural to assume that contextual labialization in Nawuri is simply an automatic transitional process that

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[3]In a study of the Kpandai dialect of Nawuri, which differs in certain respects from the Kitare dialect described in this paper, Sherwood [1982] recognizes a contrast between labialized and non-labialized consonants before round vowels as well as non-round vowels, citing minimal pairs such as [*bo*] 'to be', [*b^wo*] 'to swear' (both with falling tone). I agree with Sherwood that these two forms are in fact phonetically different; I disagree, however, that the principle phonetic contrast resides in the labialization of the initial consonants, and would transcribe these words (in both the Kpandai and Kitare dialects) as [*bɷ*] ('to be') and [*bɔ*] ('to swear').

[4]In observing the writing practices of native speakers (including those with no prior instruction in writing Nawuri words), for example, I have not found anyone to use anything other than an ordinary (non-labialized) consonant symbol to represent consonants occurring before round vowels, although they virtually always employ some additional symbol, e.g. a *w* or round back vowel, to indicate labialization before non-round vowels.

results in a slight degree of anticipatory rounding on a consonant preceding a round vowel. It would then be appropriate to account for this labialization with a phonetic rather than a phonological rule. There is good reason, however, to believe that the contextual labialization of consonants in Nawuri is actually something more than a phonetic transitional process. Spectrographic evidence presented in the next section implies that consonants occurring before round vowels may surface with just as much lip-rounding as their contrastively labialized counterparts that occur before non-round vowels, i.e. the process does not appear to be gradient. This argues that contextual labialization in Nawuri should be treated as a phonological rule spreading the feature [+round] to consonants before round vowels, rather than as a purely phonetic phenomenon.

3. Evidence of Labialization

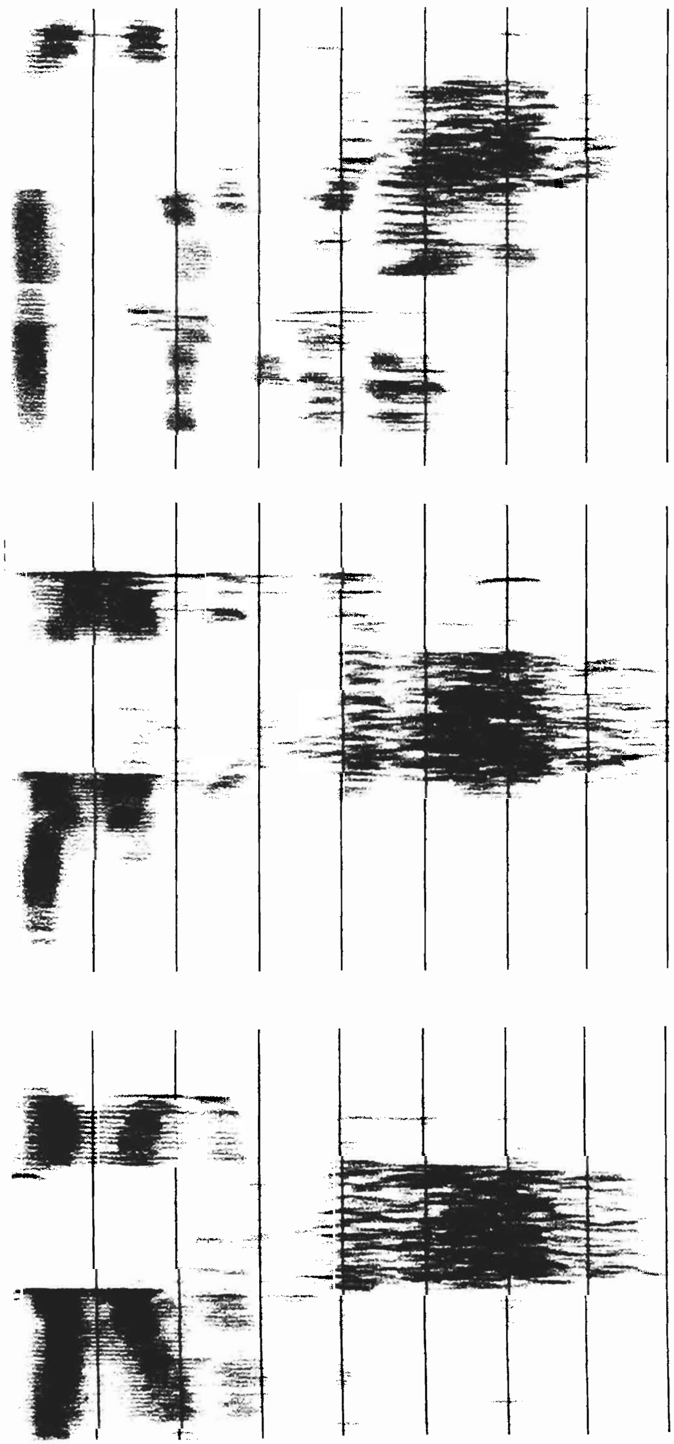
This study of Nawuri labialization is based on the spectrographic analysis of tape recordings of Nawuri speech which I made in Ghana during a three year period from 1985-1988. Most of the analysis was carried out at the phonetics laboratory of the University of Texas at Arlington during the period from January to May 1989. In investigating anticipatory labialization before round vowels, I chose to focus on the consonants *k* and *s*, both of which have contrastively labialized counterparts to which they may be compared. Also, since neither of these segments involves lip closure as a primary feature, the lips should have complete freedom to round during the production of the consonant itself in anticipation of a following round vowel. If there is a significant degree of assimilatory labialization in Nawuri, therefore, these two consonants should be likely candidates to undergo it.

3.1. Labialization of *s*. Spectrograms showing non-labialized *s* before non-round vowels appear in (2).

(2) See Figure 2

In all three examples, the spectral energy of *s* has its heaviest concentration somewhere between about 5500 and 6500 hz. Below about 4000 hz, there is only relatively weak energy. These may be compared with the examples showing clearly labialized s^w before non-round vowels in (3), all of which have their strongest energy concentration in a much lower frequency zone around 4000 hz.

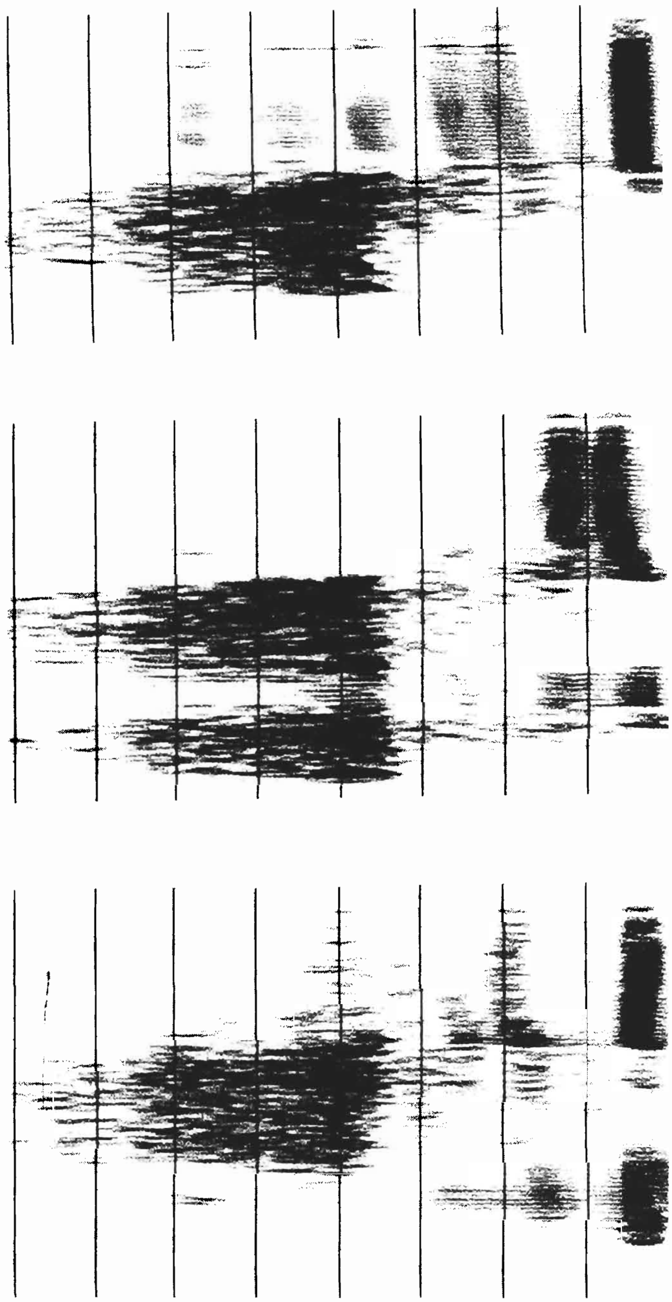
(3) See Figure 3



(2a) asiiri 'secret'

(2b) asɪŋ 'controversy'

(2c) gasɪ 'ground'



(3a) ns^{w}ɩɩ 'long'

(3b) sɔs^{w}aa 'to grease'

(3c) s^{w}ɩɩ 'to sip'

The lower spectral energy peak evident in these spectrograms of s^w is exactly the effect which would be expected to result from a superimposed lip-rounding (cf. Pickett [1980:159]). A lowering of spectral energy might also be achieved by a movement of the tongue body toward the velar position. My impression is that s^w is not appreciably velarized in Nawuri however.

Looking now at the spectrograms in Figure (4), which show *s* before round vowels, it is immediately apparent that these display the same energy concentration in the vicinity of 4000 hz which is characteristic of the spectrograms showing s^w before non-round vowels in (3).

(4) See Figure 4

A particularly interesting example is found in (3b): the single word *sɷsʷa:* contains both a clearly labialized s^w before a non-round vowel and an underlyingly non-labialized *s* before a round vowel. The resemblance between the two segments is striking; indeed there is nothing in their spectrograms which would indicate that they are qualitatively different. On the basis of this evidence, I conclude that the consonant *s* bears significant labialization before round vowels.

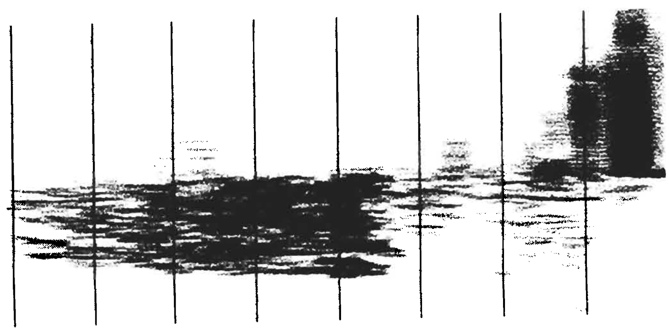
3.2. Labialization of *k*. Since, in contrast to *s*, no spectral energy is visible during the actual articulation (closure portion) of *k* itself, the contextual labialization of this consonant was investigated indirectly using other sources of evidence. The first source of evidence involves spectrograms of utterances in which *k* appeared in a V__ V frame. My assumption was that while the coarticulatory effects of a round vowel on a preceding *k* would not be directly visible in the spectrogram of the *k* itself, these effects could extend as far back as the preceding vowel, in which case they would be visible in the spectrogram of that vowel. This is basically the technique used by Öhman [1966].

Figure (5) shows spectrograms of examples in which the second vowel in a V*k*V (or V##*k*V) sequence is back and round.

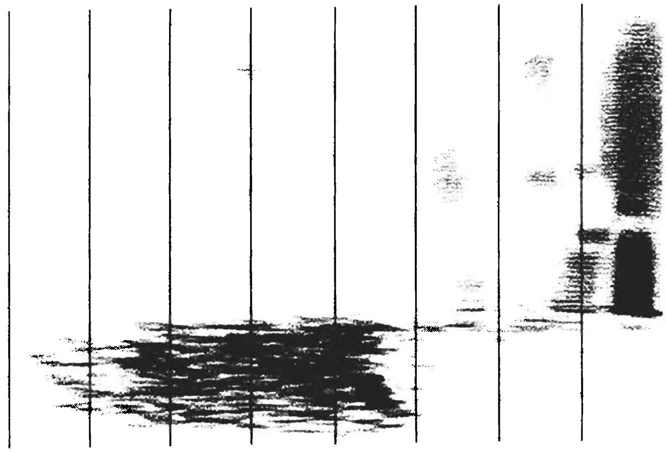
(5) See Figure 5

The relevant characteristic is the second formant trajectory of the vowel immediately preceding *k*: in every case, F_2 is noticeably lower toward the end of this vowel than at the beginning. These spectrograms may be contrasted with those in (6), showing V*k*V sequences in which *k* is followed by a non-round vowel.

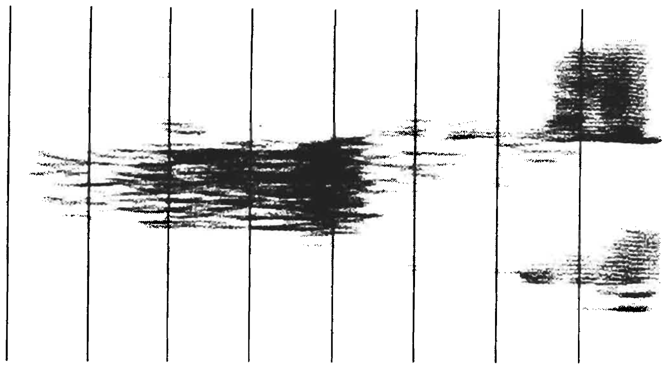
(6) See Figure 6



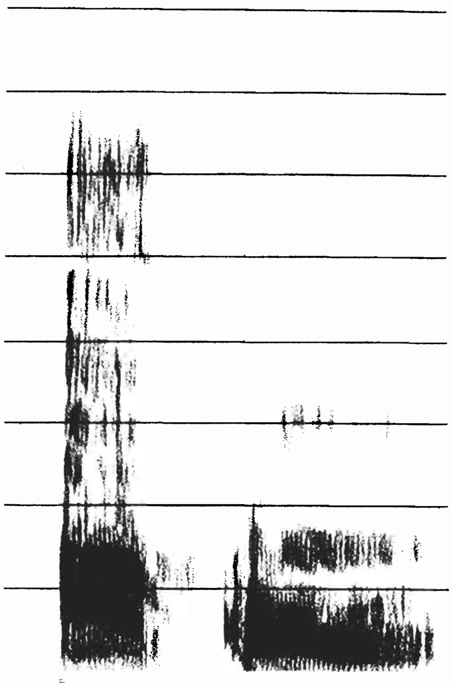
(4a) sɔ 'to have'



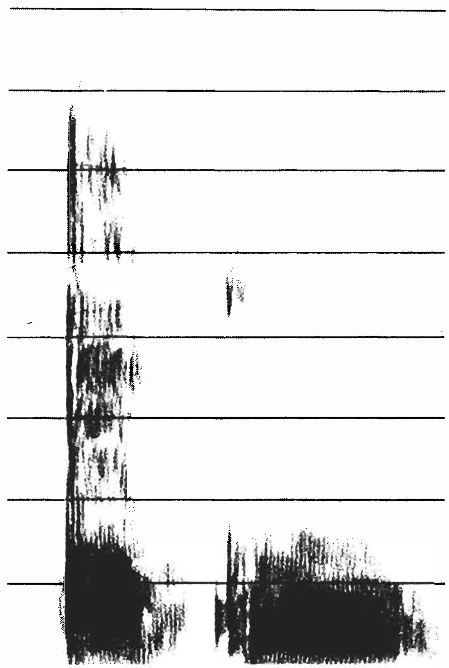
(4b) soomu 'bucket'



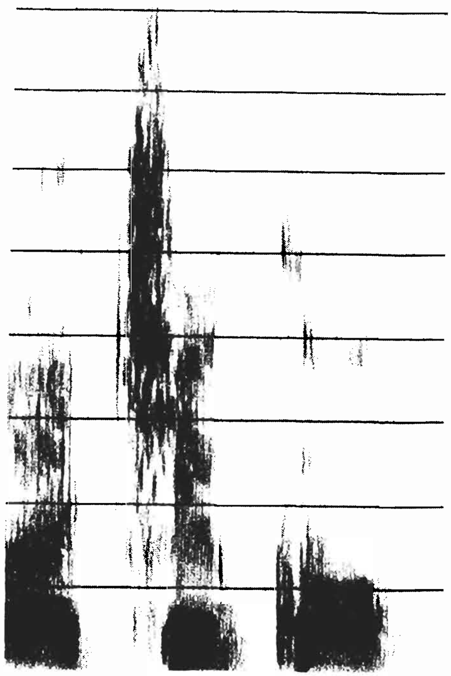
(4c) nsɔ 'ash'



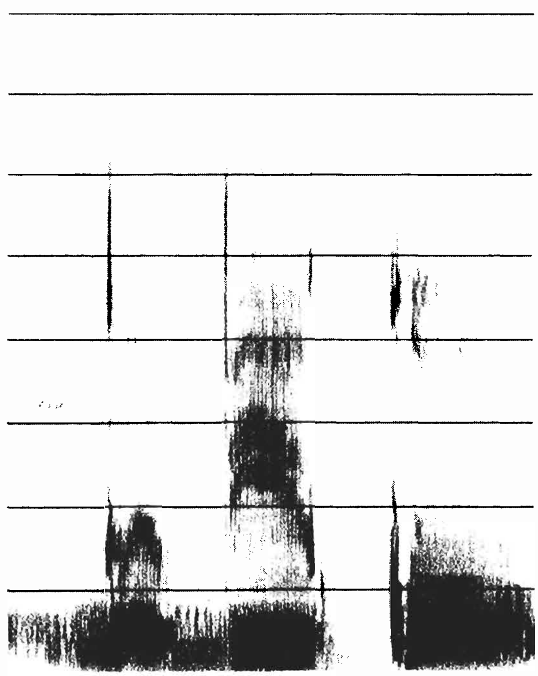
(5a) akɷŋ 'hunger'



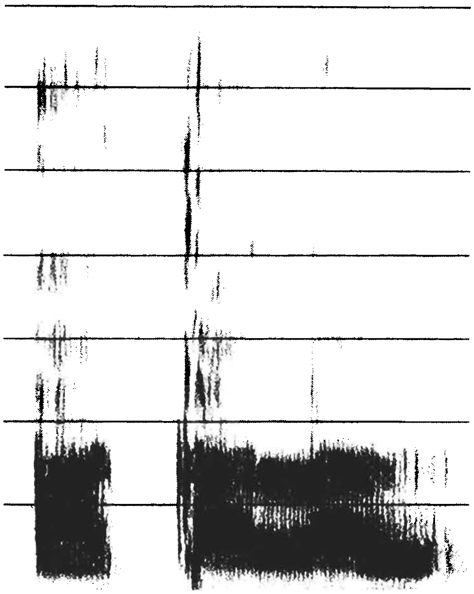
(5b) akoo 'parrot'



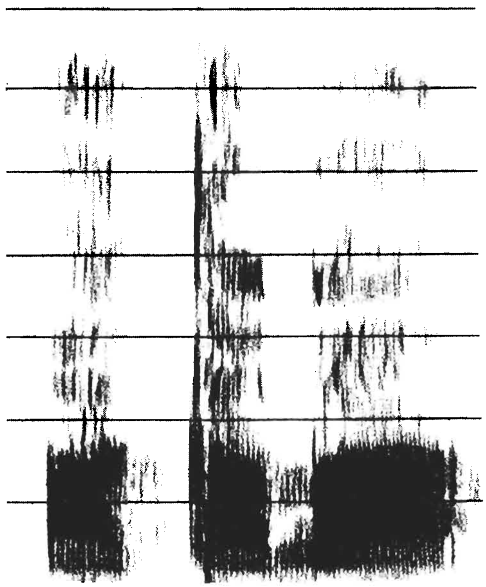
(5c) ɔčɩɩ kɷɷ 'some woman'



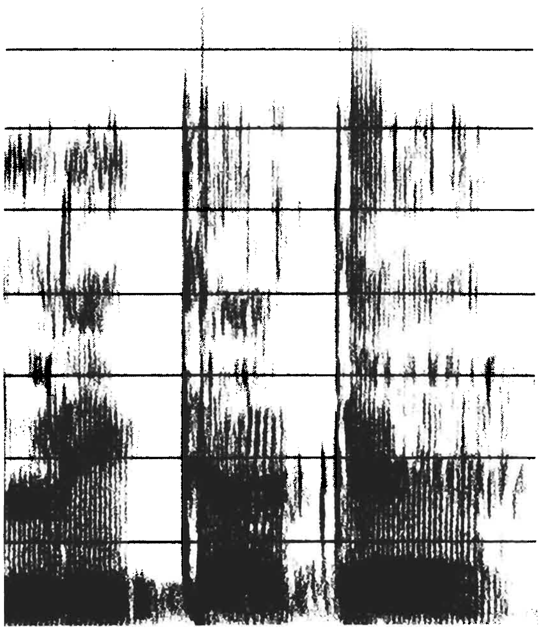
(5d) gebii kɷɷ 'some child'



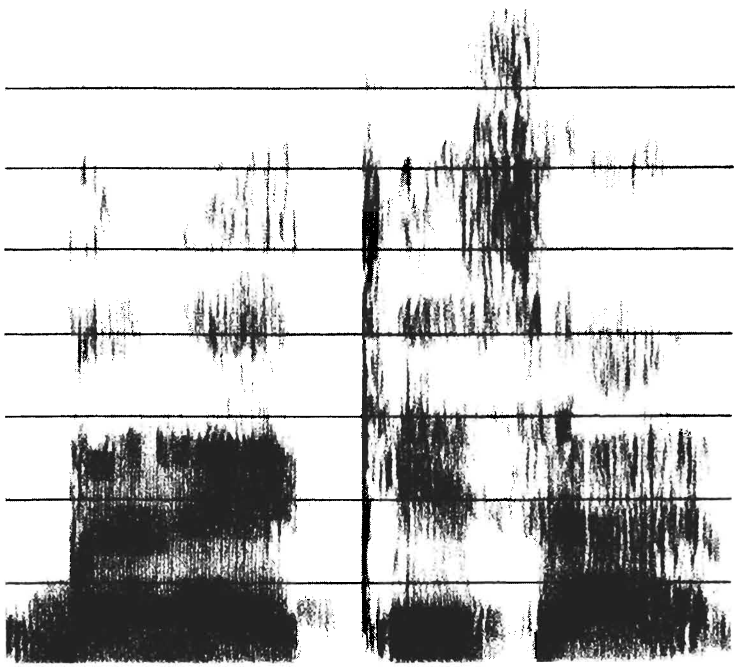
(6a) akalaŋ 'crocodile'



(6b) akaba 'skin disease'



(6c) lɩɩkaakɛ 'following day'



(6d) gbaŋɛɛ kɩɩsa 'a horse to care for'

In every one of the examples in (6), the second formant of the vowel preceding *k* is either level or rising.

A falling second formant trajectory in a vowel preceding a *k*-plus-back-round-vowel sequence could be attributed either to an anticipatory backing of the tongue body, an anticipatory lip-rounding, or both. Since the vowel following *k* is both back and round, a likely possibility is that both types of anticipation are involved.[5] Clearly, whatever anticipatory lip-rounding extends to the first vowel in a V*k*V sequence must also be present during the articulation of the *k* which intervenes between this vowel and the following round vowel that is being anticipated. Hence, there is indirect evidence of anticipatory lip-rounding during the production of the consonant *k* in the V*k*V sequences in (5).

A second source of evidence for the labialization of *k* before round vowels comes from the spectral characteristics of the burst that follows the release of this consonant. Where significant lip-rounding is present, we should expect the most intense spectral energy of the burst to occur at lower frequencies than where no lip-rounding is present. In each of the spectrograms in (5) (in which *k* is followed by a round vowel), a strong concentration of energy below 1000 hz is visible in the burst following the release of *k*. In none of the spectrograms in (6) (in which *k* is followed by a non-round vowel), on the other hand, does the spectral energy in the burst following *k* show a maximum intensity in such a low frequency zone.

More precise measurements of the spectral characteristics of the release bursts of various instances of *k* were made using the CECIL (Computerized Extraction of Components of Intonation in Language) and SPECTRUM software programs included in the Speech Analysis System produced by the Summer Institute of Linguistics. The frequency at which the maximum spectral energy of the burst ("burst frequency") occurred was measured for four instances of k^w before a non-round vowel and five instances of *k* before a round vowel.[6] The results of these

[5]In his study of coarticulation in VCV utterances in Swedish and English, Öhman [1966] concluded that where the second formant of the first vowel in a VCV sequence was lowered in anticipation of the vowel in the following syllable, most of the lowering was due to tongue movement rather than anticipatory lip-rounding. This does not mean, however, that lip-rounding was not involved, but only that its effect on F_2 was not as significant as that of the tongue: "naturally, the labial gesture will have some influence, but the lingual factor dominates" [Öhman 1966:163].

[6]The measurements were made in the following manner. First, digitized representations of tape recorded utterances were produced using the CECIL program at a sampling rate of 19500 hz. The same program was then used to extract, as nearly as possible, a portion consisting of just the releast burst and aspiration of the relevant *k* consonant in each utterance. This extracted portion was stored as a floppy disk file, which was later accessed by the SPECTRUM program to produce a two-dimensional spectral display like the one below for the word *kɷma:* 'all' (horizontal axis = frequency in hz, vertical axis = intensity (relative scale)). In every case, the spectrum was taken at a point as close to the beginning of the burst-plus-aspiration segment as possible.

measurements are shown in (7a) and (7b) respectively (the consonant to which each measurement refers is underlined).[7]

(7)	word	gloss	burst frequency (hz) of *k*/k^w
a.	*k^wɩ:*	'to differ'	620
	kɷk^wɩ:	'different'	730
	k^wa:ta:	'tortoise'	570
	k^waya:	'soap'	460
b.	*kɔ*	'to fight'	760
	kodu:[8]	'banana'	700
	kɷk^wɩ:	'different	590
	kɷma:	'all'	540
	kuŋ	'to cover'	430

The burst frequencies in (7b) compare quite closely to those in (7a). This result is consistent with the assumption that *k*'s occurring before round vowels possess a

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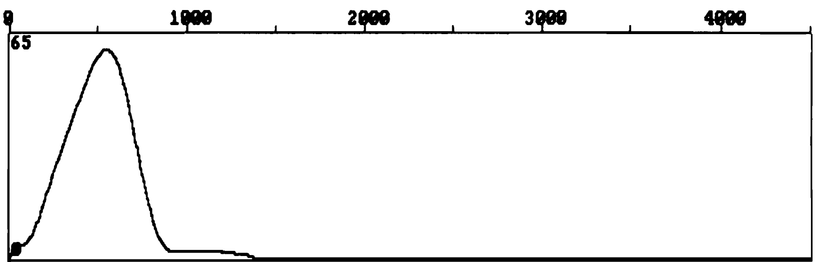


Frequency spectrum 0.003secs from start of utterance

Since the current version of SPECTRUM does not provide an actual numeric value for the frequency at which an intensity peak occurs, it was necessary to estimate this by making measurements with a ruler on a paper printout of the spectral display and using the ratio:

$$\frac{\text{peak frequency (hz)}}{\text{horizontal distance in cm from 0 to peak}} = \frac{\text{1000 (hz)}}{\text{horizontal distance in cm from 0 to 1000 hz}}$$

[7]The words on which the measurements were made were all taken from a tape recording of a list of words recited by an adult male Nawuri speaker. The four words in (7a) represent the only instances of /k^w/ which occur in the word list. The five words in (7b) were chosen more or less at random (although care was taken to include examples involving *k* before each of the four round vowels in the language) from among the (many) words in the list which have an initial *k* preceding a round vowel. The same token of the word *kɷk^wɩ:* 'different' was used for the measurements in both (7a) and (7b).

[8]The word *kodu:* 'banana' is borrowed from Twi.

degree of lip-rounding similar to that of the clearly labialized *k*ʷ's which occur before non-round vowels. If, on the other hand, contextual labialization were simply a gradient transitional process producing a slight degree of lip-rounding, we might have expected to find that the burst frequencies of *k*'s before round vowels were not as low as the burst frequencies of contrastively labialized *k*ʷ's that occur before non-round vowels.[9]

3.3. Summary. The spectrographic evidence presented in this section suggests that consonants occurring before round vowels in Nawuri may surface with a significant degree of anticipatory labialization. There is no indication that this labialization process is in any way gradient. Rather, it would appear that the contextual labialization of *s* or *k* before a round vowel produces a degree of lip-rounding comparable to that of the contrastively labialized *s*ʷ's and *k*ʷ's which occur before non-round vowels. This argues that contextual labialization in Nawuri should be treated as the result of a phonological rule assigning the feature specification [+round] to consonants occurring before round vowels rather than as a purely phonetic process assigning an intermediate degree of roundness to consonants in this environment. In the following two sections I briefly outline an analysis incorporating such a rule and show how this analysis can shed light on the treatment of two other phonological processes in Nawuri.

4. Sources of Labialized Consonants: Basic Analysis

A complete analysis of labialization in Nawuri must account for both the labialized consonants which contrast with non-labialized consonants before non-round vowels, as in (1), and the contextually labialized consonants which occur before round vowels. This paper is primarily concerned with the latter. For our present purposes, I simply assume that the seven labialized consonants which occur contrastively before non-round vowels are derived form underlying labialized conso-

[9]This would seem to be the case in English, for example. The burst frequency measurements below were made (in exactly the same manner as the measurements in (7)) from the speech of a male speaker of American English:

word	burst frequency (hz) of *k*/*k*ʷ
question	590
query	950
quail	780
caught	1200
cool	1000
coat	1300

The burst frequencies of the English *k*'s occurring before round vowels (bottom group) are not as low as those of the contrastively labialized English *k*ʷ's, nor are they as low as the burst frequencies of the contextually labialized Nawuri *k*'s in (7b).

nant phonemes which differ from their non-labialized counterparts only in that they are positively specified for the feature [round]. These seven underlying [+round] consonants are listed in (8):

(8) k^w $\check{c}^w$ s^w b^w p^w f^w m^w

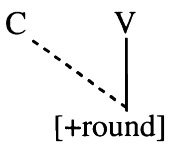
Under this analysis, the underlying form of a word like [k^wɩ:] 'to differ' (cf. (1a)) will simply be /k^wɩ:/, where /k^w/ is identical to /*k*/ in all its feature specifications except that it is [+round].

In addition to these seven labialized consonant phonemes, Nawuri has a total of twenty-one other consonant phonemes, as listed in (9). (The phonemic status of *r* is open to doubt, as [*r*] is very nearly in complementary distribution with [*d*]. An additional phoneme /*h*/ occurs in a few loan words; it may be regarded as extrasystemic.)

(9)	labials:	*p, b, f, m, w*
	alveolars:	*t, d, s, l, r, n*
	(alveo-)palatals:	*č, j, ɲ, y*
	velars:	*k, g, ŋ*
	labio-velars:	*kp, gb, ŋm*

With the exception of *w*, none of these consonants is underlyingly [+round]. Before round vowels, i.e. *u, ʊ, o, ɔ*, they will become [+round] through the application of a phonological rule:

(10) **Labialization**



Rule (10) will apply to all the consonants in (9), both those which have underlyingly labialized counterparts (*k, č, s, b, p, f, m*), and those which do not. Admittedly, nothing we have seen so far requires this assumption; since direct spectrographic evidence of contextual labialization has been obtained only in the case of the consonants *s* and *k*, both of which have underlyingly labialized counterparts, a plausible alternative assumption would be that only the seven consonants with contrastively labialized counterparts become [+round] before round vowels. Motivation for the claim that *all* consonants become [+round] before round vowels will be given in §5, where I show how this assumption allows for a simple and natural treatment of other aspects of Nawuri phonology.

Since the labialization brought about by rule (10) is entirely predictable, I will generally not indicate it explicitly in my phonetic transcriptions. Only before non-round vowels will labialization be directly indicated (with the familiar superscript *w*). This will also serve as a reminder that it is only before non-round vowels that labialized consonants are cleary audible. This notational practice should not, however, be allowed to obscure the claim inherent in rule (10) that all consonants before round vowels are in fact phonetically [+round].

5. Labialization and other Phonological Processes

In this section I show how positing a general phonological rule that labializes consonants before round vowels allows for a simpler and more explanatory treatment of two other phonological processes in Nawuri: a vowel fronting process which applies in fast speech to convert a back round vowel to a front non-round vowel before the consonant *y* and a vowel elision process which applies when clusters of non-identical vowels arise across word boundaries. These are discussed in §§5.1 and 5.2 respectively. In §5.3, I consider (and reject) some alternative ways in which these processes might be analyzed *without* relying on a general labialization rule applying to all consonants occurring before round vowels.

5.1. Labialization and Vowel Fronting. In fast speech, underlying back vowels which occur before the consonant *y* frequently surface phonetically as front non-round vowels.[10] This is illustrated in (11). Note that if the fronted vowel is underlyingly round, as in (11c-e), the preceding consonant surfaces phonetically with clearly audible labialization.

(11) a. *kuruma yɛ gbaŋɛ:* → *kurumɛ yɛ gbaŋɛ:* 'a donkey and a horse'

b. *sa ya:* → *sɛ ya:* 'give (something) to Yaa'

c. *ge-lu: yɛ lewu* → *gel^{w}i: yɛ lewu* 'war and death'

---

[10]The fronting and unrounding of a word-final back round vowel may also take place before a word-initial front vowel, e.g. */du: ijo/* 'plant yams' → [*d^{w}i: ijo*]. (Only long vowels ever exhibit fronting in this environment, since word-final *short* vowels regularly undergo elision before a following word-initial vowel. See §5.2 for more discussion.) To facilitate the discussion, I choose to ignore this additional data and focus only on cases involving fronting before the consonant *y*. Nothing of importance is affected by this.

d. *kotoku yɛ čɛmɩsɩ* → *kotokʷi yɛ čɛmɩsɩ* 'a sack and a headpan'

e. *gɷ-tɔ yu:ri-sa* → *gɷtʷɛ yu:ri-sa* 'something stolen'

I assume that the fronting (and unrounding) of the word-final vowels in these examples is accomplished by a rule whose precise formalization need not concern us; it then remains to account for the labialization which surfaces on the consonants in (11c-e). Under the present assumption that all consonants are labialized before round vowels in Nawuri, the explanation for this labialization is straightforward: the consonants become [+round] by rule (10), prior to the operation of the vowel fronting rule. This is illustrated in the derivation of (11e) shown below:

(12) Underlying Form: /gɷtɔ yu:risa/

Labialization (10): *gɷtʷɔ yu:risa*

Vowel Fronting: *gɷtʷɛ yu:risa*

Note that in this analysis the labialization of the consonant *t* in *gɷtɔ* is independent of the fronting of the following vowel; even where the fronting process is inapplicable (as when the word *gɷtɔ* is pronounced in isolation or before a word beginning in a consonant other than *y*), rule (10) predicts that this consonant will be phonetically [+round]. The fact that this labialization is generally not very audible need not be considered a serious problem for this analysis, since we have already seen spectrographic evidence that consonants may bear a significant degree of labialization before round vowels even where such labialization is not very perceptible.

5.2. Labialization and Vowel Elision. There is a general rule in Nawuri which converts a sequence of two short non-identical vowels arising across a word boundary to a single lengthened vowel which, in the simplest case, is identical to the *rightmost* of the two original vowels:[11]

(13) a. *na:tɩ ɔ-pɩ:* → *na:tɔ:pɩ:* 'a cow's tail'

b. *gi-bite o-bu* → *gibito:bu* 'a girl's room'

c. *kɷntɩ asɩ* → *kɷnta:sɩ* 'near the elephant'

[11]A fuller treatment of the processes which may affect sequences of vowels arising across word boundaries in Nawuri is given in Casali [1988]. Analyses of similar (though not entirely identical) vowel sandhi processes in the closely related language Chumburung are given in Snider [1985, 1989b].

When the first vowel is round and the second vowel is non-round, not only is the underlying vowel sequence converted to a single lengthened vowel, but the consonant preceding this vowel surfaces with clearly audible labialization:

(14) a.	*fʊ ɩ-pʊ*	→	*fʷɩ:pʊ*	'your soup'
b.	*sʊ ɩ-ca:sɩ*	→	*sʷɩ:ca:sɩ*	'to have fowls'
c.	*gu-du a-sa*	→	*gudʷa:sa*	'thirteen'

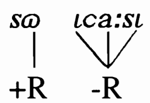
When *both* vowels are round, whatever labialization is present on the consonant preceding the underlying word-final round vowel is not very audible phonetically. In contrast to (14b), for example, the phrase *sʊ ɔkʊlɩ:* 'to have a boat', surfaces as *sɔ:kʊlɩ:*, without clearly perceptible labialization on the initial *s*. Nevertheless, in keeping with the spectrographic evidence of §3, I assume that this consonant is in fact phonetically labialized.

As with the vowel fronting data in the previous section, the treatment of the examples in (14) is straightforward, given the inclusion of the labialization rule (10) in the grammar of Nawuri. Assuming that the data in (13) are accounted for by a rule which deletes the first in a sequence of two adjacent vowels, with compensatory lengthening of the remaining vowel, the data in (14) will be accounted for automatically as a result of the interaction of this rule with the labialization rule (10). This is illustrated in the derivation of (14b) below:

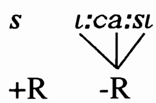
(15)	Underlying Form:	*/sʊ ɩca:sɩ/*
	Labialization (10):	*sʷʊ ɩca:sɩ*
	Vowel Elision:	*sʷ ɩ:ca:sɩ*

5.3. Alternative analyses. I have shown how the assumption that Nawuri has a phonological rule assigning the feature specification [+round] to all consonants before round vowels allows for a straightforward and natural treatment of some data related to two other processes in the language. The rules used in this analysis are both independently motivated and phonologically natural. In the present section, I consider two alternative analyses which might be advanced to account for the same data without positing a general labialization rule such as (10). It will be shown that both of these analyses are inadequate in some respect.

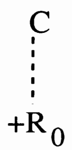
The first analysis makes crucial use of the assumption that the feature [round] appears on its own autosegmental tier, separate from the other features which comprise the segmental feature matrices. Given this assumption, the initial representation (prior to the application of the vowel elision rule) of (14b) might be as in (16). (Here +R is used to represent a [+round] autosegment, -R a [-round] autosegment. The symbol *ɷ* in (16) should now be understood as standing for the set of features [+high], [-low], [+back], [-ATR], i.e., for all the usual features of *ɷ* *except* the feature [+round], which does not appear together with the other features since it is represented autosegmentally. Similarly, *ι* now represents all of the usual features of *ι* except [-round].)

(16) 

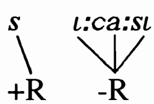
Provided that the vowel elision rule is formulated so as to delete only the segmental feature matrix of a word-final vowel (leaving any features on autosegmental tiers unaffected), it will convert the representation in (16) to the one in (17) below:

(17) 

At this stage, all that is needed is a rule which attaches a floating [+round] autosegment to an accessible consonant, as in (18). (Here the symbol $+R_0$ is used to indicate a [+round] autosegment which is not associated with any segment.)

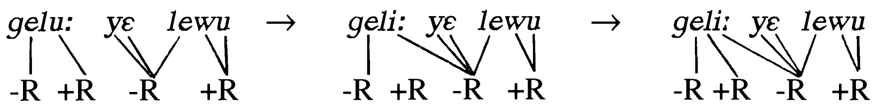
(18) 

This rule will link the floating +R autosegment in (17) to the consonant *s*. (Note that *s* is the only consonant accessible to this autosegment, since linking +R to any other consonant would lead to a crossing of association lines.) The result is the representation in (19), which corresponds to the phonetic form s^w *ι:ca:sι*.

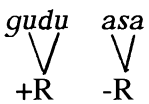
(19) 

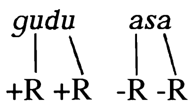
This analysis has some appeal to it, in that it provides an elegant explanation for the consonantal labialization that shows up when a following round vowel is deleted in the examples in (14). This labialization derives from the ability of the feature [round], as an autosegmental feature, to survive the deletion of the vowel it was associated with and reassociate with a neighboring segment. This kind of ability to survive deletion has been well-documented in the case of tone, and it might seem reasonable to expect that other phonological features should, in some languages, exhibit similar behavior.

The analysis can also be readily extended to the vowel fronting examples of §5.1. Assuming that the fronting of a back vowel before *y* also involves the delinking of any [+round] autosegment associated with this vowel, rule (18) would then be free to reassociate this "floating" [+round] autosegment with the appropriate consonant. This sequence of events is sketched in (20).

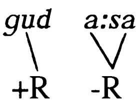
(20)


Despite the attractiveness of this analysis, however, it runs into difficulty with an example like (14c). Assuming that the Obligatory Contour Principle (OCP) holds at the word level in Nawuri, the representation of this example at the stage when vowel elision is to apply must be as in (21) rather than as in (22):

(21)


(22)


Applying vowel elision to (21) yields:

(23)


At this point rule (18) is inapplicable, since the [+round] autosegment is still associated with the first vowel, i.e. it is not floating. The output of the derivation is therefore the incorrect form **guda:sa* instead of the desired *gudʷa:sa*.

This difficulty might be circumvented by assuming that the OCP does *not* govern the roundness tier at the word level in Nawuri, in which case vowel elision could apply to the representation in (22) rather than the one in (21). This would lead to the desired output, i.e. *gudʷa:sa*. There is strong language-internal evidence, however, that the autosegmental representation of *gudu* 'ten' should actually be as in (21) and not as in (22). The initial syllable *gu* in this word is a very common singular noun class prefix whose vowel always agrees in roundness (and also tongue root advancement) with the vowel in the initial syllable of the following noun stem.[12] Within autosegmental phonology, the standard treatment of such "harmonizing" affixes (cf. Clements [1981], Clements & Sezer [1982]) is to assume that they carry no autosegment of their own for the harmony feature in question (in this case [round]); instead, they will become associated with the nearest autosegment of the stem through autosegmental spreading. This assumption clearly rules out a representation such as (22), in which the prefix *gu* is associated with a [+round] autosegment of its own and dictates that the vowel of the prefix must rather "share" the [+round] autosegment which is part of the lexical representation of the stem *du*, as in (21). While this need not mean that the OCP always holds at the word level in Nawuri, the fact that the OCP is not violated in the case of *gudu* (and numerous other words of the same structure) does mean that the analysis as presented will be incapable of correctly deriving examples like (14c). Moreover, there seems to be no simple way of modifying the analysis to overcome this problem.

The other analysis to be considered is one which accounts for the examples in (14) by means of a glide formation rule that converts an underlying word-final short round vowel to a glide *w* before a following word-initial non-round vowel (with compensatory lengthening of the latter). In the case of (14b), for example, this would lead to the surface form *swɩ:ca:sɩ.*

In contrast to the analysis considered above, there is no crucial evidence to show that a glide formation analysis is untenable in Nawuri. The chief reason for not preferring it to the analysis I outlined in the preceding sections is simply that it is less general. Whereas in the analysis of §§5.1 and 5.2 the same rule (10) is used to account for the labialization which surfaces in both (11) and (14), the glide formation rule would apply only to the latter. If the glide formation analysis were adopted then a separate rule would have to be formulated to account for the vowel fronting examples in (11).

There is, in addition, a minor objection to the glide formation analysis in Nawuri stemming from the fact that the labialized consonants derived under this analysis are represented phonetically as sequences of a consonant followed by *w*, rather than as unitary [+round] segments. Quite apart from the issue of the number of segments involved, the [+high], [+back] feature specification of the consonant *w* conflicts with the fact that the labialized consonants in the data in (14) do not appear to involve any significant raising or backing of the tongue body during their production, i.e. they are not phonetically velarized. While this discrepancy could conceivably be regarded as a matter of low-level phonetic detail, one must question

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[12]In slow speech, this agreement may however be blocked by a stem-initial non-round labial consonant, i.e. *p*, *b*, *f*, *m*, *kp*, *gb*, or *ŋm*.

how far we should go in allowing the output of the phonological rules to contain feature specifications which have no basis in articulatory reality.

6. Nawuri Labialization and Speech Perception

In the preceding sections, I presented evidence indicating that labialization before round vowels should be treated as a phonological (rather than a purely phonetic) process in Nawuri, and I discussed some implications of this claim for the analysis of other aspects of Nawuri phonology. I have not so far, however, considered the question of why this labialization, if it is indeed present to a significant degree, is not very audible. It is this question which forms the subject matter of §6.1.

A related and equally intriguing question arises in connection with the fact that, while labialization before round vowels is not very perceptible, there are a few environments in which it does tend to be somewhat easier to detect. What makes this situation interesting is the fact that the environments in which contextual labialization is more noticeable are not the kinds of environments which we would expect, on articulatory grounds, to contribute to a more pronounced rounding of the lips. I suspect, in fact, that consonants are not actually more strongly labialized in these environments, but that there are acoustic factors which render labialization more perceptible in these contexts. In §6.2 I advance some specific, though tentative, suggestions as to the kind of acoustic factors which may be involved.

6.1. The Perceptual Filter Hypothesis. On one level, the fact that labialization is not readily perceived before round vowels in Nawuri might be viewed as a simple consequence of the fact that any property of a segment is likely to be more difficult to detect against a less contrastive background. Just as a white object is more easily identified against a dark background than against a white one, we might expect labialized consonants in any language to be more salient before non-round vowels (to which they are less similar) than before round vowels. (It is thus not surprising that many languages have a contrast between labialized and non-labialized consonants only before non-round vowels.)

A fuller explanation (which addresses the question of *why* properties of segments are more difficult to perceive against a less contrastive background) is suggested by the work of linguists such as Ohala [1981] and Kawasaki [1986], who claim that a listener's speech perception mechanism automatically "factors out" features of the signal which could be attributed to the perturbing influence of an adjacent segment, e.g. nasalization before a nasal consonant:

> listeners' expectations in perceiving speech play a crucial role in giving rise to sound patterns in language...whatever a listener expects to hear, that is, some kind of automatic or commonly encountered perturbation of one segment by another, may be taken for granted and factored out of the phonetic percept constructed for a word, as long as the segment responsible for the perturbation is

> detected… If the perturbing segment is not detected, for whatever reason, then the perturbation is not expected and is not factored out; it is then included as part of the phonetic percept of the word. [Kawasaki 1986:86,87]

Among the studies which support this hypothesis (henceforth the "perceptual filter hypothesis") is an investigation by Kawasaki [1986] into the effect which a listener's perception of a nasal consonant has on his ability to perceive the (contextually induced) nasality of an adjacent vowel in English. She found that subjects became more able to perceive the nasality of vowels flanked by nasal consonants as the amplitudes of these consonants were attenuated.

The perceptual filter hypothesis has a straightforward application to contextual labialization. Since a certain amount of anticipatory lip-rounding before round vowels is probably inevitable in any language, it is likely that any normal speaker of a human language will have come to expect labialization in this environment and will therefore tend to "factor it out", thus failing to perceive it. This will be the case not only when listening to one's own language, but to a foreign language as well. Presumably, this general tendency to "factor out" labialization before round vowels may be counteracted by other factors (such as a particularly strong articulatory degree of anticipatory lip-rounding or acoustic factors that may render labialization more salient in certain environments), for otherwise we would wrongly predict that contextual labialization would be imperceptible to all listeners under all circumstances. But while other factors may need to be taken into consideration, the perceptual filter hypothesis would seem to provide a plausible basis for explaining the general lack of perceptual salience of labialized consonants before round vowels.

Note that if the roundness of the conditioning vowel that follows a contextually labialized consonant were to be somehow removed (a situation analogous to Kawasaki's experiment with vowel nasalizaton), or if something were to prevent the listener from detecting it, the perceptual filter hypothesis predicts that the labialization of the consonant should become perceptually evident. There is reason to believe that this is exactly what is happening in the case of the Nawuri vowel fronting and vowel elision processes discussed in §5. In most environments in which Nawuri words ending in word-final round vowels may occur, the consonants which precede these vowels are not heard with clear labialization, even though there is reason to believe that they do in fact bear significant lip-rounding. But if the feature which conditions this lip-rounding, i.e. the roundness of the word-final vowel, is removed, as in the vowel fronting examples in (11c-e) or the vowel elision examples in (14), then the labialization becomes readily noticeable. In the case of vowel elision, it is especially interesting to note that where the word-initial vowel that follows the deleted vowel is itself round, no clear labialization is heard. A phrase like *sɷ ɔkɷlɩ:* 'to have a boat' surfaces as *sɔ:kɷlɩ:*, without clearly audible labialization on the initial *s*. The generalization, then, would seem to be that a consonant preceding an underlying round vowel is heard with clearly audible labializtion only when it surfaces phonetically before a non-round vowel. Under the perceptual filter hypothesis, this is just what we might expect.

6.2. Perception of labialization in different environments. While labialization before round vowels is never all that salient in Nawuri, it is somewhat more noticeable before mid round vowels, i.e. *o* and *ɔ*, than before high round vowels, i.e. *u* and *ɷ*. It is least perceptible before *u*. The nature of the consonant itself may also make a difference: labialization is most noticeable with the consonant *k*, but it may also be somewhat more noticeable with *č* and with the labial consonants *p*, *b*, *f*, and *m*. Finally, the perception of labialization may also depend on the phonetic identity of the consonant, if any, which *follows* the round vowel responsible for conditioning the labialization. Labialization is more readily perceived when this following consonant is an alveolar[13]. (Where the round vowel preceding this alveolar consonant is non-high, the labialization of the preceding consonant may be even more perceptible.) To my ears, for example, the initial consonants of the words in (24), all of which have an alveolar as their second consonant, generally sound more labialized than do the initial consonants of the words in (25).

(24)	a.	*kɷntɩ*	'elephant'
	b.	*bɔtɩ*	'termite'
	c.	*kotoku*	'sack'
	d.	*fɔlɔgɩ*	'to complain'

(25)	a.	*kɷ:gɩ*	'to give birth'
	b.	*bɔ*	'to swear'
	c.	*ko:*	'far'
	d.	*fɔgɩ*	'to sweep'

From a purely articulatory standpoint, it is difficult to understand why these particular factors should be especially conducive to labialization. For a period of time, the implausibility of these conditioning factors led me to distrust my own auditory impressions. But after several years of exposure to the language, I am confident that, whether or not the statements of the preceding paragraph have any *articulatory* basis (I happen to think that they do not), they do embody valid generalizations about the environments in which contextual labialization is more audible.

My statement that contextual labialization tends to be more salient in these particular environments also finds some support in the Nawuri data of two other investigators, Sherwood [1982] and Snider [1989a]. In Sherwood's data, I counted a

[13]A following alveolar consonant may occur as the onset of the following syllable, or it may be a syllable-final [*n*]. (Only nasal consonants may occur syllable-finally in Nawuri.)

total of twenty-four distinct morphemes in which a phonetically labialized consonant precedes a round vowel. These labialized consonants were, in order of frequency, k^w, b^w, p^w, m^w, f^w, j^w, h^w (the latter four each occurred in only one morpheme). In all cases, the round vowel following the labialized consonant was transcribed as a non-high vowel, *o* or *ɔ*.[14] There were eighteen cases in which the labialized consonant was followed by another consonant in the same morpheme. In thirteen of these cases this following consonant was an alveolar; in three of the remaining five cases it was *y* (in these latter cases it is conceivable that the vowel fronting process discussed earlier might have played a role in rendering the labialization more conspicuous). In Snider's Nawuri data, there are fifteen instances in which a phonetically labialized consonant is transcribed before a round vowel. All fifteen cases involve one of the four consonants k^w, b^w, p^w, and f^w before a non-high round vowel (*o* or *ɔ*). In eight out of the fifteen cases the round conditioning vowel is in turn immediately followed by another consonant. In all eight of these instances, this following consonant is one of the alveolar segments *t*, *r*, or *l*.

Of further interest is the fact that a number of other Ghanaian languages from several language families exhibit tendencies for contextual labialization to be favored in these same kinds of environments. Allophonic labialization of consonants is favored in some way before round vowels of lower tongue height[15] in Chumburung, Hanga, Kasem, Konkomba, and Adele.[16] In Chumburung [Snider 1986], contextual labialization is said to occur only before the vowel *ɔ*, which, in its usual phonetic realization, is the lowest of the four round vowels in the language [Snider 1984:9]. In the case of Hanga, Hunt [1981] describes several of the consonants in the language as having labialized allophones before non-high ("non-close" in his terminology) round vowels; allophonic labialization does not occur before high ("close") round vowels. All consonants in Kasem [Callow 1965] are allophonically rounded before round vowels. Two consonants however, *k* and *ŋ*, are more strongly labialized before non-high ("open" in Callow's terminology) round vowels than before high ("close") ones. According to Steele and Weed [1966], thirteen of the twenty-one consonants in Konkomba may undergo contextual labialization before round vowels. All but four of these thirteen consonants have two labialized allophones, one of which is described as "labialised" and the other as "slightly labialised". While the precise distribution of these allophones is fairly complex and varies somewhat according to which consonant is involved, there is an overall tendency for the degree of labialization to be inversely correlated with

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[14]A few of these may actually be [*ɷ*].

[15]It is also interesting that parallel cases where *palatalization* is favored in some way before front vowels of lower tongue height have been reported, for example in Tampulma [Bergman, Gray & Gray 1969] and Hanga [Hunt 1981].

[16]A somewhat different pattern, in which the degree of contextual labialization of alveolar and alveo-palatal consonants is greater before [*ɒ*] and [*ɷ*] than before [*ɔ*], [*o*], and [*u*] is reported in Basari [Abbott and Cox 1966:14].

the tongue height of the following conditioning vowel. Before [ɒ] (an allophone of /ɔ/), for example, which is phonetically the lowest round vocalic segment that occurs in the language, only the stronger of the two labialized allophones ever occurs. Only the "slightly labialised" forms, on the other hand, ever occur before the high back vowel /*u*/, and then only when it is lowered phonetically to [ɷ]. Before [*u*] (the other allphone of /*u*/), which is phonetically the highest round vowel segment occurring in the language, consonants are not reported to be labialized at all. In the case of Adele, Renate Kleiner informs me (personal communication) that her phonetic data show eight instances in which she has transcribed consonants with labialization before a mid round vowel (*o* or ɔ) and two instances where she has transcribed labialization before the high vowel ɷ. Before *u*, which is phonetically the highest of the four round vowels in the language, she has no examples where she has transcribed consonants as labialized.

Another point of partial similarity to the Nawuri pattern is found in Hanga, Kasem, Chumburung, and Basari, in that velar or labial consonants undergo contextual rounding more readily or more strongly than others. According to Hunt, only the consonants *k, p, b, g,* and *ŋ* may be allophonically labialized in Hanga. While all consonants are allophonically rounded before round vowels in Kasem, it is only the velar consonants *k* and *ŋ* which are reported to have more strongly labialized allophones (which, as already stated, occur before non-high round vowels). In the case of Chumburung, Snider [1986:54] posits an allophonic rounding rule that applies only to non-coronal consonants, although he later adds that "while [+coronal] consonants in general aren't rounded before [ɔ] there is a tendency for some of those which are palatal (i.e. [+high]) to have a degree of rounding. This is most pronounced in the case of /*č*/." While contextual labialization in Basari [Abbott and Cox 1966] may occur with all consonants except labio-velars, *y*, and *l*, "the consonants which show the greatest degree of labialisation are the bilabials and velars."

A final point of similarity is found in Konkomba, in which contextual labialization also appears to depend on the identity of the consonant that follows the conditioning round vowel. With few exceptions, allophonic labialization (whether weak or strong) may occur on the initial consonant of a closed syllable only if the consonant which closes that syllable is one of the consonants *b*, *m*, *n*, *r*, or *l*.[17] While this pattern is not completely identical to the one I described for Nawuri (in that, first, the consonant following the conditioning vowel is relevant only when it occurs in the same syllable and, second, a following labial consonant as well as a following alveolar consonant may be conducive to labialization) it is similar enough to be noteworthy.

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[17]In the actual words employed by Steele and Weed, the consonant which closes the syllable must be "other than a velar". Elsewhere (p.3) they list the following consonants as occurring syllable-finally: *b*, *k*, *r*, *l*, *m*, *n*, and ŋ.

Where natural assimilatory processes are at work, there is ordinarily nothing unusual about languages exhibiting similar patterns of allophonic variation. What makes these particular tendencies somewhat surprising, however, is that there is no obvious articulatory motivation for them. It is difficult to imagine, for example, what articulatory factors might lead to consonants rounding more readily before non-high round vowels than before high ones. (If anything, we might have expected consonants to be more labialized before high round vowels, since these generally involve tighter lip-rounding than mid vowels.) The tendency for non-coronal consonants to undergo contextual labialization more readily than coronal ones is also difficult to understand in purely articulatory terms. Perhaps most puzzling of all, from an articulatory standpoint, are the patterns in Nawuri and Konkomba in which the degree of labialization appears to depend on the identity of the consonant following the conditioning round vowel.

While one cannot rule out the possibility that natural articulatory-based explanations could in fact be found for these tendencies, it is also quite possible that they might be more profitably explained in terms of acoustic factors. I am suggesting, in other words, that (in Nawuri and perhaps in the other languages mentioned as well) consonants are not necessarily articulated with a greater degree of lip-rounding in the environments cited. Rather, acoustic factors are at work to give greater perceptual prominence to labialization in these environments. As a somewhat rough and tentative example of the kind of acoustic factors I have in mind, it is reasonable to suppose that a major perceptual cue to the labialization of a consonant is a rising second formant transition in the following vowel. Presumably, the perceptual salience of the labialization would increase in proportion to the slope of this formant. The tendency in Nawuri for contextual labialization to be particularly salient where the conditioning round vowel is non-high and followed by an alveolar consonant might then be explained as being due to the high F_2 locus of the alveolar point of articulation and the lower F_2 value for non-high vowels. This combination would lead to a particularly steep second formant slope in the vowel following the labialized consonant, i.e. the conditioning vowel. The high F_2 locus of alveolar consonants might also help to explain why alveolar consonants are, in several of the languages, less likely to be heard with clearly audible labialization: since F_2 starts off high to begin with, the prospects of it rising significantly during the following vowel are reduced.

REFERENCES

Abbott, Mary & Monica Cox. 1966. "Collected field reports on the phonology of Basari." (Collected language notes, 5.) Legon: Institute of African Studies, University of Ghana.

Bergman, Richard, Ian Gray & Claire Gray. 1969. "Collected field reports on the phonology of Tampulma." (Collected language notes, 9.) Legon: Institute of African Studies, University of Ghana.

Callow, John. 1965. "Collected field reports on the phonology of Kasem." (Collected language notes, 1.) Legon: Institute of African Studies, University of Ghana.

Casali, Roderic F. 1988. "Some phonological processes in Nawuri." University of Texas at Arlington master's thesis.

Clements, George N. 1981. "Akan vowel harmony: a nonlinear analysis. In G.N. Clements (ed.), *Harvard Studies in Phonology* 2, pp. 100-177. Bloomington: Indiana University Linguistics Club.

Clements, George N. & Engin Sezer. 1982. "Vowel and consonant disharmony in Turkish." In Harry van der Hulst & Norval Smith (eds.), *The Structure of Phonological Representations (Part II)*, pp. 213-255. Dordrecht: Foris Publications.

Hunt, Geoffrey R., with Rosemary H. Hunt. 1981. "A phonology of the Hanga language." (Collected language notes, 18.) Legon: Institute of African Studies, University of Ghana.

Kawasaki, Haruko. 1986. "Phonetic explanation for phonological universals: the case of distinctive vowel nasalization." In John J. Ohala & Jeri J. Jaeger (eds.), *Experimental Phonology*, pp. 81-103. Orlando: Academic Press.

Kiparsky, Paul. 1985. "Some consequences of lexical phonology. In Colin Ewen & John Anderson (eds.), *Phonology Yearbook 2*, pp. 83-138. Cambridge: Cambridge University Press.

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

Ohala, John J. 1981. "The listener as a source of sound change." In Carrie S. Masek, Roberta A. Hendrick, & Mary Francis Miller (eds.), *Papers from the Parasession on Language and Behavior*, pp. 178-203. Chicago: Chicago Linguistic Society.

Öhman, Sven. 1966. "Coarticulation in VCV utterances: spectrographic measurements." *Journal of the Acoustical Society of America* 39:151-168.

Pickett, J.M. 1980. *The Sounds of Speech Communication.* Baltimore: University Park Press.

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

Sherwood, Barbara. 1982. "A grammatical description of Nawuri." University of London PhD dissertation.

Snider, Keith L. 1984. "A generative phonology of Chumburung." MS. Ghana Institute of Linguistics, Literacy, and Bible Translation.

Snider, Keith L. 1985. "Vowel coalescence across word boundaries in Chumburung." *Journal of West African Languages* 15(1):3-13.

Snider, Keith L. 1986. "A generative theory of the syllable applied to Chumburung phonology." Ms. Ghana Institute of Linguistics, Literacy, and Bible Translation.

Snider, Keith L. 1989a. "North Guang comparative word list: Chumburung, Krachi, Nawuri, Gichode, Gonja." (*Comparative African Wordlists,* 4.) Legon: Institute of African Studies, University of Ghana.

Snider, Keith L. 1989b. "Vowel coalescence in Chumburung: an autosegmental analysis." *Lingua* 78:217-232.

Snider, Keith L. 1989c. "The vowels of Proto-Guang." *Journal of West African Languages* 19(2):29-50.

Steele, Mary and Gretchen Weed. 1966. "Collected field reports on the phonology of Konkomba." (*Collected language notes*, 3.) Legon: Institute of African Studies, University of Ghana.

Stewart, John M. 1989. "Kwa." In John Bendor Samuel (ed.), *The Niger-Congo Languages*, pp. 217-245. Lanham: University Press of America.

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CHARACTERISTICS OF OMOTIC TONE: SHINASHA (BORNA)

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The article provides some phonological background and outlines the tonal system of Shinasha (Borna), an isolated North Omotic language of Ethiopia. There are two contrasting tones. Their behaviour shows characteristics which have also been observed for other Omotic languages: stability of lexical tone, limited use of tone in the syntax, and absence of sandhi. The article provides new evidence that vowel quality can have a strong influence on the tonetic realisation: Shinasha is not the only Omotic language where high vowel quality is associated with extra high pitch.

0. Introduction

The Shinasha people are Ethiopian Orthodox Christians. Farming is their main occupation. They call themselves *Bora* [*bɔ̀rá*], and their language *Borna* [*bɔ̀rná*].[1] In the linguistic literature the term "*Shinasha*" rather than *Borna* has been established, and so it will be used in this paper. Occasionally the term *Bworo* has also been used in the past, but this form is rejected by our informants.

Shinasha is an isolated Omotic language spoken in the Metekel administrative region of the Gojjam province of Northern Ethiopia. It has been classified as part of the "North Gonga" subgroup of "North Omotic" languages [Fleming 1976:300], and as a member of the "Kefa Group", along with Kefa/Mocha and Anfillo [Bender 1987:22, 30].

There are two varieties of Shinasha which are mutually intelligible. According to the speakers of the language, Shinasha is divided into *Worwi-Bora* and *Gayi-Bora*. *Worwi-Bora* (or *Tari-Bora*) "Lowland Shinasha" is mainly spoken in the lowlands of the districts Wembera, Dangur, Guba, and Dibate, whereas *Gayi-Bora*

[1] In certain contexts, the forms *Boro* and *Borno* will also be used. Forms in *-a* are citation forms, those in *-o* are non-oblique masculine forms.

"Highland Shinasha" is mainly spoken in the highlands of the first three districts. The present study is based on data of the *Wembera* dialect as provided by the students Nasisa Wubete and Mulualem Bessie, for whose cheerful help and co-operation we want to express our appreciation.

Morphological and grammatical sketches of Shinasha have been written by Grottanelli [1941], Plazikowsky-Brauner [1950, 1970], Fleming [1975, 1976], and Fekadie Baye [1988]. A phonology of Shinasha was written in 1986 by Gabre Bizuneh at the Addis Abeba University. The structure of the NP in Shinasha, described under an X bar perspective, is the topic of the most recent study of this language [Ashenafi 1989]. However, a survey of the literature on Shinasha shows that so far there is no study on the role of tone.

1. Phonological Sketch

To provide sufficient background for the presentation of the tone system, a sketch of the Shinasha phonology will be given in this section. The transcription follows the IPA conventions as revised to 1989. Note the following: *ɗ* stands for an implosive *d*, *p' t' c'* and *k'* are glottalized consonants, *c'* standing for glottalized *ts'* (not [*tʃ'*], which does not occur in Shinasha). Data in the subsequent sections are given in a phonemic transcription where the phoneme *c* is written as *ts* and *j* as *dʒ*. The mid vowels are more open than *e* and *o*, and in a strict phonetic transcription, the symbols *ɛ* and *ɔ* would be more appropriate. Length and gemination are written as double letters. Thus, *aa*, *ee*, etc. stand for long vowels and *tt*, *kk*, etc. for geminated consonants. Acute accent (´) represents high tone, grave accent (`) indicates low.

1.1. The segments. Gabre's [1986] unpublished study is closely related to the topic of the present paper, and his phoneme chart (at the top of the next page) will serve as a starting point for the presentation of segments. It will be presented in a revised form however.

According to Ashenafi [1989], the sounds *ts* (*c*), *dʒ* (*j*), *ə*, and *ɨ* are phonemic, though they are not listed as such in previous studies. The *ɨ* is a high central vowel, and *ə* is the mid central schwa. These two vowels are typically found in Ethio-Semitic languages, while *ts* (*c*) is common in Omotic languages. The *dʒ* is not a substitute for *z* (as one might conclude from Bender [1987:25]), but an additional phoneme. These four additional phonemes can be exemplified with the following Shinasha data:

(1)	*ts*	*àtsà*	'body'
	dʒ	*dʒòrá*	'chair'
	ɨ	*bɨ́*	'his'
	ə	*mə́n*	'definite marker'

Table 1: Gabre's [1986] Phoneme Chart

Consonants

Labial	Alveolar		Palatal	Velar	Glottal
p	*t*			*k*	*ʔ*
p'	*t'*			*k'*	
b	*d*		*dʒ* (*j*)	*g*	
	ɗ				
	ts	(*c*)			
	ts'	(*c'*)			
f	*s*		*ʃ*		*h*
	z				
m	*n*				
	l				
	r				
w			*y*		

Vowels

Short			Long		
i	*ɨ*	*u*	*ii*		*uu*
e [ɛ]	*ə*	*o* [ɔ]	*ee*		*oo*
	a			*aa*	

If we take Bender's [1987:25, 28] proto-Omotic phonemes as a basis of comparison (where *ts* is included with question marks), then the Wembera dialect of Shinasha distinguishes itself from proto-Omotic and from many of today's Omotic languages by just those sounds which Ashenafi has pointed out in his recent analysis [1989:11], namely: *ə*, *ɨ*, *dʒ*, and maybe *ts*. They are Shinasha innovations.

1.2. The status of the central vowels. Two central vowels, *ɨ* and *ə*, both without long counterparts, have been included here on the basis of Ashenafi's [1989:11] analysis. Their inclusion will need a few comments, because no such vowels have been included in the major Omotic analyses so far, and they are not considered proto-Omotic phonemes (cf. Bender [1987:28], but see Wedekind [1989:128]). Since the status of these vowels is important for the tonal analysis, the following points should be noted:

(a) The fact that *ɨ* and *ə* have no long counterparts does shed some doubt on their status as phonemes. But it is not unusual for short and long vowel sets to differ.[2]

(b) Shinasha speakers in the Gojjam province are surrounded by Ethio-Semitic languages of seven vowels, where *ɨ* and *ə* are there to be "loaned". But whether they were loans or not, today these vowels are integrated into various items of the Shinasha lexicon and in grammatical morphemes such as *bɨ́* 'his' and *mə́n* 'definite'.

(c) A comparison with a language like Sheko shows that central vowel phonemes may be infrequent, but they are not altogether unusual in the North-Omotic family [Aklilu 1988].

(d) It is true that *ɨ* is unstable in the sense that it alternates with other vowels. The alternation is however morphophonological, e.g. *ɨ* → *i* before vowels, and it does not cancel basic contrasts such as *bí* 'he' vs. *bɨ́* 'his'.

(e) The vowels *ɨ* and *ə* take the same tones as all other Shinasha vowels, short or long.

1.3. Suprasegmentals. *Vowel length* has been discussed in some of the previous descriptions, e.g. Gabre's [1986] study which distinguishes *i, e, a* from *ii, ee, aa*, etc. Length is largely independent of other parameters such as syllable pattern or pitch. This can be exemplified with the following pairs where vowel length differs while the syllable patterns are the same, as in (2), or where vowel length differs while pitches are the same, as in (3). See §2 below for the reverse of this perspective.[3]

(2)	[*gɔ̀ʃà*]	'farm (n.)'	[*gɔ́:ʃà*]	'migrate (v.)'
	[*gɔ̀ndà*]	'bad (adj.)'	[*gɔ́:ndà*]	'bridge (n.)'
(3)	[*gàwə́*]	'witness (n.)'	[*gà:wə́*]	'wound (n.)'

Gemination of consonants is described as contrastive by Gabre [1986:14]. Since gemination is a common feature in Ethiopian languages, it need not be discussed in detail here. But it should be noted that according to our Shinasha data, gemination is rare and limited to a few consonants; *kk* and *tt* are among the more frequent ones. Data like (5) also show that gemination and pitch are independent parameters.

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[2]About one fifth of the sample of the world's languages in Maddieson [1984:129] have vowel sets which differ in this way.

[3]Length and pitch are largely independent. In the section about adverbial constructions (3.4), complications will be discussed which seem to arise from compensatory lengthening.

(4) [ìk:à] 'one'
[gìt:á] 'two'

(5) [mít:à] 'wood'
[mìt:à] 'load (v.)'

Stress is used occasionally to express emphasis. Apart from this pragmatic function, stress is not phonetically noticeable.

Tone has not been mentioned in any of the previous studies, and it will be in focus for the rest of this paper.

2. Basic Tonal Contrasts

Contrasts between high (H) and low (L) tones can be documented with a large number of minimal pairs.

Monosyllabics: The Shinasha lexicon is predominantly disyllabic (or bi-radical). But there are a few monosyllabic morphemes which contrast in tone: [4]

(6)	H	*bɨ́*	'his'	*bí*	'he'
	L	*bɨ̀*	'her'	bì	'she'

Disyllabics: In disyllabic words, the H and L tone combinations contrast in all conceivable ways. In the selection of minimal pairs, we have attempted to keep all vowels identical, including the word final *-a*. The reason is that pitch is not independent of vowel quality. This will be discussed in §§5-7 below. The word final *-a* is analysed here as a "citation suffix", a suffix common to the language families and the area around Shinasha.[5]

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[4]The difference between these pronouns—possessive and independent—could be analysed as a difference between clitics and words, where the vocalic difference would then be secondary. At the present stage of the analysis, however, we feel safer with a limited phonological perspective where *ɨ* and *i* are contrasting "phonemes".

[5]The same suffix could be analysed as a copula. Note the final *à* in data such as the following:

àʃ	*èw-ɨ̀*	*ʃèeng-à*
person	demonst.-feminine	beautiful-?copula

'that woman is beautiful'

But in the present paper, we prefer to regard *-a* as a citation suffix, since citation suffixes of the form *-a* are quite common in Cushitic and Omotic languages. Their use could even be regarded as an area feature which characterizes western Ethiopian languages as diverse as Gumuz (Nilo-Saharan), Oromo (Cushitic), and Shinasha (Omotic).

(7)

HH	*gáʃá*	'mould (v.)'	HL	*gáʃà*	'tooth (n.)'
LH	*gàʃá*	'belch (v.)'			
HH	*átá*	'sprout (v.)'	LL	*àtà*	'medicine (n.)'
HL	*málà*	'trick(n.)'	LL	*màlà*	'necklace (n.)'
HL	*gáwà*	'next year (adv.)'	LH	*gàwá*	'witness (n.)'
LH	*ʃìrá*	'shelter (n.)'	LL	*ʃìrà*	'common property (n.)'
LH	*àtsá*	'body (n.)'	LL	*àtà*	'medicine (n.)'

Trisyllabics: Not much can be said about tone patterns of trisyllabics, because trisyllabic verb roots do not seem to exist, and trisyllabic nouns are rare. Those trisyllabics which have been found include either the formative *-tsa* or reduplication; others are loans. Note that these nouns tend to start with a low tone.

(8)

LLH	*kòkòp'á*	'tortoise'	(reduplication)
LLH	*àkùrtsá*	'axe'	(formative *-tsa*)
LLH	*ùumpètsá*	'thief'	(formative *-tsa*)
LHL	*àndúrà*	'cat'	(Cf. Cushitic *ʔadurre* 'cat')

Like the few trisyllabic nouns above, disyllabic nouns prefer LL and LH tone patterns (in our sample, seven out of ten). Nouns prefer low tones and final high tones, but this is not an exclusive preference. Shinasha tone patterns are not conditioned by morpheme classes, as the following examples show:

(9)

	NOUNS		VERBS	
LL	*màlà*	'necklace'	*màʃà*	'to wash'
LH	*gàlá*	'provisions'	*gàʃá*	'to belch'
HL	*málà*	'trick'	*máʃà*	'to get drunk'
HH	*márá*	'nightmare'	*gáʃá*	'to mould'

These examples make it plain that pitch patterns and morpheme classes are independent of each other. In this regard, Shinasha (along with other Omotic languages) differs from the neighbouring Cushitic languages where word shape and morpheme class determine stress and pitch.[6] In Shinasha they do not.

The tone patterns are also independent of vowel length. The same tones and tone patterns are found both on short and long vowels. (In the transcription of long vowels, the tone mark is placed only on the first letter, but it is meant to be read as one pitch extending over the entire vowel length.) Even phonetically, the long

[6]Under a diachronic perspective, however, the high incidence of Shinasha (L)LH nouns is quite interesting, especially when compared with the Cushitic preference for word final stress.

Shinasha vowels of nouns or verbs do not generate any special pitch movements such as rises, falls, or other "contours".

(10)

	SHORT		LONG	
LL	*àwà*	'mother in-law'	*àawà*	'sun'
LH	*gàwá*	'witness (n.)'	*gàawá*	'wound (n.)'
HL	*málà*	'trick'	*máalà*	'grinding stone'
HH	*márá*	'nightmare'	*máará*	'she ate'

3. Lexical Tones, Morphology, and Syntax

Shinasha uses tone to show lexical and grammatical distinction. Breeze [1988:481] says of Gimira, "Grammatical distinctions shown by tone … [are] more limited", and this is true for Shinasha too, where the main function of tone is lexical.

Every morpheme has its lexical tones. As in other Omotic languages analysed so far, there are hardly any morphotonological changes. In general, the lexical tones will not change, but some of them will disappear without leaving any traces. The only morphotonemic process in Shinasha, then, is the loss of word final tones, and this seems to be restricted to nouns and verbs. In the following sections, the conditions for this process will be discussed with reference to the morphological and syntactic context.

3.1. Verb final tones. The tone of the citation suffix *-a* will be regarded as part of the lexical tones of a verb, since it is not predictable. The verbs under (11) below will be used to exemplify the tonal patterns and the tonal behaviour of verbs; cf. also (9) above.

(11)	*áttá*	'to sprout'			(lexical tones: HH)
	kéwà	'to buy'	*ímà*	'to give'	(HL)
	kùt'á	'to cut'	*ùuɗá*	'to kill'	(LH)
	ts'àafà	'to write'	*jòt'à*	'to hit'	(LL)

3.2. Elision of lexical tones in verbs. The verb final lexical tones disappear as soon as any suffixes are attached other than the citation suffix *-a*. This is true both for derivation and inflection suffixes.

Passive forms, for instance, are derived by suffixation of *-éer* ~ *-ér* "passive". The following examples show that the final tone of the verb root will be dropped, and the high tone of the passive suffix takes its place whatever the final tone of the verb root may have been. (Note the compensatory lengthening in most of these verbs.)

(12)	*kɓ́w-éeré*	'it was bought'	(lexical tones of *kéwà*: HL)
	ím-éeré	'it was given'	(lexical tones HL)
	kùt'-éeré	'it was cut'	(lexical tones LH)
	ùuɗ-éeré	'it was killed'	(lexical tones LH)
	ts'àaf-éré	'it was written'	(lexical tones LL)
	jòt'-éeré	'it was hit'	(lexical tones LL)

Inflection suffixes, such as tense/aspect or person/number suffixes, and polarity suffixes will also cause the verb final lexical tone to be dropped. Cf. the following two paradigms, where the verb stem is followed by the suffix *-ítùw* 'imperfect (present, future)'. There is no trace of the final H tone of *áttá* 'to sprout' or of the final L tone of *kéwà* 'to give'.

(13)	*átt-ítùw-è*	'I will sprout/flourish'	(lexical tones: HH)
	átt-ítùw-í	'you'	
	átt-ítùw-é	'he'	
	átt-ítùw-á	'she'	
	átt-ítùw-ó	'we'	
	átt-ítùw-ɨ́t	'you pl.'	
	átt-ítùw-ɨ̀nó	'they'	

(14)	*kéw-ítùw-è*	'I will give'	(lexical tones: HL)
	kéw-ítùw-í	'you'	
	kéw-ítùw-é	'he'	
	kéw-ítùw-á	'she'	
	kéw-ítùw-ó	'we'	
	kéw-ítùw-ɨ́t	'you pl.'	
	kéw-ítùw-ɨ̀nó	'they'	

The same is true for other tense or aspect suffixes, such as *-ɨ́r* (*-ér*, *-r*) 'past/perfect'.

(15)	*átt-ɨ́r-è*	'I sprouted', etc.	(lexical tones *áttá* HH)
	kéw-ér-è	'I gave', etc.	(lexical tones HL)
	kùt'-ɨ́r-è	'I cut (past/perf.)', etc.	(lexical tones LH)
	àm-r-è	'I went', etc.	(lexical tones LL)

In the optative/imperative paradigm, the verb root can be followed by person/number suffixes, but again, these suffixes do not show traces of the lexical verb tones. Cf. the HH tone verb *áttá* 'to sprout' and the HL tone verb *kéwà* 'to give':

(16)	*áttúwà*	'let me sprout/flourish'	(lexical tones: HH)
	áttá	'flourish! (you sg.)'	
	áttúwá	'let him flourish', etc.	

(17)	*kéwúwà*	'let me give/may I give'	(lexical tones: HL)
	kéwá	'give! (you sg.)'	
	kéwúwá	'let him give', etc.	

The negation suffix is *-áats* 'not'. The verb root final tone leaves no traces where this suffix is attached.

(18)	*átt-áats-è*	'I don't sprout', etc.	(lexical tones: HH)
	kéwr-áats-è	'I don't give', etc.	(lexical tones: HL)

3.3. Noun final tones. With nouns, as with verbs, it is again the "citation suffix" *-a* which carries the lexical tones. But unlike verbs, nouns will also display their lexical tones on other suffixes (Cf. the adverbial suffix *-tsé* 'from' in §3.4 below.) The citation suffix *-a* can have H or L tone. This is part of the lexical identity of the noun and independent of any other factor. Cf. the following tonal patterns of nouns again:

(19)	*bóorsá*	'bag'	(lexical tones HH)
	géʃà	'wheat'	(HL)
	bòlá	'mule'	(LH)
	àttà	'medicine'	(LL)

3.4. Noun final complex tones with adverbial suffixes. Adverbial suffixes do not delete the noun final lexical tone. Among these suffixes there are *-tsé* 'from near', *-ké* 'from', and *-tsà* 'in'.

(20)	*bóorsó-tsé*	'bag-from'	(lexical tones: *bóorsá* HH)
	jòoró-tsé	'chair-from'	(LH)
	bòlóó-tsé	'mule-from'	(LH)
	géʃòó-tsé	'wheat-from'	(HL)
	àttòó-tsé	'medicine-from'	(LL)
	dàazòó-tsé	'donkey-from'	(LL)

In some instances, the long suffix vowel *-oo* accomodates two different tones. The first is the lexical tone of the noun, and the last is the high tone which characterizes the suffix *-´tsé* 'from'. In §1.3 and §2 it was pointed out that long vowels in lexical entries will not have two different tones. But long vowels in suffixes can have two tones, e.g. those resulting from adverbial suffixation. (Note that the length of the *-ó* ~ *-oó* suffix compensates for the length of the root vowel in most of our data.)

3.5. Elision of lexical tones in nouns. While the citation suffix and the adverbial suffixes preserve the lexical tones, case and gender suffixes do not. A noun loses its word final lexical tones when certain case or gender suffixes are attached. In the following examples, various suffixes will be discussed which characterize cases (subjects, direct and indirect objects, genitives) and genders (masculine and feminine).

The morphology of subject and object cases differs only in nominals which rank high in the "animacy" scale (names, relationship terms, and pronouns), and in determiners. But even with these nominals, the differences between subjects and objects are minimal. We will focus on subjects first and discuss differences later.

Subjects: Gender and case are distinguished by vowels and by tone. With common nouns, *-o* stands for masculine, *-u* for feminine, and at the same time they stand for subject (concerning objects, see below). Case overrides lexical tone. Gender also controls tone, and the relation between the two conflicting rules is steered by the animacy scale and determination. The examples below include only common nouns in the function of syntactic subject. Common nouns tend to rank low on the animacy scale, and in general they will not have feminine forms (unless there is some special "animated" relation to some lifeless item.) Cf. the masculine forms in (21).

(21)	*gáʃó ɗùiʃéré*	'a tooth broke'	(HL)
	àttó kùuɗéré	'medicine was spilled'	(LL)

For common nouns referring to animates, the use of feminine forms is more frequent. Cf. the common nouns in (22).

(22)	*nàʔó wàaré*	'a son came'	(lexical tones of *nàʔá*: LH) (masc.)
	nàʔú wàará	'a daughter came'	(lexical tones: LH) (fem.)
	gàwó wàaré	'a witness came'	(lexical tones: LL) (masc.)
	gàw(ù)ú wàará	'a witness came'	(LL) (fem.)
	dàazó wàaré	'a donkey came'	(LL) (masc.)
	dàazùú wàará	'a donkey came'	(LL) (fem.)
	àndúrùú ʃèengà	'a cat is nice'	(LHL) (fem.)

The examples show that masculine subjects end in *-ó* with high tone which overrides the lexical tone, while feminine subjects end in *-(u)ú* with high tone, but there are traces of the lexical tone where the *u* is long.

With determiners, things are different. Cf. the following examples which include *mə́ń ~ mə́nɨ́* 'definite, masc.' vs. *mə́ǹ ~ mə́nɨ̀* 'definite, feminine', where *ń* and *ǹ* are syllabic nasals:

(23)	*àʃ mə́ń wàaré*	'the man came (man def. came-masc.)'
	àʃ èwɨ́	'that man'
	àʃ mə́ǹ wàará	'the woman came'
	àʃ èwɨ̀	'that woman'

With pronouns and names, gender is clearly expressed by tone, and tone alone.

(24)	*bí*	'he (subj.)' (masc.)
	bì	'she (subj.)' (fem.)
	gìʃèd(d)ɨ́ wàaré	'Gished came' (masc.)
	dàatsétsɨ̀ wàará	'Daatsets came' (fem.)

Objects: Objects have the same morphology as subjects, so what was said about common nouns need not be repeated here. But nouns high in the animacy scale will behave differently from subjects: Object names and relationship terms have *-i* suffixes (rather than *-ɨ*). Again, tone distinguishes gender in the same way as elsewhere. Cf. the following examples of object names and relationship terms:

(25)	*bí làmmí jòt'ré*	'he killed Lemma' (masc.)
	bí àlmáazɨ̀ ts'égré	'he called Almaz' (fem.)
	bí níhí ts'égré	'he called (a) father' (masc.)
	bí ìndì ts'égré	'he called (a) mother' (fem.)

With pronouns, there is an optional difference between object and subject marking. Object pronouns can have the suffix *-n*. Tone distinguishes gender.

(26)	*àʃ-əwiɨ́ bí(n) ts'égré*	'that man called him' (masc.)
	àʃ-əwiɨ́ bì(n) ts'égré	'that man called her' (fem.)

Like names and pronouns, determiners such as *mə́ní* or *mə́nì* 'definite masc./fem.' also take the object ending *-i* (rather than *-ɨ* as in the subject), and tone indicates gender:

(27)	*bí àʃ mə́ní ts'égré*	'he called the man' (masc.)
	bí àʃ mə́nì ts'égré	'he called the woman' (fem.)
	bí àʃ əwí dʒòt'ré	'he hit that man' (masc.)
	àʃ əwì	'that woman (obj.)' (fem.)

Genitives: Like subjects, genitive attributes have different morphological expressions depending on gender, animacy rank, and determiners. Masculine nominals have high tones, feminine have low tones. But the vowels differ depending on their animacy rank. Common nouns have the suffix *i*.

(28)	*dʒòorí tàhà*	'the chair's cloth'
	bùní tàhà	'coffee's cloth'

Genitive pronouns have a final vowel *ɨ*,. Tone in third person goes with gender:

(29) *tɨ́ gálà* 'my village' *bɨ́ gálà* 'his village' *bɨ̀ gálà* 'her village'

Genitive names and relationship terms are different from common nouns, and they have the same morphology as genitive attributes as they have as subjects:

(30)	*gìʃè(d)dɨ́ mòó...*	'Gished's house' (masc.)
	àlmáazɨ̀ mòó	'Almaz's house' (fem.)
	tɨ́ nìhɨ́ mòó	'my father's house' (masc.)
	tí ìndɨ́ mòó	'my mother's house' (fem.); *ɨ* → *i* before vowels

Determiners in the genitive also have the same morphology as the subjects:

(31)	*àʃ-mə́nɨ́ tàhà*	'the man's cloth(es)' (citat., masc.)
	tí ìndɨ́ tàhà	'my mother's cloth(es)' (fem.); *ɨ* → *i* before vowels

Other attributes: Attributes other than genitives have the same morphology as genitives or subjects: adjectives and numerals receive a *-ɨ* suffix, whose tone depends on the gender. The attribute usually precedes the head noun, but it can be rearshifted for emphasis. In both cases the first word can have a H tone suffix *ɨ́*.

(32) **Number + Noun**

gìttá àʃà	'two men' (citat.)	*gìttɨ́* → *gìttá* before *a*
gìtt(ɨ́) gúrá	'two mountains'	
kèezɨ́ kàn-wòtsí	'the three dogs'	

Noun + Number

àʃ(ɨ́) gìttá	'TWO men'
gúr(ɨ́) gìttá	'TWO mountains'

Adjective + Noun

nàts'(ɨ́) bóorsá	'a white bag (citat.)'
àak'(ɨ́) bóorsá	'a black bag'
múk'(ɨ́) bóorsá	'a short bag'

Noun + Adjective

bóors(ɨ́) nàts'ó	'a WHITE bag (obj.)'
ʃúpt(ɨ́) nàts'ó	'a WHITE cup'
ʃɨ́r(ɨ́) nàts'ó	'a WHITE root'

3.6. A Summary on word final tones of nominals. The various interrelations of lexical tone, syntactic function, gender, nominal classes, and animacy are not yet fully documented. Table 2 gives a preliminary survey of the data of this section.

Table 2: Interrelations of lexical tone, syntax, gender and animacy

	Genitive	Subject	Object	Adverbials
Common Nouns				
masc.	*-í*	*-ó*	*-ó*	*-(o*)ó*
fem.	*-ì*	*-(u*)ú*	*-(u*)ú*	
Pronouns				
masc.	*-ɨ́*	*-í*	*-í(n)*	
fem.	*-ɨ̀*	*-ì*	*-ì(n)*	
Names				
masc.	*-ɨ́*	*-ɨ́*	*-í*	
fem.	*-ɨ̀*	*-ɨ̀*	*-ì*	
Relationship Terms				
masc.	*-ɨ́*		*-í*	
fem.	*-ɨ̀*		*-ì*	
Determiners				
masc.	*-ɨ́*	*-ɨ́*	*-í*	
fem.	*-ɨ̀*	*-ɨ̀*	*-ì*	

The vowels of these suffixes differ with case and word class or animacy. Note that *-ɨ* alternates with *-i* morpho-phonologically: before vowels, *ɨ* changes to *i*.

The tones of these suffixes are, in most instances, controlled by gender. But there are a few instances where the lexical tone is preserved; this is indicated by asterisks.

4. The Tonetic Surface: Disyllabic "Normal" Utterances

The phonetic realizations of the two tones H and L differ from utterance to utterance, with relation to the various factors of the environment, tonal and other.

To eliminate a number of factors, such as the differences of word shape, consonantal onset, vowel quality, or syntactic function, words of the structure CVCV were observed which contain no other vowels but *a* (cf. the word lists of §2 above). In these data it should be only intonation, assimilation, and downdrift (and the tonemes themselves) which determine the actual pitch movements. The actual pitch movements in data with HH, LL, HL and LH sequences can be characterized as folllows:

HH is realized as a sequence of two identical pitches. (With certain vowels, there is a slight rise. This will be discussed in §5.1 below.) So for a Shinasha speaker, a "HH" sequence must be produced with two identical pitches to be perceived as "HH". A slightly descending sequence could be interpreted as "LL".

LL will not have two identical pitches. As a minimum, the second low tone will be one semitone lower than the first, but in most cases the difference will be two or three semitones.[7]

HL is realized as a rather large interval. With about four semitones it is the largest of the four.

LH is realized as a pitch increase of only two, sometimes three semitones. The reduction of ascending intervals is very common.[8] But since there is a sister language of Shinasha where ascending steps are not reduced,[9] it is worth noting here that in Shinasha, they are.

---

[7]Cf. Collier's physiology-based explanation: "[I]n sequences of like tones [...] each tone is produced on a successively lower pitch" [Collier 1984:238]. In Shinasha this is true for subsequent low tones; high tones behave differently.

[8]Collier [1984:238] generalizes that "after a low tone (L), a high tone (H) does not reach its usual pitch but stops short of it: it is assimilated downward."

[9]This reduction of ascending intervals by intonation or downdrift may not be universal; it certainly is not universal with intervals of this size. In languages of four or five tonal levels, the tolerance for interval reduction is very small or even non-existent. Cf. Bearth's analysis of restraints on intonation in a four tone language: "l'intonation expressive se superpose rarement

To summarize these observations on disyllabics, the tonetic realisations of HH, HL, LH, and LL utterances will be presented in Table 3 below. In this table, the average "low" tone is regarded as the zero level (which corresponds to about 220 Hertz with the young male Shinasha informants), and the distance between two lines represents the interval of one semitone. Lines in parentheses (—) show where tones "should be" if there were no intonation, downdrift, or assimilation. Lines without parentheses show the actual pitches observed in "a-only" disyllabics.

Table 3: Pitch movements in *a*- only disyllabics

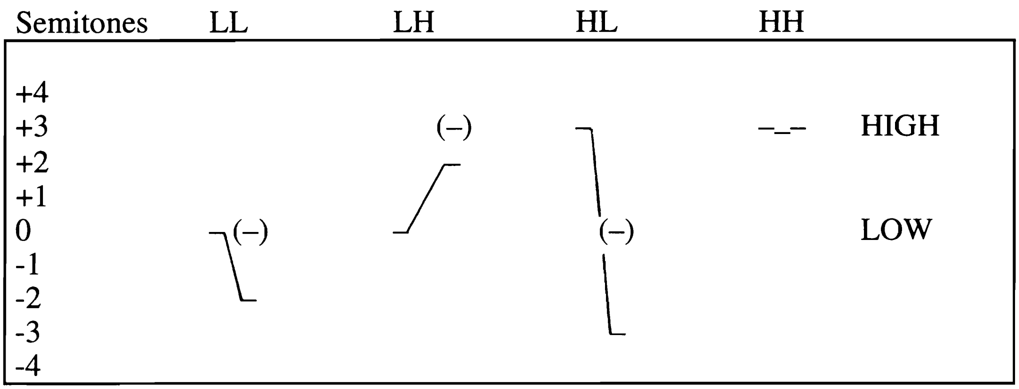

Table 3 does not display anything extraordinary. The only remarkable features of Shinasha when compared with other languages of two tones are the absence of downdrift in HH sequences and the rather dramatic drop in HL sequences.

5. Vowel Quality and Pitch

As soon as differences of vowel quality are introduced, the picture changes. On a [+HIGH] vowel, a high tone syllable will have an "extra high" pitch (EH). The Shinasha vowels which count as [+high] are *i*, *u*, and the central high vowel *ɨ*.[10]

The following data will exemplify the effect which [+high] vowels have on the tones of monosyllabics. Isolated monosyllabics were chosen in an attempt to exclude factors other than those which are of interest here, viz. vowel quality and tone. The data are the Shinasha pronouns *tà* 'I', *nè* 'you sg.', *bí* 'he', *bì* 'she', *nò*

aux tons en toura [an Ivorian language]. En revanche, les locuteurs disposent d'un certain nombre de morphèmes segmenteaux spécialisés [...]". Cf. also Wedekind [1983:136] on Gimira which, with five level tones, has a "very small range [about one semitone...] in intonational variation and in [...] 'downdrift'".

[10]In Gimira, the segments of comparable behaviour include *i*, *u*, V*y*, and *u*-coloured nasals. Concerning Shinasha *a*, note §7 on extra high tone in *gálá*.

'we'[11], *ʔít* 'you pl.', and *bó* 'they'. They were read and recorded by a young Shinasha informant. The resulting pitches are presented in Table 4.

Table 4: Vowel quality and pitch

Toneme	L	L	EH	L	L	EH	H
Vowel			[+HI]	[+HI]		[+HI]	
Word	*tà*	*nè*	*bí*	*bì*	*nò*	*ʔít*	*bó*
Gloss	I	youSG	he	she	we	youPL	they

Table 4 shows that isolated high tone words have an extra high pitch (EH) if the vowel is [+high]. But [-high] vowels of high tone behave "as they should", and so do [+high] vowels of low tone.

5.1. Combination of high and low tones with high and low vowels. In tone studies, it is only recently that data on the impact of vowel quality on pitch have become available for closer studies. Hombert [1978:96], in a survey of the relevant data, still concludes that these data "do not suggest that the development of contrastive tones from vowel height is a widely attested process." Schuh [1978:224] agrees that "The few cases of a connection between tone and vowel height are unconvincing or have alternative explanations."

More recently, Beckman [1986:129] has taken a stronger position: "Other things being equal, a higher vowel generally has a higher FO than a lower vowel [...], and the effect has been found in enough different languages that there must be a physical basis." But most of her references are on non-tonal languages.

Since Shinasha, like Gimira, seems to be one of the few tone languages with firm data on pitch-vowel relations, this issue will be given more attention in the subsequent paragraphs. For instance, the following questions arise: How will the different vowel qualities affect the actual pitches of different tones? How will neighbouring syllables and vowels affect each other? And how will differences of vowel qualities affect tonemic differences eventually? The following data display the effect of vowel differences on the actual pitch movements in Shinasha disyllabics.

In **HH** sequences, there can be a slight ascent of about one semitone if both vowels, or the last, are [+high]:

(33) *áttí(rít)* 'you (pl.) sprouted (flourished)'

The pitches are identical if none of the vowels is [+high]:

[11]We are not sure about the exact meaning of 'we' here.

(34) *bóorsá* 'bag'
áttá 'to sprout'

In **LL** sequences, there is a noticeable descent (about two semitones) if only the first vowel is [+high]:

(35) *dùubà* 'music'
ìndà 'mother'
bùudà 'flour'

There also is a similar descent (up to two semitones) in all other cases, i.e. if both vowels, the last, or none are [+high]:

(36) *àmì* 'let her go'
-əwɨ̀ 'that (fem.)'
àmà 'let me go'
kànà 'dog'

In **LH** sequences, there is a large ascent (up to four semitones) if only the last vowel is [+high]:

(37) *àmrɨ́* 'you pl. went'
àmrí 'you sg. went'
àmí 'let us go'

There is a smaller ascent (about two semitones) if both, the first, or none are [+high]:

(38) *ìndá* 'arm'
shɨ̀rá 'root'
jòorá 'chair'
bòlá 'mule'

In **HL** sequences, there is a large descent (five semitones or more) if only the first vowel is [+high]:

(39) *ímà* 'let me give'
úshà 'the drink'
míttà 'wood'

There is a rather large descent (four semitones or more) if both or none of the vowels are [+high]:

(40) *géshà* 'wheat'
ímì 'let her give'

6. The Impact of Vowel Quality on Pitch

The impact of vowel quality on pitch and the amount of phonetic variation really is considerable, especially in isolated utterances, where extra high pitches are not "smoothed out" by neighbouring syllables. In the particular recording of pronouns which was presented in Table 4 above, the tonetic distance between a "normal high" and its "extra high" variant is bigger than the tonetic distance between low and normal high. If it weren't for the rest of the Shinasha data, this language would be a three tone language. One needs to visualize the actual intervals to appreciate how far away the "extra high" is from the others.

Table 5: Low vs. high vs. extra high

Semitones above LOW								
+7			—			—		EXTRA HIGH
+6								
+5								
+4								
+3								
+2							—	HIGH
+1								
0	—	—		—	—			LOW
Hertz	156	156	233	156	156	233	175	
Tone	L	L	EH	L	L	EH	H	
Word	tà	*nè*	*bí*	*bì*	*nò*	*ít*	*bó*	
Gloss	I	youSG	he	she	we	youPL	they	

The "extra high" variants of "high" tones are not limited to the reading of pronouns or to the idiolect of one informant. They are also documented in different words and in the data given by different informants. For this reason it is not possible to just disregard the extravagant behaviour of words like *bí* 'he" or *ít* 'they'.

7. The Dynamics of a New Pitch

Will the dynamics of the "extra high" tones affect the Shinasha tone system as a whole? This is not altogether unlikely, for the following reasons:

(a) There is an Omotic sister language of Shinasha, Gimira, where this has actually happened; and

(b) There is at least one Shinasha noun which has an "extra high" tone on a non-high vowel (*gá̋lá̋* 'village').

We have no explanation why a word such as the inconspicuous, non-ideophonic morpheme 'village' should have extra high tones, tones which in the rest of our Shinasha data are strictly limited to high vowels. But with reference to other languages, especially Gimira, it is inviting to argue as follows:

Gimira, with a firmly documented system of five contrasting level tones, is surrounded by languages of only three tones or less [Wedekind 1983:134, 1985b:884, Breeze 1986:68, 1988:480ff]. A comparison of cognates in these languages shows that Gimira has lost its word final vowels, and most of the CVCV cognates are CVC in Gimira [Wedekind 1985a:113ff]. This reduction was compensated for, as Hombert [1978:102-103] would say, by a "development of new tones [...] in an already complex system". However, this has not been "creating new tone shapes" as he reports for West African languages, but new tone levels.

In this "tone-splitting" [Schuh 1978:228] which can be documented for Gimira, there is one feature which Shinasha has in common with Gimira. As in Shinasha, the Gimira data show that "high vowels frequently carry a high tone". In Gimira today, "there are more high vowels of higher tones than a normal distribution would allow for" [Wedekind 1985b:887, 886]. The extra high tone, for instance, is found on 31% of all *i* vowels, as against 8%, 3% and 3% for *e*, *a*, *o* respectively (where 16.6% would be expected–Wedekind [1983:141]).

So both in Shinasha and in Gimira, high vowels correlate with high tones. The difference is that in Shinasha the instances of "extra high" pitches are limited to, and conditioned by, high vowels, and therefore, they constitute no "new tone" (yet).

Or do they? The domain of "extra high" pitch has extended to at least one non-high vowel, *a*. Sometimes differences of quantity bring differences of quality: "The separation of tone 5 [the extra high tone ...] may have become phonemic once the phonetic exponents of a very high tone (i.e., tone 5) approached a critical percentage" [Wedekind 1985b:899]. Percentages are of interest here. Weidert [1981 passim] has argued that in the development of a tonal system, a critical mass of tonetic differences must gather before a new pitch can split off to constitute a new toneme.[12] In Shinasha, there is at least one morpheme, *gáĺá*, where pitch exhibits a new quality.[13]

REFERENCES

Akilu Yilma. 1988. "Sheko phonology and morphophonemics." Abstract of paper presented at the Xth International Conference of Ethiopian Studies, Paris, 1988.

Ashenafi Tesfaye. 1989. "The structure of the noun phrase in Shinasha." M.A. thesis, Addis Abeba University.

Bearth, Thomas. 1968. "Etude instrumentale des tons du toura (Côte d'Ivoire)." *Cahiers Ferdinand de Saussure* 24:45-58.

Beckmann, Mary E. 1986. *Stress and Non-Stress Accent.* Dordrecht: Foris.

Bender, M. Lionel. 1987. "First steps toward Proto-Omotic." In David Odden (ed.), *Current Approaches to African Linguistics* Vol. 4,, pp. 21-36. Publications in African Languages and Linguistics 7. Dordrecht: Foris.

Breeze, Mary. 1986. "Personal pronouns in Gimira." In Ursula Wiesemann (ed.), *Pronominal Systems*, pp. 47-70. Tübingen: Narr.

Breeze, Mary. 1988. "Phonological features of Gimira and Dizi." In Marianne Bechhaus-Gerst and Fritz Serzisko (eds.), *Cushitic-Omotic: Papers from the International Symposium on Cushitic and Omotic Languages, Cologne, January 6-9, 1986*, pp. 475-487. Hamburg: Buske.

Collier, R. 1984. "Some physiological and perceptual constraints on tonal systems." In Brian Butterworth et al (eds.), *Explanations for Language Universals*, pp. 237-248. Berlin: Mouton.

[12]The critical percentage, according to Weidert, is around ten percent [Weidert 1981].

[13]Alternative explanations would have to posit special vowel features for *a* or some kind of vowel harmony which includes *a* with the high vowels. A marked semantic feature for *gáĺá* 'village' is also conceivable, but rather unlikely.

Fekadie, Baye. 1988. "Shinasha verb and noun morphology." B.A. thesis, Addis Abeba University.

Fleming, Harold. 1975. "Recent research in Omotic-speaking areas." In Harold Marcus (ed.), *Proceedings of the First United States Conference in Ethiopian Studies, 1973,* pp. 261-278. East Lansing: Michigan State University.

Fleming, Harold. 1976. "Omotic overview." In M. Lionel Bender (ed.), *The Non-Semitic Languages of Ethiopia*, pp. 299-323. East Lansing: Michigan State University..

Gabre Bizuneh. 1986. "The Phonology of Shinasha: a generative approach." Unpublished B.A. thesis, Addis Abeba University.

Grottanelli, Virgil L. 1941. "Gli Scinascia del Nilo Azzurro ed alcuni poco noti dell loro lingua." *Rassegna di Studi Etiopici* 1:234-270.

Hombert, Jean-Marie. 1978. "Consonant types, vowel quality, and tone." In Victoria A. Fromkin (ed.), *Tone: A Linguistic Survey*, pp.77-112. New York: Academic Press.

Maddieson, Ian. 1984. *Patterns of Sounds.* Cambridge: Cambridge University Press.

Plazikowsky-Brauner, Herma. 1950. "Schizzo morfologico dello ʃinaʃa". *Rassegna di Studi Etiopici* 9:65-83.

Plazikowsky-Brauner, Herma. 1970. "Die Schinascha in West-Aethiopien." *Zeitschrift fuer Ethnologie*, pp. 29-41.

Schuh, Russell G. 1978. "Tone rules." In Victoria A. Fromkin (ed.), *Tone: A Linguistic Survey*, pp. 221-256. New York: Academic Press.

Wedekind, Klaus. 1983. "A Six-tone language in Ethiopia: tonal analysis of Bench^4 Non^4 (Gimira)." *Journal of Ethiopian Studies* 16:129-156.

Wedekind, Klaus. 1985a. "Thoughts when drawing a map of tone languages." *Afrikanistische Arbeitspapiere* 1:105-124.

Wedekind, Klaus. 1985b. "Why Bench' (Ethiopia) has five level tones today." In Ursula Pieper and Gerhard Stickel (eds.), *Studia Linguistica Diachronica et Synchronica*, pp. 881-901. Berlin: Mouton de Gruyter.

Wedekind, Klaus. 1989. "Status and dynamics of Ethiopian vowel systems." *Journal of Ethiopian Studies* 22:105-135.

Weidert, Alfons. 1981. *Tonologie: Ergebnisse, Analysen, Vermutungen.* Tuebingen: Niemeyer.

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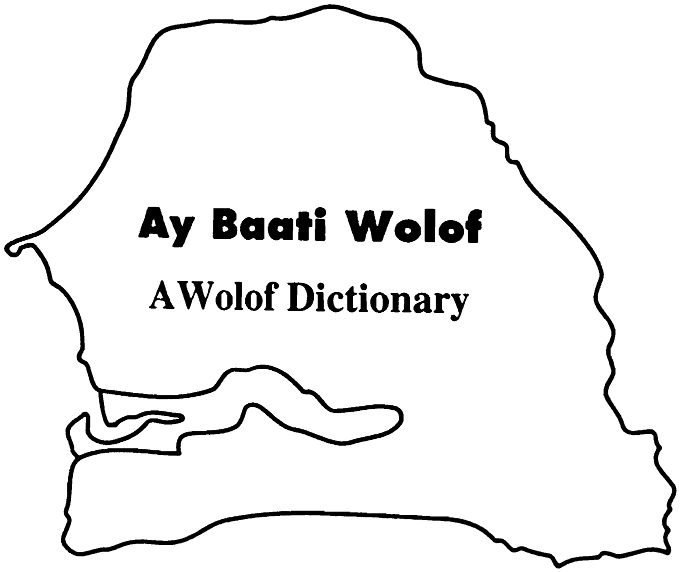

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