LEXICAL AND POST-LEXICAL RULES IN BUKUSU TONOLOGY

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Morphology is again emerging as a distinct module interacting with other components of natural grammars. Phonological rules frequently make reference to morphological information. For example, tone often serves a morphological function in specifying tense and aspect in Bantu languages, along with segmental material. Tonal systems typically interact with and are constrained by accentual systems and syllable structure. There is a general trend in Bantu languages for a morphological tone to be realized one tone-bearing unit (TBU) to the right, and in some languages tone has been shown to migrate even further. "Tone-shift" is used as general term in this thesis to cover instances of morphological tone being realized on segmental material for which it is not lexically specified. "Tone-spread" describes a subset of such phenomena in which association, but no disassociation, takes place. This is the situation which is found in Bukusu, the language in question.

In terms of data, this research is completely dependent on the pioneering work of Dr. Cheryl Austin. Data collected from a native Bukusu speaker did not in all respects agree with Austine's data, so a decision was made to limit the scope of this work to a reanalysis of the latter. Austine
herself collected most of her data from two individuals, Simeon Chilungu and Elizabeth Kamukotte, both originally from near the town of Bungoma, Kenya. There is no attempt on Austine's part to characterize any dialectal variation within the Bukusu-speaking area, although locals acknowledge the existence of such variations.

A brief description of the background of the Bukusu people is in order, based on Austine (1974:1-14). The language is currently spoken in western Kenya, in the foothills south of Mt. Elgon. Its speakers consider themselves a subset of the Luhya group, and their language is most closely related to that of the Gisu people of eastern Uganda. There is an oral tradition that describes how the Bagisu and Babukusu came to be separated, the latter being driven out of eastern Uganda to their current location in western Kenya. Maina, chief of the mother group, found that his eldest son Chesekweli was committing adultery with his wife, and sentenced him to death for his crime. Masaaba, the second son of Maina, and ancestor of the Gisu, supported his father in this matter, while the youngest son, MuBukusu, ancestor of the Babukusu, disagreed with the severity of the punishment. In anger, Maina exiled his sons Chesekweli and Mubukusu, together with their followers, from his land.

Brown (1968) presents an in-depth dialectal survey of the Gisu-speaking area in eastern Uganda. Austine (1974:
3) holds that linguistic facts show Bukusu is more closely related to the southern Gisu dialects, particularly that of BuwuBwala. The separation of the Bukusu from the other dialects is attributed to the invasion of a Nilotic group, the Teso. Incessant cattle raids eventually drove them into western Kenya.

Profound thanks goes to the members of my master's thesis committee for their patience, help, and guidance in the project: Joe Amoako, Richard McGinn, and especially the chair, James Coady.
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The Model

Autosegmental Phonology (Goldsmith 1976) and Lexical Phonology (Mohanon 1982) have attempted to provide a principled account of tonal phenomena in general, and tone-shift in particular. Within the Autosegmental school, advances in the theory of a skeletal tier have provided a means of decomposing contour tones into a series of level tones, each attached to at least one tone-bearing unit. Current research issues center upon the organization of the phonological geometry: for instance, does tone attach to timing slots of the CV tier, to the segmental tier, or a syllabic tier? At the interface of Morphology and Phonology, Lexical Phonology has provided an account of how Lexical rules might interact with phonological rules within the Lexicon. These Lexical rules are distinguished from the Post-Lexical, which apply after the morphology has been fully concatenated. The extent of this Post-Lexical domain is a hotly debated issue. Lieberman (1983) suggests that the Post-Lexical phonology is equivalent to the phonetic component, but Pulleyblank (1986) presents evidence that this position is too strong. Pulleyblank follows Mohanon (1982) in assuming a unified set of phonological rules, each
of which is specified as applying Lexically, Post-lexically, or both. This is schematized in Fig. 1:

Fig. 1: Lexical and Post-Lexical Phonology

The domain of a rule must consist of a continuous set of strata. Strata are environments of cyclic morphological concatenation, which are scanned by the phonology for rules whose structural descriptions are met. The application of Lexical and Post-Lexical rules can be characterized by the sets of properties appearing in (A) (Pulleyblank 1986:6):
(A) Lexical and Post-Lexical Properties

Lexical: Post-Lexical:

1.) may refer to 1.) cannot refer to word-
word-internal structure internal structure
2.) may not apply across 2.) may apply across
words words
3.) may be cyclic 3.) cannot be cyclic
4.) if cyclic, then 4.) non-cyclic, therefore
subject to strict across the board
cycle
5.) structure-preserving 5.) need not be
structure-preserving
6.) may have Lexical 6.) cannot have Lexical
exceptions exceptions
7.) must precede all 7.) must follow all
Lexical rule Lexical rule
applications applications

The key generalization is that cyclic rule application precedes non-cyclic. Cyclic tone association is motivated within Lexical Phonology by the principle (Goldsmith 1976) that the rules associating tone with segmental material should apply whenever their structural description is met. Pulleyblank (1986) shows that tonal association respects morphological bracketing in languages such as Margi and Tiv. He stresses (1986:21): "But while most of this book argues for cyclic association, I want to stress that such cyclic behavior is the result of a cyclic morphology, and not a special property of tone per se. If tone was present in a language with a non-cyclic stratum, then tone association on such a stratum would be non-cyclic".
Goals of the Research

This study will restrict itself to the analysis of Bukusu verbs, since due to their highly agglutinative nature, they display most readily the work of tonal processes. Also, verbal tone conforms in general to a tense/aspect paradigm, which makes it easier to set up underlying forms. Irregularities in the paradigm can be caused by such things as the tonal effects of vowel fusion. This sometimes triggers tone-shift, the most distinctive tonal phenomenon. These perturbations, however, as can be seen in analyses of Kikuyu in Chapter 4, can serve as a diagnostic for the cyclic or non-cyclic nature of phonological processes. Metrical structure often plays a role as well in tonal processes: in the literature, some languages have even been argued to have cyclic application of rules affecting accent assignment (Hyman 1983).

Asymmetries in rules applications, particularly in the area of the verb stem, may imply underspecification, which can only be predicted by the Strict Cycle Condition. This is due to the fact that some rules will not be blocked before the assignment of tonal default values, while some may. Sometimes, as will be argued for Bukusu, morphological tone will be specified for segmental material that had remained unspecified through a previous cycle. Polarity effects, in particular, which are typically analyzed as boundary tones, supply evidence in this regard. Asymmetrical rule
application may apply particularly to "heavy" and "light" syllables if the tonal or stress systems are quantity sensitive.

This thesis minimally assumes the autosegmental framework as established in Goldsmith (1976). The central theoretical concern is whether the cyclic application of phonological rules is necessary to account for the distribution of verbal tone in Bukusu, a Bantu language of western Kenya. Morphological tone, stress, and syllable structure interact with and constrain each other in various ways. Perhaps the starting place for a fresh analysis of Bukusu verbal tone within the framework of Lexical Phonology would be to determine which processes can be described as applying cyclically, and which cannot. Further complicating the issue are the effects of phrasal phonology, which overlay the Post-Lexical word-level phonology. This study, however, will confine itself to word-level processes. When examining cyclic processes, it is important to bear in mind that while morphological brackets may specify the environment for rules to apply, they also constrain these rules. For example, in a language where there is no cyclic application of a tone-shift rule, the morphological cycle will ensure that an underlingly toneless morpheme is not automatically associated by a rule of Tone Spread before the default rules have applied.

This thesis will motivate a rules system, based on
Austine's, dividing the tonal rules of Bukusu into Lexical and Post-Lexical components. There are three independent arguments that Austine's rule of Dissimilation is a Lexical rule in the sense of Mohanon (1982). First, it is morphologically conditioned in a way that can only be accounted for by the Strict Cycle Condition. It will be shown in Chapter 5 that Lexical rule application and the Strict Cycle Condition are crucial in interpreting this rule as the insertion of a boundary-tone at a particular morphemic boundary. Second, Dissimilation has exceptions, so must make reference to information contained in lexical entries of morphological items. For example, there is no phonologically-motivated reason that Dissimilation should not apply to negative forms, or occur only in certain tenses. Post-Lexical rules applications do not permit such exceptions, but apply across-the-board. Third, Austine finds that Dissimilation must be ordered before all other rules. This is significant because Lexical rules must precede all Post-Lexical rules applications. These arguments are all developed in Chapter 5.

The researcher will argue for placing the mechanisms of Bukusu tone-shift in the Post-Lexical component of the grammar. The data in Chapter 6 illustrate the generalization that there is a sequence of at least two H-tones in any word with a H-tone at all. This seems to adhere to the Post-Lexical property (a la Pulleyblank) of
across-the-board application (across verb-root classes, across tenses). Cyclic processes can be posited for other tonal phenomena, but the researcher can find no evidence of cyclicity in the rules of tone-shift. Rather, it seems that tone-shift applies across-the-board on fully concatenated verbal forms. Austine's separation of the work of tone-shift into the rules of Assimilation, High Spread, and High Copy loses the important generalization that there is a "culminative" effect upon the verbal complex. Hyman (1983) in his accentual analysis of Luganda (a language closely related to Bukusu), finds that there is a maximum of one H to L drop per word. He writes (1983:2): "This latter property inspires McCawley to suggest that Luganda starts out with an underlying accentual system which becomes a tonal system at a later stage in the derivation". Thus, the lexicon would specify [*] or [ ] (no accent) for each morpheme. It is only the first tone-bearing unit with an underlying [*] that will be assigned a H-tone at surface structure: any successive TBU's specified for [*] will be realized L-tone, and any subsequent TBU's specified for [ ] (no accent) will surface H:

(I.)

```
* * * *
/           /
 a-ba-ta-li-lab-il-il-a ## a-ba-pakas-i
 L  H  L  H  L (H)
```
Here, it is seen in a language closely related to Bukusu that historically tonal Bantu processes are being reinterpreted accentually. Goldsmith, as cited in Chapter 6, holds this to be a trend across Bantu languages. Interestingly, Hyman admits the possibility that underspecified tone might account for the same data, but sees no incompatibility with the accentual approach that he himself takes.

This analysis of Luganda tone-shift suggests the value of an accentual approach to the mechanism of Bukusu tone-shift. Austine's rules of Assimilation, High Spread, and High Copy might be collapsed into a single process if we account for it in terms of the construction of a binary metrical foot being triggered by the first underlying H-tone in a Bukusu verb. If the right element of such a metrical foot is not already underlying H, the construction of the foot will license tone-spread to the right edge of the foot. As construction of such a foot could only happen once in a word, it would serve a kind of "culminative" function.
The Verbal Tone System

This research is deeply indebted to Dr. Austine, who has provided the entire body of data used in this analysis. In this chapter, the researcher characterizes the nature of Austine's analysis of Bukusu tone, and attempts to briefly evaluate it within the framework of Lexical Phonology. In Chapter 3, a tonal rules system consonant with the principles of Lexical Phonology is presented. Austine (1974:196) posits three kinds of tonal patterns in the Bukusu tense/aspect system. There are those that are (1.) morphological conditioned, (2.) phonologically derived from rules triggered by morphological conditions, and (3.) phonologically derived from rules not triggered by morphological conditions. Here are the ordered formal representations (or definitions) of the tonal rules in Bukusu, according to Austine:

(B) Tonal Rules System (Austine)

(1.) Dissimilation Rule

Ensures that the infinitive, present participle, and the affirmative forms of the present, remote future, near past, and imperative tenses realize at surface level a "polar" tonal contrast between the underlying tone of the root and the first syllable of the extension. The second mora of the verb root will count as an extension. If the verb root is underlyingly L-toned, a H-tone will be
inserted by this rule and associated to the following mora. If the verb root is underlyingly H-toned, this rule will apply vacuously (since all verbal extensions are underlyingly L-toned).

(2.) Terracing Rule

Stipulates that the second H-tone of a HLH series is realized at a lower pitch than the first H-tone.

(3.) Assimilation Rule

\[
\begin{bmatrix}
L \\
+syl \\
-cons
\end{bmatrix} > \begin{bmatrix}
H \\
+syl \\
-cons
\end{bmatrix} \quad / \quad L \quad H \quad [+seg]
\]

(4.) High Spread

\[
\begin{bmatrix}
L \\
+syl \\
-cons
\end{bmatrix} > \begin{bmatrix}
H \\
+syl \\
-cons
\end{bmatrix} \quad / \quad H \quad + \quad \begin{bmatrix}

\end{bmatrix} \quad \text{verb root}
\]

(5.) High Copy

\[
\begin{bmatrix}
L \\
+syl
\end{bmatrix} > H \quad / \quad \begin{bmatrix}
H \\
+syl
\end{bmatrix} \quad C
\]

(6.) Dampening

\[
\begin{bmatrix}
H \\
+syl \\
-cons
\end{bmatrix} > [+falling] \quad / \quad \begin{bmatrix}
L \\
+syl \\
+nas
\end{bmatrix}
\]

Dissimilation (Dis.) is a morphologically conditioned rule, and it is unfortunate that nowhere does Austine provide a formalization of it. Terracing (Ter.) corresponds to what is generally known as "downdrift", and within Lexical Phonology would be expected to be a late Post-Lexical rule, for reason of its across-the-board application. Assimilation (Asm.) applies once in words initiated by a L-
tone or series of L-tones followed by a H-tone. High Spread (HS) occurs only at the boundary between the verb root and its prefixes; it must be preceded by glide elision, and followed by vocalic fusion. Austine orders it before the rules whose structural descriptions are more specific, however, contrary to the Elsewhere Condition of Lexical Phonology. High Copy (HC) spreads a H-tone leftward in the environment of adjacent vowels or an adjacent vowel and nasal. The principles of Lexical Phonology would minimally predict that High Spread would precede Terracing, since the former seemingly is morphologically conditioned, and clearly has the more specific structural description. By the same criterion, Terracing would be ordered after all of the other tonal rules. Austine's ordering anticipates one claim of Lexical Phonology, however; that is, the most clearly morphologically conditioned rule is ordered first.

This research will focus on the rules of Dissimilation, Assimilation, High Spread, and High Copy, and it will be shown that they can be accounted for in a highly principled fashion within the framework of Lexical Phonology, with metrical structure acting as the primary trigger of tone-shift. (II.) (Austine 1974:209) illustrates the effects of the extrinsic rules ordering:
(II.)

a-xù-xlol-êl-a
he-you(s.)-work-for-Pres.
"He works for you".

ka-á-xlol-êl-a
he-me-work-for-Pres.
"He works for me".

a-li-xù-ulîl-a
he-Rem. Fut.-you-listens-Asp.
"He will listen to you".

a-li-i-ulîl-a
he-Rem. Fut.-it-listen-Asp.
"He will listen for it".

Rule

Dis. ãxùxolèlè kàáxolèlè àlixùulîlè àliiùulîlè
Ter. ãxùxolèlè kàáxolèlè àlixùulîlè àliiùulîlè
Asm. ãxùxolèlè kàáxolèlè àlixùulîlè àliiùulîlè
HC  -------- kàáxolèlè  -------- àliiùulîlè

Surface Tone Levels:

Note that the rules of High Spread, High Copy, and Dampening include as part of their structural description two adjacent tone-bearing units (TBU's). This might indicate that "syllable weight" is a factor in rules operations, though it would not be the case that such syllables are licensed for only one tone, as is the case in Kikuyu.
Of Austine's tonal rules, only Dissimilation makes reference to specific morphological information. That is, for certain combinations of morphemes (tenses), it makes reference to the underlying tonal specification of the verb root, and ensures that there is a "polar" contrast between it and the first mora of the extension. Since an underlying L-tone is posited for all segmental verbal suffixes, Dissimilation applies vacuously when the verb root is underlyingly H-toned. CVVC and CVNC verb roots exhibit exceptional behavior in regard to this rule, however, in that the second mora of the root undergoes Dissimilation only if it is in penultimate (primary stress) position. Austine (1974:210) offers the examples in (III.)

(III.)

em-(b)aan-a  
I-give-Pres.  
"I give".

en-du[j]g-a  
I-pay-Pres.  
"I pay".

Rule

Dis. èmbăánà    èndù[j]gà
HC èmbăánà      èndù[j]gà

If the iterative/habitual suffix /-vëg-/ is added, or the verb is conjugated in the Near Past tense, Dissimilation will affect only the mora to the immediate right of the verb
root, as in (IV.)

(IV.)

em-baan-a\(\text{g}\)-a  
I-give-hab.-Pres.  
"I usually give".

en-du\(\text{g}\)-a\(\text{g}\)-a  
I-pay-hab.-Pres.  
"I usually pay".

em-baan-ile  
I-give-Near Past  
"I gave recently".

en-du\(\text{g}\)-ile  
I-pay-Near Past  
"I paid recently".

Rule

<table>
<thead>
<tr>
<th>Dis.</th>
<th>èmbààná(\text{g})</th>
<th>èndù(\text{g})á(\text{g})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm.</td>
<td>èmbààná(\text{g})</td>
<td>èndù(\text{g})á(\text{g})</td>
</tr>
</tbody>
</table>

| Dis.         | èmbàànilè | èndù\(\text{g}\)ílè |

Thus, adjacent vowels or an adjacent vowel and nasal within a verb root will be treated by the Dissimilation Rule as a unit. Crucially, the rule seems to be morphologically conditioned. That is, a H-tone will be inserted on the next mora after the right edge of the verb root in the presence of certain morphemes. With CVC + VC verb roots (+ denoting a morphemic boundary, say, between the verb root and benefactive morpheme /-il-/), on the other hand, the
operation of Dissimilation will not be effected when extra syllables are added. The mora to the immediate right of the verb root will realize a polar tonal contrast, regardless of whether the verb root has one or two TBU's. Hyman (1990) writes that so-called polarity effects can usually be analyzed as boundary tone insertion. Dissimilation will apply only once per verb, so one might posit that it is a non-cyclic lexical rule applying at Stratum 1 (see Chapter 3). It is non-cyclic because it occurs only on that stratum, and Lexical because it occurs only word-internally. It must precede Assimilation, which is triggered if a second derivational suffix is added (1974:213):

(V.)

emb-0-ulil-a][g-a
I-Pres.-listen-Hab.-Asp.
"I usually listen".

xu-0-xol-el-an-a][g-a
we-Pres.-work-for-Hab.-Asp.
"We usually work for each other".

Rule

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dis.</td>
<td>èmбу́lilá][gá</td>
<td>xùхòlélàná][gá</td>
</tr>
<tr>
<td>Asm.</td>
<td>èmбу́lilá][gá</td>
<td>xùхòlélàná][gá</td>
</tr>
<tr>
<td>Damp.</td>
<td>èmбу́líla][gá</td>
<td>--------</td>
</tr>
</tbody>
</table>

To generalize, Dissimilation seems to be subject to the Strict Cycle Condition in that it respects the morphological
bracketing of CVC, CVVC, and CVNC verb roots (see XXIII and N, Chapter 5), except where CVVC and CVNC verb roots have no derivational suffixes attached (see XXIV, Chapter 5). Here, the H-tone corresponds to the position of penultimate stress. One way of accounting for this is to say that the stress "attracts" the H-tone, formalized in Chapter 3 as the rule of Penultimate Stress Attraction. Note that this only occurs in so-called "heavy syllables", and there is independent reason to believe that metrical structure in Bukusu is quantity-sensitive.

In the researcher's view, tone-spread in Bukusu, accounted for in Austine's three rules of Assimilation, High Spread, and High Copy, is not morphologically conditioned. Although Clark (1990) presents evidence (detailed in Chapter 4) that tone-shift in Kikuyu is a Lexical process, Bukusu tone-shift is better accounted for in metrical terms. Further, it will be shown that its general properties can be characterized as Post-Lexical. The verb roots in VI (Austine 1974:197) are all underlyingly H-toned. The first two columns have non-relative clause subject markers (hereafter referred to as NSM's), which are underlyingly L-toned, while the second two have relative clause subject markers (hereafter referred to as RSM), which are underlyingly H-toned. The verbs are conjugated in the Immediate Past tense. The second two columns appear with the object concordial marker (OCM) /-mu-/ "him". These
examples are to be identified with the subject and object above them, and the verb to their left:

(VI.)

\[ \beta a\text{-}0\text{-}mu\text{-}y\text{\-}et\text{-}ile \]

\[ \text{they-Imm. Past-him-help-Asp.} \]

"They just helped him".

<table>
<thead>
<tr>
<th>Help</th>
<th>They Ved</th>
<th>who Ved</th>
<th>they Ved him</th>
<th>who Ved him</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta ayetile )</td>
<td>( \beta ayetile )</td>
<td>( \beta amuyetile )</td>
<td>( \beta amuyetile )</td>
<td></td>
</tr>
<tr>
<td>( \beta asutille )</td>
<td>( \beta asutille )</td>
<td>( \beta amusutille )</td>
<td>( \beta amusutille )</td>
<td></td>
</tr>
<tr>
<td>( \beta alamille )</td>
<td>( \beta alamille )</td>
<td>( \beta amulamille )</td>
<td>( \beta amusutille )</td>
<td></td>
</tr>
</tbody>
</table>

Austine accounts for tone-shift here by means of the Assimilation rule, repeated below for convenience:

(3.) Assimilation Rule

\[ L > H / L \ H \text{ ___ [+seg]} \]

Since all NSM's in Bukusu are underlyingly L-toned, the underlying H-tone of the verb root meets the structural description of Assimilation, and so spreads. Note that since the H-toned RSM is not preceded by a L-tone, the structural description of Assimilation is not met. The rule will apply, however, in the non-relative forms with an OCM (which are underlyingly H-toned) preceeding an underlyingly L-toned verb stem (Austine, 1974:198):
(VII.)

\[ \beta\text{âmúxólèèlè} \]
\[ \beta a-0-mu-xol-il-ile \]
they-Imm. Past-him-work-for-Asp.
"They just worked for him".

They Ved who Ved they Ved him who Ved him
work \[ \beta axönilè \] \[ \beta axönilè \] \[ \beta âmúxólèèlè \] \[ \beta âmúxólèèlè \]
dance \[ \beta axinilè \] \[ \beta axinilè \] \[ \beta âmúxinilè \] \[ \beta âmúxinilè \]
fish \[ \beta âlòbilè \] \[ \beta âlòbilè \] \[ \beta âmùlòbèèlè \] \[ \beta âmùlòbèèlè \]

In Bukusu, in contrast to what has been found for Kikuyu (Chapter 4), each part of a long vowel or a vowel + nasal combination is licensed to bear tone. In this sense, they do not display the properties of "heavy" syllables. The CVVC and CVNC verb roots below (Austine 1974:200) show the same effects of Assimilation as their CVC + VC counterparts above in (VII.); that is, the H-tone after a L-tone spreads by one TBU. (VIII.) consists of H-toned roots, and (IX.) of L-toned roots:

(VIII.)

\[ \beta a-0-mù-réeβ-ile \]
they-Imm. Past-ask-Asp.
"They just asked him".

they Ved who Ved they Ved him who Ved him
ask \[ \beta àrééβilè \] \[ \beta àrééβilè \] \[ \beta âmûréeβilè \] \[ \beta âmûréeβilè \]
call \[ \beta àlâγilè \] \[ \beta àlâγilè \] \[ \beta âmûlâγilè \] \[ \beta âmûlâγilè \]
(IX.)

βămūtéěxēèle
βa-mu-teex-il-ile
they-0-him-cook-for-Asp.
"They just cooked for him".

tyey Ved who Ved they Ved him who Ved him
cook βátěèxilè βátěèxilè βămūtéěxēèle βămūtéěxēèle
pay βárūŋgilè βárūŋgilè βămūruŋgilè βămūruŋgilè

It can be seen that the H-tone moves just one mora to the right, regardless of whether the TBU's are adjacent or otherwise. In the forms of "call" and "pay", the HL contour on the vowel preceeding the nasal is the result of the late phonetic rule of Dampening. This points to interaction between the tonal and metrical systems, in that while tonal assignment seems to be quantity insensitive, some tonal rules do make reference to the adjacency of TBU's, and by extension to syllable weight.

In terms of the phonological geometry, it may be said that in Bukusu tones attach to the moraic, rather than the syllabic tier. Sietsema (1989) presents arguments from Sukuma, a Bantu language spoken on the southeastern shore of Lake Victoria, that tones must attach to the tier that determines timing relations, rather than the segmental or syllabic structure tiers. He (1989:336) cites a number of phonologists working within the Autosegmental framework (McCarthy and Prince 1986, Hayes 1989) who suggest that the
timing function of the skeletal (CV) tier should be relegated to a moraic tier. Such a tier would encode timing relations for only syllable rimes, providing a principled account of why syllabic units such as onsets should not be tone-bearing. Sietsema (1989:336) cites Hayes (1989:287) for the following formal representation:

Fig. 2: Organization of Autosegmental Tiers

[\[ \text{p\`al`a} \]]

High Spread performs the same basic operation as Assimilation, except that it need not be preceded by a L-tone, as seen in the data below in the Remote Past tense. It is morphologically conditioned in that it occurs only at the juncture of the verb root with its immediately preceeding prefix. High Spread is not morphologically conditioned in the same sense as Dissimilation, however, in that it does not make reference to as specific morphological information as the latter. The prefix may be a subject concordial marker, tense marker, or object concordial marker, as seen in (X.) (Austine, 1974:205). This rule always follows glide deletion, and precedes instances of either vocalic fusion or glide formation.
It is important to note that in this tense, the surface distinction between H-toned and L-toned verb roots is lost, in that they have the same tonal shape. (XI.) are all L-toned verbs, with their surface tonal realizations:
(XI.)

ówámuβənə
uu-a-mu-βon-a
who-Rem. Past-him-see-Asp.
"who saw him"

<table>
<thead>
<tr>
<th>Verb</th>
<th>You Ved</th>
<th>see</th>
<th>wáβonə</th>
<th>ówáβonə</th>
<th>wámuβonə</th>
<th>ówámuβonə</th>
</tr>
</thead>
<tbody>
<tr>
<td>work</td>
<td>wáxólə</td>
<td>ówáxólə</td>
<td>wámuxolələ</td>
<td>ówámuxolələ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hear</td>
<td>wáulilə</td>
<td>ówáulilə</td>
<td>wámúulilə</td>
<td>ówámúulilə</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kill</td>
<td>wé:rə</td>
<td>ówé:rə</td>
<td>wámwi:rə</td>
<td>ówámwi:rə</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sing</td>
<td>wémbə</td>
<td>ówémbə</td>
<td>wámwmibilə</td>
<td>ówámwmibilə</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

High Copy performs essentially the same function as High Spread, except without morphological conditioning, and in a right-to-left fashion (as illustrated in III, earlier in this chapter). As with High Spread, it affects only adjacent TBU's. This is cause for suspicion that they are really the same process, especially considering that the morphological conditioning of High Spread has been called into question. The two rules might just be two environments of the same process. There is a generalization to be made about the effects of Assimilation, High Spread, and High Copy: they each result in a sequence of at least two successive H-toned moras in any word with an underlying tone occurring before the penultimate mora. This will be accounted for in a way consonant with the principles of Lexical Phonology in the next chapter.
A Proposal for a New Tonal Rules System

The rules system outlined below will, to the best of the researcher's knowledge, account for all of the verbal forms found in Austine's data. The motivations for the division of the tonal rules of Bukusu into Lexical and Post-Lexical components will be developed in Chapters 5 and 6, respectively.

(C) Tonal Rules System (Proposed)

Lexical Rules

(1.) Tonal Node Insertion: Applies cyclically throughout the Lexical component whenever a TBU is drawn from the Lexicon for morphological concatenation. Following Hayes (1989), it shall be assumed that a node on the tonal tier is dominated by a node on the moraic tier, which in Bukusu comprises the class of TBU's. In Bukusu, this means vowels and syllabic nasals.

(2.) Dissimilation: Where a L-tone morpheme is specified by the verb tense, and associates to the first mora of the verb root, this rule ensures the insertion of a H-tone after the right edge of the verb root during the next morphological cycle. Therefore, this rule applies non-cyclically at Stem Level, Cycle 2. The morphological forms that are specified for the triggering L-tone are the infinitive, present participial, and affirmative forms of the Present, Remote Future, Near Past, and Imperative tenses.

Post-lexical Rules

(3.) Asterisk Assignment: Assigns Line 0 metrical asterisks only to every mora (TBU).
(4.) Primary Foot Construction: A left bracket is inserted immediately before the first metrical asterisk assigned to a mora which is associated with a H-tone on the tonal tier. A right bracket is then inserted immediately after the second mora from the left bracket.

(5.) Extrametrical Foot Construction: If the first mora is not enclosed in the Primary Foot, it is marked extrametrical. The last mora is always marked extrametrical.

(6.) Regular Foot Construction: This will proceed from left to right. If possible, binary, otherwise, unary bounded feet will be constructed. A heavy syllable, if not already divided by a Primary Foot bracket, will trigger the construction of a binary foot.

(7.) Penultimate Stress Attraction: If a H-tone is adjacent to a heavy syllable in penultimate position, then it will undergo Delinking and reassociate with the position of penultimate stress.

(8.) Tonal Node Deletion: If a nasal is syllabified into the onset of a syllable, its node on the moraic tier, and by extension its node on the tonal tier, will be deleted.

(9.) Delinking: If a L-tone contributed by the verb tense that is attached to the first mora of the verb root is located in the Primary Foot, it will be disassociated from the moraic node that dominates it.

(10.) Tone-Spread: If a H-tone is dominated by a moraic node which has been assigned an asterisk located within a binary foot, it will spread to the tonal node dominated by the other mora in the said foot.

(11.) Floating L-tone Deletion: Any existing L-tone that has been subject to the Delinking Rule shall be deleted.

(12.) Default Tone Assignment: A L-tone shall be assigned to all unspecified tonal nodes.
It would be useful at this juncture to go through some sample derivations, using the tonal rules system outlined above, applied to some of the problematic notions for which an analysis consonant with the principles of Lexical Phonology will be motivated in Chapters 5 and 6. Perhaps the most important is the triggering condition that has been posited for Austine's rule of Dissimilation. (XI.) shows a derivation in which the structural description of Dissimilation is met, using the L-toned verb root /-xol-/ , "work". As the insertion of tonal nodes is a cyclic process within the Lexical Component, it shall be assumed in the Rules column:

(XI.)

\[
\begin{align*}
xùxółélánàŋgà \\
xu-xol-ɛl-ɛn-aŋg-a \\
\text{we-present-work-for-reciprocal-habitual-aspect} \\
\text{"We usually work for each other".}
\end{align*}
\]

**Lexical Derivation**

<table>
<thead>
<tr>
<th>STEM LEVEL, CYCLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion of L-tone by the Present tense, affirmative form</td>
</tr>
</tbody>
</table>

(13.) Dampening:

\[
\begin{array}{c}
\begin{array}{c}
\text{H} \\
_{+\text{syl}} \\
_{-\text{cons}} \\
\end{array} \\
[+\text{falling}] \\
\begin{array}{c}
\text{L} \\
_{+\text{syl}} \\
_{-\text{cons}} \\
\end{array}
\end{array}
\]
[xol] el

CYCLE 2
Dissimilation

[xolel] an

CYCLE 3

[xolelan] a\[g

CYCLE 4

[xolelana][g] a

CYCLE 5

xu [xolelana][ga]

WORD LEVEL, CYCLE 1

Post-Lexical Derivation

* * * **** *

xuxolelana][ga

Asterisk Assignment

* * * * * * *

L H
Primary Foot Construction

Extrametrical Foot Construction
Tonal Node Deletion (after resyllabification)

Regular Foot Construction
Tone Spread

Default Tone Insertion

Shared Features Convention
In the foregoing derivation, all of the tonal rules presented in this chapter, with the exception of Delinking and Floating L-Tone Deletion, apply. Notice that the bulk of tonal activity falls in the Post-Lexical portion of the derivation, in marked contrast to what has been posited for Kikuyu. Returning to the operation of the Dissimilation Rule, (XIII.) illustrates where Dissimilation might be blocked: where the tone of the verb root is as yet unspecified.

(XIII.)

\[
\begin{align*}
\beta\bar{x}\bar{o}\bar{l}\bar{i}\bar{\ddot{e}} \\
\beta\bar{a}-\bar{0}-\bar{x}\bar{o}\bar{l}-\bar{\ddot{i}\ddot{e}} \\
\text{they-work-Immediate Past} \\
"\text{They just worked".}
\end{align*}
\]

**Lexical Derivation**

\[
\begin{align*}
x\bar{o}\bar{l} & \quad \text{STEM LEVEL, CYCLE 1} \\
& \quad \text{(No L-tone insertion)} \\
[x\bar{o}\bar{l}] & \quad \text{CYCLE 2} \\
& \quad \text{(Dissimilation blocked by underspecification)} \\
\beta\bar{a} [x\bar{o}l\bar{i}\bar{\ddot{e}}] & \quad \text{WORD LEVEL, CYCLE 1}
\end{align*}
\]

**Post-Lexical Derivation**

\[
\begin{align*}
\beta\bar{a}\bar{x}\bar{o}\bar{l}\bar{i}\bar{\ddot{e}} & \quad \text{Default Tone Assignment} \\
& \quad \text{L L L L L}
\end{align*}
\]
One potential problem for the proposed tonal analysis is that the RSM's, which are lexically specified for a H-tone, don't seem to license tone spread, as seen in forms like [oxàmùrù'gà tåå] "he who doesn't pay him" and [βáxòlìlè] "they who just worked". At the same time, they appear to participate in Primary Foot Construction in forms like [βàmùxòlèlèlè] "they who just worked for him", since Tone-Spread doesn't take place from the lexically H-toned object concordial marker to the verb root. One possible solution is that the RSM's, along with being lexically specified for H-tone, are marked [+extratonal]. This being the case, they would not be subject to any purely tonal rules. Exclusion from interaction with tonal rules, however, would not prevent them from triggering Primary Foot Construction, which would account for forms like [βàmùxòlèlèlè]. As Primary Foot Construction must be ordered before Extrametrical Foot Construction by the Elsewhere Condition, extrametricality will fail to apply at the left edge of relative verbal constructions. (XIV.) illustrates this process:
(XIV.)

óx'amúrú[g ga táà
o-xa-mu-rú[g-a taa
who-not(Present)-him-pay-aspect not
"he who doesn't pay him"

oxamuru[g ga

Output of the Lexical Component

Post-Lexical Derivation

(* *) * ** *
oxa mu ru[g ga

Asterisk Assignment
Primary Foot Construction

(* *)(*)(**)<<>
oxamuru[g a

Extrametrical Foot Assignment
Regular Foot Assignment
Penultimate Stress Attraction

(* *)(*)(**)<<>
oxamuru[g a

Tone Spread
Default Tone Assignment

The Elsewhere Condition will make certain discrimination
that, for example, in the derivation above, Primary Tone
Construction must precede Extrametrical Foot Construction.
A Non-Cyclic Analysis: Clements

In order to illustrate the theoretical issue of the morphological cycle with reference to tonal phenomena, it would be useful to examine a case where such a process has provided a simpler analysis than approaches which assume that all phonological rules operate on fully concatenated morphemes. Work done on Kikuyu by Clements (1984) and Clark (1990), another Bantu language spoken in and around Nairobi, has brought to light a case where the morphological cycle is required to account for certain environments of tone-shift. Clements posits that tones are fully assembled in the verbal complex before the Association Convention applies. The rules that assemble tones he terms the "melody composition" rules, which, along with the Initial Tone Association rule, are language-specific. Goldsmith (1990:14) gives the minimum universal Association Convention as:

(D) Universal Association Convention

When unassociated vowels and tones appear on the same side of an association line, they will be automatically associated in a one-to-one fashion, radiating outward from the association line.

The Universal Association Convention is augmented by
language-specific rules. To account for tones that appear to shift from adjacent vowels onto the following syllable in Kikuyu, Clements (1984:295) posits a rule of Syllable Fusion, forming what is known as a "heavy" syllable. The tonal consequence of this resyllabification he calls Heavy Syllable Shift. He must, however, include an otherwise unmotivated rule of Heavy Syllable Lowering when the L-tone associated with a long syllable is followed by a H-tone. Clark believes that this can be accounted for in a more principled way by letting the Association Conventions apply at every morphological cycle. This shall be dealt with in some detail in the latter part of this chapter.

Clements' (1990:282) analysis of Kikuyu tone is based upon the theory of Autosegmental Phonology. He finds that tonal melodies distinguish tense and aspect, and are thus morphological in nature. He writes:

Formatives making up the verb are of three types: those that are specified for both tonal and segmental properties, those that are specified for tonal properties alone, and those that are specified for segmental properties alone. Much of the complexity of the verbal morphology arises from the interaction of formatives of these three types. In particular, it will be shown that the rules of tone assignments largely disregard the morphological relation between tones and tone-bearing units, with the result that tones are quite typically associated with segmental material characterizing other formatives than their own.

After assembling the tones, Clements (1984:285) maps them onto tone-bearing units through the operation of these (fully specified) Association Conventions for Kikuyu,
summarized in (E):

(E) Kikuyu Association Conventions

(1.) Link the first tone of the tone melody to the second tone-bearing unit of the word.

(2.) Link free tones to free tone-bearing units, one-to-one from left to right.

(3.) Link any remaining free tone-bearing units to the nearest accessible tone.

(4.) Link a remaining free high tone to the tone-bearing unit to the left, to form a contour tone.

The operation of these rules is illustrated in (XV.)

(Clements 1984:294):

(XV.)

má-mo-tóm-aγ-a  
they-him-send-Hab.-Pres.  
"They send him/her".

to-má-rjr-irε  
we-them-look-Past  
"We looked at them".

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<td>ma mo to m aγa</td>
<td>to ma rjr irε</td>
<td>Underlying</td>
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Generally speaking, vowels compose the class of tone-bearing units. Whether adjacent vowels are treated as separate or as unitary tone-bearing units is language-specific, often constrained by the possible syllable structures available. Syllabic parity is thought to operate on the skeletal tier, in that it organizes the slots into the permitted constituent structures. Goldsmith (1990:123-4) introduces the notion of "autosegmental licensing" to describe how syllable structure constrains the operation of phonological rules on lower tiers. The essential idea is that prosodic units are licensers, in that they permit the single occurrence of any of a set of phonological features, or autosegments. Licensing proceeds in a hierarchical, top-down fashion, with the syllable node as the primary licenser, and the coda node as a secondary licenser. All autosegmental material must be licensed by a prosodic unit before it can proceed to the Post-Lexical phonology. Unlicensed features are deleted. Goldsmith observes that there is a "weakening" of the licensing power of the coda relative to that of the syllable, since it has only a subset of the syllable node's licensing capability. For purposes of licensing, the onset and the first element of the nucleus always count as a unit. If the syllable node is licensed...
for tone, the coda node may or may not be. This hierarchy is schematized as Fig 3:

![Fig. 3: Autosegmental Licensing Hierarchy](image)

In Kikuyu, adjacent vowels compose single long surface syllables. Clements (1984:295) formalizes this as (F):

(F) Syllable Fusion

\[
\begin{array}{c}
V \hspace{1em} V > V \hspace{1em} V \\
\theta \hspace{1em} \theta \hspace{1em} \theta \hspace{1em} \theta
\end{array}
\]

To cast this rule in terms of Goldsmith's licensing hierarchy, the coda in Kikuyu is not licensed for a tonal specification of its own. Thus, adjacent vowels will always share the same tone, which behaves as though it were linked to both vowels. This is in accordance with the Obligatory
Contour Principle (OCP), which says essentially that there cannot be two adjacent, identical autosegments, unless they are separated by a word boundary. The OCP is implemented in such environments by a rule of Identical Tone Deletion, formalized as (G):

\[(G) \text{ Identical Tone Deletion} \]
\[T > 0 / T \quad (\text{where } T = T) \]
\[j \quad i \quad i \quad j \]

Assuming the multiple linking of a tone within a long syllable, Clements posits the rule of Heavy Syllable Shift, formalized as (H):

\[(H) \text{ Heavy Syllable Shift} \]

Clements (1984:295-6) illustrates this process (XVI.):

\[(XVI.) \]
\[\text{to-a-rjr-a} \]
\[\text{we-Rem. Past-look-Asp.} \]
\["\text{We looked".} \]
Clements notes that Heavy Syllable Shift applies obligatorily across morphemic boundaries, and optionally across word boundaries. There is an exception, however, when the L-tone associated with a long syllable is followed by a H-tone. Heavy Syllable Shift is blocked by Heavy Syllable Lowering, formalized as (I):

(I.) Heavy Syllable Lowering

A Cyclic Analysis: Clark on Kikuyu

Working within the framework of Lexical Phonology,
Clark (1990) analyzes Kikuyu tonal displacement in terms of a cyclic morphology, in which the Association Conventions apply whenever they can within the Lexicon. Phonological rules are not extrinsically ordered, but are governed by the Elsewhere Condition, which says that the rules with the more specific environments apply first. Clark (1990:7) proposes two lexical levels in Kikuyu cyclic derivations:

**Fig. 4: Kikuyu Lexical Phonology**

The stem level consists of the verb stem plus all suffixes, segmental or tonal. The word level consists of the cyclic affixation of prefixes. Crucially, each affixation is protected by the Strict Cycle Condition. That is, it protects only material that was input to the current cycle. In this way, Clark is able to eliminate nine of Clements' rules. Clark assumes the Underspecification Theory of Kiparsky (1982), Archangeli (1984), and Pulleyblank (1986), in which only the marked value for each feature is specified in the Lexicon. H-tones are seen as the marked value for tonal specifications. Underlying L-tones are positioned by lexical insertion during the first stem cycle. Clark
illustrates this in (XVII.):

(XVII.)

to-ma-rœr-irε (L-toned)
we-them-look-Imm. Past
"We looked at them".

to-ma-tom-irε (H-toned)
we-them-send-Imm. Past
"We sent them".

tom  rœr  Stem Level, Cycle 1
     H  L  Free Tone
     Free Tone
     Association
     L Insertion

Cycles 2&3

tom-irε  rœr-irε  Suffixation of
     H  L  -ir-, -ε

Cycle 4

tomirε  rœrirε  Suffixation of -H
     H  L  Identical Tone
     Deletion
     Free Tone
     Association

Word Level, Cycle 1

tomirε  rœrirε  Spreading
     H  L  H
Clark finds that Clements' non-cyclic approach yields incorrect results for forms like the (XVIII.):

(XVIII.)

The structural description of Heavy Syllable Shift is met, but doesn't apply. Under Clark's cyclic analysis, the failure of the rule to apply is accounted for in a principled fashion. The tonal pattern within [niitą] doesn't undergo shift because the juncture of [niit] with
the Current Habitual suffix [aYa] is not, for the purpose at hand, a derived environment. Protected by the Strict Cycle Condition after Stem Level, Cycle 1, it cannot be subsequently included in the structural description of a rule. On the other hand, Clark finds that all cases where Heavy Syllable Shift applies are in fact derived environments, and that the tone shift to the following "light" syllable can be accounted for by a reapplication of Retraction and Spreading. This reapplication takes place because vowels straddling a morphemic boundary are reanalyzed into a single syllable, which in Kikuyu is licensed for only one tonal node. The tone will therefore appear to shift two TBU's to the right, while only shifting one tonal node (since heavy syllables are dominated by a single tonal node). (XIX.) illustrates the process (Clark 1990:13):

(XIX.)

\[
\begin{array}{c}
\text{ma-ikarayera} \\
\text{Word Level, Cycle 2} \\
\end{array}
\]

\[
\begin{array}{c}
\text{H} \\
\text{Prefixation of ma-} \\
\text{Retraction} \\
\text{Spreading} \\
\end{array}
\]

\[
\begin{array}{c}
\text{ma-ikarayera} \\
\text{Shared Features} \\
\text{Convention} \\
\end{array}
\]

\[
\begin{array}{c}
\text{H} \\
\text{L} \\
\end{array}
\]
The reapplication of Retraction and Spreading is accounted for by a cyclic analysis, in that rules continue to apply in a derived environment as long as their structural descriptions are met. In this way, Clark eliminates Clements' rule of Heavy Syllable Shift, while providing a principled account of the failure of the process to apply in non-derived environments.

Clements had to posit a rather unmotivated rule to account for the failure of Heavy Syllable Shift to apply in environments in which a long, underlyingly L-toned verb root is followed by a H-tone. Heavy Syllable Lowering made use of a "prelinking" convention that attaches a tone to morphological material before the Association Conventions apply. The rule is repeated below for convenience:

(I) Heavy Syllable Lowering

```
    V   V
     \  
      \ V
       \ 
        L' H
          verb stem
```
In essence, the rule says that the L-tone cannot be displaced when followed by a H-tone, though it can be if followed by a L-tone. Clark proposes that this asymmetry in the behavior of underlyingly H-toned and L-toned long roots can be traced to a difference in the way the tones are assigned in the first cycle of the stem level. She posits that H-tones are lexically specified, while L-tones are inserted by rule. Clark’s mechanism of L-tone insertion is essentially a default rule, and is couched in Underspecification Theory. Kiparsky (1982a) proposed that lexical entries are "minimally redundant", that is, all predictable aspects of phonological strings should be derived by default rules. The strong form of this hypothesis is that all predictable information should be eliminated from lexical entries. Only "marked" feature values need be specified. Pulleyblank finds that in the three-tone system of Yoruba, the Mid (M) tone is the default value, while H and L must be present in the lexical entries. Clark proposes that the L-tone is the default tonal value for Kikuyu. Bantu tonologists generally seem to concur with this assessment. One prediction of Underspecification Theory is that asymmetries will arise with regard to the way the marked and unmarked values interact with phonological rules. In particular, phonological rules that apply before the default rules will be blocked in certain cases, where the underlying tone is not yet specified. Pulleyblank
formalizes this constraint as (J): 

(J) Restraints on Underspecification

(a.) A rule must not refer to \([a]\) in its structural description before a default rule assigns \([aF]\).

(b.) A rule must not refer to the fact that a slot is not linked to a value on tier \(n\) for purposes of affecting a feature value on tier \(m\).

Clark makes heavy use of feature representation conventions in accounting for the asymmetry between H- and L-toned verb stems captured in Clements' rule of Heavy Syllable Lowering. In the first stem cycle, Free Tone Association is blocked from applying to the L-toned stem by a principle such as (Ja.) above. In addition, L-insertion is prevented from applying to both vowels in the long syllable by Identical Tone Deletion, repeated below for convenience:

(G) Identical Tone Deletion

\[ T_j > 0 / T_i \quad (where\ T_i=T_j) \]

Thus, after the first cycle of the stem level, the L-toned root has two tonal nodes, but only the first can be associated. At the same time, Free Tone Association has applied to the H-toned stem:
Thus, /haat/ meets the structural description of the Shared Features Convention, which is formalized as:

(K) Universal Shared Features Convention

\[
\begin{array}{c}
\text{S.D.} \\
\alpha \\
\text{S.C. Merge } i \text{ and } j.
\end{array}
\]

The two tonal nodes can thus be merged:

(XXI.)

\[
\begin{array}{c}
\text{haat} \\
\text{haat}
\end{array}
\]

Crucially, the structural description of Retraction specifies a multiply-linked tone:
A L-toned followed by a H-tone will not constitute an environment in which the Shared Features Convention may apply. A L-tone followed by another L-toned, or a H-toned root followed by another H-tone, will. All contiguous identical tones will merge. After the Shared Features Convention has applied, the structural description of Retraction is met. Without multiple linkings, Retraction cannot take place. Remember that a long syllable, after the Shared Features Convention has applied, has exactly one tonal node. It must be linked with at least one identical tone to its right before it can undergo Retraction. In terms of autosegmental licensing, we may say that it is only the syllable, but not the coda, that is licensed to bear tone in Kikuyu.

The Strict Cycle is able to account for the application and reapplication of tone-shift precisely in derived environments because the structural description for application of phonological rules can be derived either by concatenation of morphemes, or by rule. The result in Kikuyu is that while adjacent vowels are linked to two slots on the skeletal tier, they are licensed for only one node on the tonal tier. As has been mentioned, what counts as a
"heavy" syllable is language-specific, but their distinguishing characteristics can include exceptional treatment by stress and tone systems. Heavy syllables tend to be strong points of attraction for primary stress or H-tone association across Bantu languages.
5

The Lexical Component in Bukusu Tonology

In (A), Lexical and Post-Lexical Properties, the characteristics of processes that apply Lexically are contrasted to those that apply Post-Lexically. In Bukusu, the key evidence for such a distinction is that certain phenomena, such as polarity effects, occur at the edge of what would be the domain of a Lexical rule, while others have more generalized environments. Clark found that the mechanism driving tone-shift in Kikuyu applies at the left edge of a morphological domain, and does so in a cyclic fashion. Hyman finds a different situation in Luganda (discussed in the next chapter), where tone-spread is tightly linked to, and in large measure the expression of, the underlying accentual system. While the underlying accentual system seems to employ cyclic rule application, tone assignment seems to be characteristically Post-Lexical. This variety in tonal realization in Bantu languages is cast against the wide-spread belief that Bantu historically distinguished between toned and toneless vowels, with the latter being supplied with a default value of L. There is significant pressure to interpret Bantu tonal systems in a way that is consonant with this proposal. A central issue within this analytical tradition is at what point in the
derivation of the verbal complex the default values begin to apply. It will be argued with regard to Bukusu that the default rules must apply at some point after Dissimilation has taken place.

Underspecification Theory predicts that there will be asymmetries in the way rules apply precisely because some will be blocked at certain points because, as per (J) Universal Restraints on Underspecification, they may not make reference to underspecified features. A prime example of an asymmetric rule application is the non-occurrence of Austine's rule of Dissimilation in, for example, negative verbal forms. As has been mentioned, there is no basis in the surface realization of the phonology for predicting such restrictions. Generally speaking, morphological stipulations on phonological rules are undesirable, since the morphology and phonology are considered separate, if interacting, components. It will be argued that it is tonal underspecification of the verb root that blocks the application of Dissimilation in certain morphological contexts.

It would be well to outline the theoretical issue of "polarity effects", before looking at the Bukusu examples. There is a common phenomenon found in tone systems where a given morpheme is realized as H when adjacent to a L-tone, or L when adjacent with a H. Pulleyblank (1986:203-14) demonstrates that the polarity condition in Margi can be
derived in a way compatible with Underspecification Theory by marking the specific polarizing morpheme [+extratonal] in the Lexicon, in combination with tonal default rules. Extratonal elements can occur at the right- or left-hand edges of their domains. Extratonal elements, together with extrametrical, are subject to the Peripherality Condition (Harris 1983), which says that elements marked [+extratonal] on the periphery of domains of phonological rules should be excluded from consideration by them. The cyclic application of phonological rules predicts that such elements "lose" their extratonicity if they cease to be on the periphery of the relevant domain. In any case, [+ex] has no role to play at the phonetic level.

Polarity can be formally expressed with alpha notation (Pulleyblank 1986:203):

\[ (M) \text{ Polarization} \]

\[ V > V / [ - V \]
\[ \text{Q} \]
\[ -\alpha H \quad \alpha H \]

Such an approach is not consistent with Lexical Phonology, however, which posits that only the marked feature specification is represented in the Lexicon. Alpha notation does not require either value be basic, and thus cannot capture valuable generalizations about asymmetries in rules applications. Alternatives consistent with Underspecification Theory include: (a.) a dissimilation
rule acting on certain L+L sequences, (b.) a dissimilation rule working on certain H+H sequences, or (c.) a deletion rule working on a H+H sequence in combination with the default insertion of L. There is no obvious reason to prefer (a.) over (b.), which presents us with a problem of indeterminacy, while (c.) costs us an extra rule. One of the basic implications of autosegmental theory is that when a phonological effect can be expressed either by a feature-changing mechanism or by a reassociative mechanism, the latter is to be preferred.

Pulleyblank's analysis of the polarity condition occurring in the present tense of Margi (1986:206) is more consonant with the goals of Lexical Phonology than (a.) - (c.) above, because it doesn't make use of feature-changing mechanisms, and it requires the single application of a single rule, apart from insertion of the default values: Floating H Tone deletion. In this context, it can be seen as implementing the OCP:

( XII.)

\[
\begin{array}{c}
\text{a} \\
\text{[+ex]}
\end{array}
\quad
\begin{array}{c}
\text{wi} \\
\text{H}
\end{array}
\quad
\begin{array}{c}
\text{a} \\
\text{[+ex]}
\end{array}
\quad
\begin{array}{c}
\text{sa} \\
\text{H}
\end{array}
\]

\[
\begin{array}{c}
\text{H} \\
\text{L}
\end{array}
\quad
\begin{array}{c}
\text{H} \\
\text{H}
\end{array}
\]
Floating H Tone Deletion applies:

\[
\begin{array}{c}
a \\
\left[+ex\right] \\
0 \\
\hline
\end{array}
\quad
\begin{array}{c}
\text{sa} \\
\hline
\text{H}
\end{array}
\]

And then there is bracket erasure:

\[
\begin{array}{c}
a \\
\text{wi} \\
\hline
\text{H} \\
\text{L}
\end{array}
\quad
\begin{array}{c}
a \\
\text{sa} \\
\hline
\text{H}
\end{array}
\]

Finally, the default rules will supply a L-tone where the H-tone has been deleted. Marking polarizing morphemes as [+ex] predicts that their effects will be felt at the peripheries of rule domains, which turns out to be the case. This approach also makes it possible to derive an analysis free of morphological stipulations on phonological rules. Austine accounts for polarity in Bukusu by a Dissimilation that occurs only in certain affirmative tenses. She can find no purely phonological reason that the rule shouldn't apply in the corresponding negative tenses. Thus, she posits, the Dissimilation rule is "morphologically" triggered by the affirmative form. This is not consonant with the principles of Lexical Phonology, in that application of the Dissimilation rule is burdened with a morphological specification. Lexical Phonology, on the
other hand, would assign the rule to a particular stratum or continuous set of strata.

Let us return to Bukusu. As has been mentioned, polarity effects can generally be analyzed as the insertion of so-called boundary tones at the edge of certain rules domains. In Bukusu, a H-tone will be inserted on the next mora after a verb root of the shape CVC, CVVC, or CVNC, unless the verb root or part of it is in penultimate position, in which case it surfaces in that position. This is remarkable in that underlying tonal assignment in Bukusu can generally be shown to be quantity-insensitive (see next chapter), so that in a non-cyclic analysis one would expect that it would always be the TBU immediately adjacent to the first mora of the verb root that would undergo Dissimilation. This not being the case with regard to CVVC and CVNC verb roots, it appears that Dissimilation respects morphological bracketing. The following L-toned verb root forms demonstrate this with reference to all three verb root syllable structures. The examples are given with full cyclic morphological bracketing, but with only the tones relevant to Dissimilation:

(XXIII.)


L  H
This can be formalized as (N):

(N) Syllable Structure and Dissimilation

\[
\begin{align*}
[CVC] & \quad VC \\
[CVVC] & \quad VC \\
[CVNC] & \quad VC \\
L & \quad H \\
L & \quad H \\
L & \quad H
\end{align*}
\]

In order for Dissimilation to be blocked in morphological forms not included in its description, it must be posited that the L-tone shown above is not assigned by a default rule. It would follow, then, that insertion of default values would occur sometime after Dissimilation has taken place. Only a cyclic analysis such as the one above can account for the tendency of H-tones derived by Dissimilation to respect morphemic boundaries. By the Universal Restrictions on Underspecification (J), rules are constrained from making reference to unspecified features in their structural descriptions. It must therefore be assumed that the underlying tone of the verb root is specified before Dissimilation takes place. Since Dissimilation only applies with reference to certain tense/aspect and
affirmative/negative conditions, one might posit that this is in fact the source of the L-tone needed to trigger Dissimilation. That is, the L-tone needed to trigger Dissimilation is itself part of the tonal material contributed by the morphological forms that are distinguished by polarity effects. Where tense/aspect conditions don't supply a special default rule, Dissimilation will be blocked. On the other hand, it is unnecessary for the tense/aspect or affirmative/negative condition to supply a H-tone for H-toned roots, since they are lexically specified. In such cases, Dissimilation will apply vacuously.

There is an example left unaccounted for by this analysis, when an unextended L-toned verb root of the shape CVVC or CVNC occurs with its second TBU in penultimate position. (III.) is repeated for easy reference:

(III.)

<table>
<thead>
<tr>
<th>Rule</th>
<th>èmbàánà</th>
<th>èndùŋgà</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dis.</td>
<td>èmbàánà</td>
<td>èndùŋgà</td>
</tr>
<tr>
<td>HC</td>
<td>èmbàánà</td>
<td>èndùŋgà</td>
</tr>
</tbody>
</table>

One account for (III.) above might be that polarity effects are generated within the Lexical derivation in such a way as to respect morphological bracketing, and that the H boundary
tone generated is then attracted to the point of penultimate stress. Evidence is presented in the next chapter that metrical structure in Bukusu is quantity-sensitive, so that penultimate stress would be assigned to the entire "heavy syllable" whose second mora appears in penultimate position:

(XXIV.)

(\(\ast\ast\))

\[\begin{array}{c}
\text{èmbáánà} \\
\text{[em \([(b)aan] \ a]]}
\end{array} \]

L H

(\(\ast\ast\))

\[\begin{array}{c}
\text{èndù[gà]} \\
\text{[en \([(d)ug] \ a]]}
\end{array} \]

L H

Again, it is posited that the L-tone in the forms above is contributed by tense/aspect conditions, so that polarity effects are triggered. If adjacent TBU's trigger the construction of a metrical constituent, this would license tone-spread within the constituent. More will be said in the next chapter regarding the special properties of heavy syllables. The phenomenon of H-tone attraction to point of stress posited above can with reasonable certainty be assigned to the Post-Lexical component, and will be further illustrated.
Interaction between Bantu Accentual and Tonal Systems

Before moving into the motivation for an accentual analysis of Bukusu tone-shift, it would be well to survey the current thinking on interaction between Bantu accentual and tonal systems. Goldsmith (1988) makes five generalizations about the evolution of Bantu tonal systems. First, underlying tones tend to extend their domains from their underlying mora over entire morphemes. Second, tonal association is becoming more sensitive to metrical structure, in that H-tones will tend to reassociate from metrically weak to metrically strong positions. This may be seen at the word or phrase level. Third, surface realization of a tone might be to the left, or more commonly, to the right of its underlying morpheme. The general trend is for this tonal displacement to take place by one syllable, though more are attested. This is embodied in the mechanism of tone-shift in Kikuyu, which is conservative in this respect. Fourth, a single H-tone per word restriction has developed in some languages. This single H-tone, however, can usually be multiply-associated, so that there is a series of H-toned syllables. Finally,
the most economical treatment of lexical specification of tone in most Bantu languages is a "privative" one, rather than a "equipollent". As has been mentioned, this predicts that there will be asymmetries in the application of rules to associated and unassociated tone-bearing units prior to the assignment of default values. Only a cyclic application of rules is compatible with a theory of Lexical underspecification because, as Goldsmith (1990:84) writes: "if there were no stem-cycle, then in languages where the inflectional prefixes have no tones of their own, the radical's tone would be likely to associate with a verbal prefix (such as a subject marker), a most unusual occurrence, in fact".

Historically, tonal and stress systems are separate in Bantu, but Goldsmith (1988) has noted that the overall trend is for H-tones to be attracted to metrically strong positions. Hyman (1983) undertakes an accentual analysis of Luganda tone, assigning a [*] to the lexical entries of morphemes that were underlyingly H-toned in PB. A single HL melody associates at the point of the first diacritic, accounting for the single H-to-L drop restriction that has arisen. Hyman posits that the historic tonal system has been reinterpreted accentually in the language, so that there is "culminative accent". Meinhof has reconstructed Proto-Bantu primary stress as being on the stem syllable, to distinguish it from its various prefixes and suffixes. He
differentiates this historical source of primary stress from another placing stress regularly upon the penultimate or antepenultimate syllable. The first does not generally condition vowel lengthening, though the second does. In Swahili, for example, regular penultimate stress has altogether displaced PB stem-stress. Goldsmith (1988) posits that these two historical processes have driven the development of two distinct ways of assigning stress in Bantu languages. Stem-stress has developed into the construction of metrical feet with alternating strong and weak syllables radiating outwards from the H-toned tense marker. This is typical of the Middle Lake family of Kirundi and Kinyarwanda. Historical penultimate stress has developed into the construction of a metrical foot at the ends of words, making the penultimate and antepenultimate syllable attractive for H-tone association.

Goldsmith (1990:114) differentiates three typologies of principles assigning stress: those that assign stress on a fixed syllable location in each word, on the basis of morphological structure, or on syllable structure. We have seen examples of all three operating in Bantu languages. Bukusu has regular penultimate stress, but Austine gives no metrical account of the tonal distribution in the language. In some Bantu languages, H-tone may also be realized as primary stress, or either or both might be attracted to heavy syllables. Both tone and stress systems come in
quantity-sensitive and quantity-insensitive varieties. The first can "see" the syllable structure, while the second cannot. Quantity-sensitive tonal systems will license a light syllable for one tone, and a heavy one for two. Kikuyu, then, has a quantity-insensitive tonal system, because syllables are licensed for precisely one tone, regardless of their weight. More conservative Bantu languages permit each party of a long vowel to bear its own tone. Such is the case, at least at surface level, in Bukusu.

In a quantity-sensitive metrical system, only strong foot nodes can branch. That is, heavy syllables can only appear in "head" position. In quantity-insensitive systems, on the other hand, it is perfectly acceptable to have branching weak nodes, because syllable weight has no role to play in stress assignment. Hayes (1983) posits that the "weak-nodes-don't-branch" rule extends universally down to the foot structures, but that it is language-specific whether this prohibition extends down to the rhyme structure. Essentially, quantity-sensitive foot construction requires direct linkage of rhyme structure to the stress pattern of the word. Languages can contain both kinds of foot construction. In such a case, they will be ordered by the Elsewhere Condition, which will differentiate the quantity-sensitive rule as having the more specific structural description of the two. Quantity-insensitive
rules, in such a system, would act essentially as default rules.

Some languages that realize at surface structure only one word-level stress can only be analyzed as constructing several feet per word with a regular word-level structure. Such languages have "supression of non-primary stress" as a parameter, and vary widely as to how non-primary stress is phonetically realized. The word-level structure can only pick out the first or last foot to receive primary stress. Thus, the only other parameter germain to the word-level structure is whether it is right-headed or left-headed. If no rules establish foot-level metrical structure, then rhyme-nodes can be taken for the word-level structure's terminal elements. In this case, heavy syllables might attract primary stress, if located in the foot selected by the word-level structure.

An Accentual Approach to Bukusu Tone-Spread

Hyman (1983) comments at length on the theoretical implications of his accentual analysis of Luganda tone. In particular, he considers the question of what the salient characteristics of an accentual system are for the child language learner, and what it is that formally separates accent from tone. He outlines four primary areas of distinction (1983:28):
(1.) Linear constraints: If the tonal characteristics of a language are in some measure a realization of an underlying accentual system, then they will in some fashion manifest a "culminative" effect upon each accentual unit (i.e., the word).

(2.) Hierarchical constraints: If tones are related to one another in an equipollent rather than privative fashion, this may be a reflection of accent subordination. This need not be realized at surface level, following Goldsmith on suppression of non-primary accent. Hyman accounts for such tonal phenomena in Luganda by means of "boundary reduction" and "accent reduction".

(3.) Mobility constraints: Accent generally exhibits more freedom of movement than morphological tone. Hyman also notes that "anticipation of an H tone occurs where the H is "accent-like", whereas it does not occur when the H is "tone-like" (Hyman and Schuh 1974)".

(4.) Globality constraints: While tonal rules, along with other phonological rules, are constrained from making reference to material protected by the Strict Cycle Condition, Hyman notes that accent often encodes some reference to earlier stages of a derivation (via stress trees).

The following analysis will make use particularly of Hyman's
generalizations (1-3). Consider first the issue of the "culminative" function of tone in Bukusu. It has been noted that where any underlying H-tones are posited to precede a mora in penultimate position, there will be a sequence of at least two H-tones. The solitary exception to this generalization is the H-toned RSM, which was illustrated in (IX). (XXV.) draws from various morphological combinations:

(XXV.)
βa-yét-ilè "they helped" (Imm. Past Tense, Cl. I root)
βa-yét-ilè "they who helped" ("")
βa-mú-yét-ilè "they helped him" ("")
βa-mú-yét-ilè "they who helped him" ("")
βa-mú-xól-è-èlè "they worked for him" ("", Cl. II root)
βa-mú-xól-è-èlè "they who worked for him" ("")
βa-rééβ-ilè "they asked" (", Cl. I root)
βa-rééβ-ilè "they who asked" ("")
βa-mú-rééβ-ilè "they asked him" ("")
βa-mú-rééβ-ilè "they who asked him" ("")
βa-mú-tèêx-è-èlè "they cooked for him" (", Cl. II)
βa-mú-tèêx-è-èlè "they who cooked for him" ("")
W-a-βón-à "you saw" (Remote Past, Cl. II)
Ów-a-βón-à "he who saw" ("")
W-a-mú-βón-à "you saw him" (""
ów-á-mú-βôn-à "he who saw him" ('')
w-á-úlil-à "you heard" ('')
ów-á-úlil-à "he who heard" ('')
w-á-mú-úlil-à "you heard him" ('')
ów-á-mú-úlil-à "he who heard him" ('')
èmb-áán-à "I give" (Present, Cl. II root)
èn-duajg-à "I pay" ('')
èmb-áán-áujg-à "I give" (Present Habitual, Cl. II root)
èn-duajg-áujg-à "I pay" ('')
èmb-úlil-áujg-à "I listen" ('')
xù-xol-él-án-àujg-à "we work for each other" ('')
xù-si-li-xò "we still are" (Still Tense)
xw-á-βé-élè "we were" (Near Past Tense)
xw-á-βé-élè "we were" (Perfect Tense)
xù-lá-βá "we will be" (Imm. Future)
xù-xá-βé "we will be" (Near Future)
sè-xù-mú-βón-à taa "we do not see him" (Present)
sè-xù-lá-mú-rùjg-à taa "we will not pay him" (Imm. Future)
ò-xà-mú-rùjg-à taa "Don't pay him" (Imperative)
ò-xá-mú-rùjg-à taa "You haven't paid him yet" (Not Yet)
ò-xà-mú-rùjg-à taa "who does not pay him" (Present)
sà-βà-yét-ilè taa "they didn't help" (Imm. Past)
sè-βà-mú-xol-è-èlè taa "they didn't work for him" ('')
xù-xol-él-án-à "we work for each other" (Present)
xù-li-xín-il-án-à "we will dance for each other (Rem. Fut.)

xù-βiál-à "we plant" (Present)
xù-fúár-à "we wear" ("

xù-li-βiál-à "we will plant" (Rem. Fut.)
xù-li-fúár-à "we will wear" ("

ó-li-mâŋg-à "you cultivate" (Pres. Hab., Cl. I root)

ó-li-mâŋg-à "he who cultivates" ("
ó-mú-lím-il-âŋg-à "you cultivate for him" ("
ó-mú-lím-il-âŋg-à "he who cultivates for him ("
ó-réeβ-âŋg-à "you ask" ("
ó-réeβ-âŋg-à "he who asks" ("
ó-mú-réeβ-âŋg-à "you ask him" ("
ó-mú-réeβ-âŋg-à "he who asks him" ("

áán-à "give" (Imperative)
rúŋg-à "pay" ("

ó-xà-mú-xól-èl-à táá "don't work for him" ("
ó-xá-á-xól-èl-à táá "don't work for me" ("
mú-réeβ-è "ask him" ("
mú-mú-lím-il-è "you (pl.) should cultivate for him" (Subjunctive, Cl.I)
mú-ń-dím-il-è "you (pl.) should cultivate for me" ("
mú-lâŋg-è "you (pl.) should call" ("
mú-mú-lâŋg-è "you (pl.) should call him" ("
mu-n-daŋ-g-è "you (pl.) should call me" ("")
mù-mù-xól-èl-è "you (pl.) should work for him"

(Subjunctive, Cl. II)
mù-ú-xól-èl-è "you (pl.) should work for me" ("")
mù-rùg-è "you (pl.) should pay" ("")
mù-mù-rùg-è "you (pl.) should pay him" ("")
mù-ń-duŋ-g-è "you (pl.) should pay me" ("")
βà-sí-βón-à "they still see" (Still Tense, Cl. II)

βà-sí-βón-à "they who still see" ("")
βà-sí-mù-βón-à "they who still see him" ("")
βà-sí-mù-βón-à "they who still see him" ("")
βà-sí-rùg-à "they still pay" ("")
βà-sí-rùg-à "they who still pay" ("")
βà-sí-mù-rùg-à "they who still pay him" ("")
βà-sí-mù-rùg-à "they who still pay him" ("")
sà-sí-βón-à tāa "he still dosen't see" ("")
sà-sí-rùg-à tāa "he still dosen't pay" ("")
o-sí-mù-lim-il-à "you still cultivate for him" ("")
o-sí-mù-lim-il-à "he who still cultivates for him" ("")
o-sí-mù-reēβ-à "you still ask him" ("")
o-sí-mù-reēβ-à "he who still asks him" ("")
sè-xù-lá-lim-à tāa "we will not cultivate" (Imm. Fut.)
sè-xù-lá-reēβ-à tāa "we will not ask" ("")

At least two adjacent H-tones are associated with the class
of verbal forms represented in (XXV). This is not the only possible tonal pattern, however. If underlying morphological tone occurs in penultimate position, it will not spread rightwards. It is common in Bantu languages that the first and/or last mora of a word proves extrametrical or extratonal, which means that it isn't subject to phonological rules. Austine gives the data in (XXVI.):

(XXVI.)

xù-βà  "to be"  (Infinitive)
xù-lí-xò  "we are"  (Present)
xw-á-βà  "we were"  (Remote Past)
èmb-ùlil-à  "I hear"  (Present, Cl. II)
n-òmbéx-à  "I build"  ("")
βà-li-ùlil-à  "they will hear"  (Remote Future, Cl. II)
ùlil-à  "hear"  (Imperative)
ààndik-à  "write"  ("")
à-lil-à  "he cries"  (Present, Cl. I)
à-lím-à  "he cultivates"  ("")
mù-lím-è  "you (pl.) should cultivate"  (Subjunctive, Cl. I)
mw-imb-il-è  "sing for him"  (", Cl. II)
nj-imb-il-è  "sing for me"  ("
There are two contexts in which verbal forms in Bukusu realize only one H-tone, on their penultimate syllable. The first is an extended form which has no lexical H-tones, and that has undergone the polarity effects, such as /èmbùlìlà/ "I listen". The second is an underlyingly H-toned verb root that occurs in penultimate position, and thus does not undergo Assimilation, such as /àlìlà/ "he cries". There are far fewer verbal forms that conform to this pattern than realize a tonal foot because it is more likely than not that a H-toned morpheme or tense marker will be selected. In fact, it is only the tenses in (XXVII.) that utilize no tonal markers:

(XXVII.)

\[
\begin{align*}
\text{xù-lí-xò} & \quad \text{"we are"} \quad \text{(Present)} \\
\text{xù-βè-èlà} & \quad \text{"we were"} \quad \text{(Imm. Past)} \\
\text{xù-li-βà} & \quad \text{"we will be"} \quad \text{(Rem. Fut.)}
\end{align*}
\]

It is the H-toned verb root /-lì-/ "to be" that contributes the H-tone to the Present tense form above. In (XXVIII.) are examples of verbal forms which have no underlying H-tone and therefore do not undergo Dissimilation:

(XXVIII.)

\[
\begin{align*}
\text{βà-à-xòl-ilè} & \quad \text{"they worked"} \quad \text{(Imm. Past, Cl. II)} \\
\text{βà-tèèx-ilè} & \quad \text{"they cooked"} \quad ("")
\end{align*}
\]
<table>
<thead>
<tr>
<th>Verb Form</th>
<th>Meaning</th>
<th>Tense</th>
<th>Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ò-òn-à</td>
<td>&quot;you see&quot;</td>
<td>Present, Cl. II</td>
<td></td>
</tr>
<tr>
<td>ò-òlò-òn-à</td>
<td>&quot;he who will see&quot;</td>
<td>Rem. Fut., Cl. II</td>
<td></td>
</tr>
<tr>
<td>sè-xú-òn-à tåå</td>
<td>&quot;we don't see&quot;</td>
<td>Present, Cl. II</td>
<td></td>
</tr>
<tr>
<td>ò-òn-à</td>
<td>&quot;see&quot;</td>
<td>Imperative, Cl. II</td>
<td></td>
</tr>
<tr>
<td>ò-xà-òn-à tåå</td>
<td>&quot;don't see&quot;</td>
<td>&quot;&quot;</td>
<td></td>
</tr>
<tr>
<td>lim-à</td>
<td>&quot;cultivate&quot;</td>
<td>Imperative, Cl. I</td>
<td></td>
</tr>
<tr>
<td>rèèò-à</td>
<td>&quot;ask&quot;</td>
<td>&quot;&quot;</td>
<td></td>
</tr>
</tbody>
</table>

The underlying H-tone of the last two forms is suppressed presumably by the extrametricality of the left edge of the word. Austine accounts for this in her rule of High Tone Adjustment. The generalization to be made is that where it is not blocked by extrametricality (which applies at the left or right edge of the rule domain), morphological tone will spread in such a way as to create a tonal foot. In some tenses, such as in the pure Subjunctive, this process has neutralized any distinction between H-toned and L-toned verb roots:

(XXIX.)

<table>
<thead>
<tr>
<th>Verb Form</th>
<th>Meaning</th>
<th>Tense</th>
<th>Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td>mù-lim-è</td>
<td>&quot;you (pl.) should cultivate&quot;</td>
<td>Imp., Cl. I</td>
<td></td>
</tr>
<tr>
<td>mù-rèèò-è</td>
<td>&quot;you (pl.) should ask&quot;</td>
<td>&quot;&quot;</td>
<td></td>
</tr>
<tr>
<td>mù-xól-è</td>
<td>&quot;you (pl.) should work&quot;</td>
<td>Imp., Cl. II</td>
<td></td>
</tr>
<tr>
<td>mù-áán-è</td>
<td>&quot;you (pl.) should give&quot;</td>
<td>&quot;&quot;</td>
<td></td>
</tr>
</tbody>
</table>
The tonal foot in Bukusu may not have the fully "culminative" character of its counterpart in Luganda, but the evidence indicates a tonal system well on its way to becoming accentual.

There is also evidence of equipollent, or hierarchical relationships amongst certain H-tones, consonant with Hyman's diagnostic (2.) for accentual systems. The supporting data from Austine is sketchy, but some examples of "downstepped" H-tones are given:

(XXX.)

à-xú-xól-él-à "he works for you"

ká-á-xól-él-à "he works for me"

à-li-xú-úlil-à "he will listen to you"

à-li-í-úlil-à "he will listen to me"

è-xú-βón-ájg-à "I see you"
è-xù-xól-él-â[ ]g-à "I work for you"

è-xù-rû[ ]g-â[ ]g-à "I pay you"

è-xù-ândík-il-â[ ]g-à "I write for you"

In each case, it appears that the first two H-toned "syllables" are realized at the same pitch, while any subsequent H-toned moras are downstepped. This process seems to recognize adjacent vowels as "heavy" syllables, so would seem to be quantity-sensitive. This might indicate something other than purely tonal rules at work, since they have proven in other cases to be quantity-insensitive. In the last item, /èxúándíkilâ[ ]gâ/, a sequence of four H-toned moras is found, with the last pair downstepped with respect to the first pair. One possible analysis is that these compose two binary metrical feet, and that the second is subordinated to the first. If so, this would more clearly define the "culminative" character of the first metrical foot. Terracing, Austine's rule (2.) (see Chapter 2), might supply the mechanism for tonally subordinating one metrical
foot to the next.

A final point bears mention with regard to mobility constraints inherent in accentual systems. Two of Austine's rules for tone-spread, Assimilation and High Spread, account for rightwards spread, while the third, High Copy, accounts for leftward spread. High Copy is repeated below for convenience:

(B,5) High Copy

\[
\begin{align*}
\begin{bmatrix}
L \\
+\text{syl} \\
-\text{cons}
\end{bmatrix} & > H / \_ \\
\begin{bmatrix}
H \\
+\text{syl} \\
-\text{cons}
\end{bmatrix}
\end{align*}
\]

Crucially, this leftward spread only takes place with respect to adjacent TBU's. Again, this looks like a special property of heavy syllables (after resyllabification), and quantity-sensitivity has been associated elsewhere with metrical structure. Also, recall Hyman's generalization that "anticipation of an H tone occurs where the H is "accent-like", whereas it does not occur when the H is "tone-like". Anticipation might be phonetically realized as the leftward-spread of a H-tone, especially if a heavy syllable were to trigger the construction of a metric foot.

Taken together, the evidence for the construction of tonal feet, the apparent subordination of the second tonal foot to the first, and the special properties of heavy
syllables with respect to tone strongly motivate an accentual approach to the phenomenon of tone-spread in Bukusu.
Conclusion

This research has focused upon a reanalysis, within the framework of Lexical Phonology (Mohanon 1982, Pulleyblank 1986), of Bukusu data presented in Austine (1974). The research program was to determine if a division could be made between rules that apply Lexically and Post-Lexically. In Kikuyu, cyclic application of the rules driving tone-shift can be cited as evidence for such a division; however, this kind of evidence has not been forthcoming in Bukusu. Evidence for a Lexical component has been found with regard to polarity effects, which are analyzed as applying at the edge of a rules domain. It is posited that the insertion of a H-tone by the Dissimilation rule in fact marks the right boundary of the verb root with its extensions.

The actual mechanism of tone-spread in Bukusu, on the other hand, has been placed within the Post-Lexical component. The primary motivation for this position, which contrasts with what Clark has found for Kikuyu, is that tone-spread in Bukusu is not morphologically conditioned. Rather, tone-spread applies to any word in which an underlying H-tone occurs before the position of penultimate stress. Following Goldsmith, it was posited that the historically independent tonal and accentual systems must be
regarded as being at least partially interlocking. In particular, heavy syllables in Bukusu seem to trigger the construction of a binary metrical foot, if not previously divided by Primary Foot Construction. In addition, a heavy syllable in position of penultimate stress can attract a H-tone from an adjacent syllable to the right or left.

Following Hyman (1983), it was observed that the realization of tone on Bukusu verbs corresponds in part to the characteristics he posits for an underlying accentual system. In particular, a sequence of at least two H-tones on the majority of verbal forms in Austine's Bukusu data demonstrates a kind of "culminative" effect, with apparent phonetic subordination of other H-tones. To explain this effect, it has been hypothesized that in Bukusu, the construction of binary metrical units licenses tone-spread within those units. This would imply that some metrical units are subordinated to a primary unit, motivating the rule of Primary Metrical Construction. More evidence of the phonetic realization of stress and tone than is given in Austine's data is necessary to give more conclusive findings in regard to this matter. Ultimately, the foregoing research has demonstrated that accent and syllable structure appear to interact with morphological tone to produce the surface tonal patterns observed in Bukusu.
REFERENCES


Appendix

Bukusu Verbal Morphology

The following is an outline of Bukusu verbal morphology relevant to this thesis. The analysis is based on the description given in Austine (1974). The maximum extension of the Bukusu verbal complex is as in Fig. I:

Table I.: Paradigm of Bukusu Verbal Morphology


The notation, in order, represents the negative marker, subject concordial marker (for a relative or non-relative clause), tense marker (which may be 0), object concordial marker, verb root, up to two extensional suffixes (benefactive, causative, reciprocal, or passive), the habitual morpheme /-Vŋg-/ , and final vowel or aspect marker. A complex example is:

sa-xu-0-xol-il-an-aŋg-a taa
Neg-we-Pres.-work-for-reciprocal-Hab.-Asp. not
"We don't usually work for each other"

There are twelve basic tenses, seven of which are the so-called "simple tenses". These tenses are simple in that they segment a gradient time scale, organized with reference to the present. Tenses can be distinguished by both
segmental and tonal material, depending on the particular contrast in question. Segmental material includes a tense marker occurring after the subject concordial marker, and a final morpheme /-a, -e, or -ile/. Table II is the morphological paradigm for the seven "simple" tenses (Austine 1974:190):

Table II.: Paradigm for Bukusu Temporal Simple Tenses

<table>
<thead>
<tr>
<th>Tense</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Future</td>
<td>-li...-a</td>
</tr>
<tr>
<td>Near Future</td>
<td>-xa...-e</td>
</tr>
<tr>
<td>Immediate Future</td>
<td>-la...-a</td>
</tr>
<tr>
<td>Present</td>
<td>-0.....-a</td>
</tr>
<tr>
<td>Immediate Past</td>
<td>-0.....-ile</td>
</tr>
<tr>
<td>Near Past</td>
<td>-a.....-ile</td>
</tr>
<tr>
<td>Remote Past</td>
<td>-a.....-a</td>
</tr>
</tbody>
</table>

Note that two of the simple tenses, the Present and Immediate Past, are distinguished by a 0 tense prefix. Immediate Future and Past refer to events realized in the same day as the point of reference. Near Future and Past are used to refer to events ranging from one to a number of days away. Remote Future and Past refer to times at least a month away. Each of these simple tenses can be marked for habitual or iterative action by suffixing /V[t̠]g/ after the verb stem and before the final morpheme.
There are five of the "simple" tenses that are not temporal in nature, which might be characterized as mood or aspect. Their morphological paradigm is in Table III (Austine 1974:190):

Table III: Paradigm for Bukusu Simple Moods

<table>
<thead>
<tr>
<th>Mood</th>
<th>Morpheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Still/No Longer</td>
<td>-si........-a</td>
</tr>
<tr>
<td>Perfect</td>
<td>-a.......-ile</td>
</tr>
<tr>
<td>Not Yet</td>
<td>-xa........-a taa</td>
</tr>
<tr>
<td>Imperative</td>
<td>-a</td>
</tr>
<tr>
<td>Subjunctive</td>
<td>-0........-e</td>
</tr>
</tbody>
</table>

The first is the only one of this set that may employ the habitual morpheme /V\g/. Without it, the Still tense refers to an action or state that is generally in effect, but not necessarily occurring at the moment. When combined with the habitual morpheme, it denotes some action or state that still occurs periodically. The perfect tense indicates an activity that was in progress for some time, but that has been completed. The Not Yet tense is the only one of the twelve reviewed that doesn't have a corresponding negative of the form /sa...... taa/, because it is itself inherently negative. Affirmative commands are expressed in the "imperative" form shown above only if the subject is 2nd person singular, and there is no object concordial marker attached. The subjunctive form is used not only for true
subjunctives, but also for imperatives where the subject is 2nd person plural, there is an object concordial marker attached, or it is non-initial in a series of commands. The subjunctive form is also used when an imperative is to be interpreted as a suggestion, rather than as a direct command, or in certain compound future tenses to indicate conditionality.

Compound tenses consist of one of the two forms of "to be" + a participle, of which there are two possible forms, one present, and one past. Both verbs show subject concordial agreement. One form of the copula, /-li/, to which the morpheme /-xo/ may optionally be suffixed, is used in only the Present and Still/No Longer tenses, while /-be/ is used in all the others. Austine (1974:192) gives the paradigm as Table IV.:

Table IV.: Paradigm of Bukusu Auxiliary Copula

<table>
<thead>
<tr>
<th>Form</th>
<th>Bukusu</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infinitive</td>
<td>xù-bà</td>
<td>&quot;to be&quot;</td>
</tr>
<tr>
<td>Present</td>
<td>xù-li-xò</td>
<td>&quot;we are&quot;</td>
</tr>
<tr>
<td>Still</td>
<td>xù-si-li-xò</td>
<td>&quot;we still are&quot;</td>
</tr>
<tr>
<td>Imm. Past</td>
<td>xù-βè-èlè</td>
<td>&quot;we were&quot;</td>
</tr>
<tr>
<td>Near Past</td>
<td>xw-à-β-èlè</td>
<td>&quot;we were&quot;</td>
</tr>
<tr>
<td>Rem. Past</td>
<td>xw-á-βà</td>
<td>&quot;we were&quot;</td>
</tr>
<tr>
<td>Perfect</td>
<td>xw-à-βè-èlè</td>
<td>&quot;we were&quot;</td>
</tr>
<tr>
<td>Imm. Fut.</td>
<td>xù-lá-βà</td>
<td>&quot;we will be&quot;</td>
</tr>
<tr>
<td>Near Fut.</td>
<td>xù-xá-βè</td>
<td>&quot;we will be&quot;</td>
</tr>
</tbody>
</table>
As we have seen from the paradigms above, tense specifications contribute tonal as well as segmental material. Such tones may be said to be morphemic. The verbs roots can also be demonstrated to contribute tone. Austine distinguishes between Class I (H-toned) roots and Class II (L-toned) roots. She asserts that the tone contributed can belong underlyingly only to the first mora of the root, which is what Goldsmith (1988) found for Proto-Bantu. The fundamental structure of the root is CV(C), but complex verb stems abound that cannot be analyzed into synchronically productive parts, such as /-wulil-/, "hear". In addition to such bound morphemes, there are a number of synchronically productive verbal extensions of the shape /-VC-/.

The causative morpheme is /-iy-/,

the benefactive /-il-/, the reciprocal /-an-/, and the passive /-w-/.

The domain of tonal rules affecting verbal extensions includes, in the words of Austine (1974:169), "any syllable between the root and the final vowel".