CONSTRAINING HIGH TONE SPANS IN EKEGUSII VERBAL TONOLOGY

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0. Introduction

Ekegusii, a Bantu language spoken in southwestern Kenya, exhibits a wide range of tonal patterns in the finite verbal system.[1] Of the four logical types of tonal phenomena defined by crossing the parameters of displacement vs. spread and bounded vs. unbounded, three are attested in Ekegusii: 1) bounded High displacement, the delinking of a High and relinking it to an adjacent Tone Bearing Unit (TBU), 2) bounded High spreading , the spreading of a High to an adjacent TBU, as well as 3) unbounded High spreading, the spreading of a H to the maximal number of free TBU's in a certain direction. While these are all productive phonological processes, they are 'blocked' from applying in certain configurations. To help account for the occurrence of these three tonal processes, I will argue that Ekegusii has both linked Highs and floating Highs, and that their tonal behavior is distinct in crucial respects. I will show that the complex array of surface tonal patterns results from a delicate interplay between the productivity of various tonal processes and the avoidance of certain tonal structures. Making use of a constraint ranking within Optimality Theory as described in McCarthy & Prince (1993a-b), Prince & Smolensky (1993) and as refined in subsequent work, I will provide a complete account of the Ekegusii facts.

Several issues of theoretical importance arise. First, I show that there are two distinct lexical domains (the phonological stem and

phonological word) for which constraints are potentially sensitive. I show that a single pass through a constraint ranking, where constraints are annotated for the lexical domain in which they apply, is superior to an account in which a block of constraints (in a stem domain) produces an output which is then fed to another block of constraints (in a word domain). Second, I show that in addition to having lexical tones of both the linked and floating varieties, Ekegusii has certain tenses which assign an accent to some TBU of the stem. I examine two general constraints (one of them a particular instantiation of Goldsmith's (1987) *Tone to Accent Attraction Condition*) which help define the interaction of tone and accent. Third, I show that in certain circumstances two High tones must fuse, and that when they do, the resulting High is subject to all the constraints which hold of the two input Highs. Specifically I show that some constraints apply only to floating Highs and some apply only to linked Highs, but when a floating and linked High fuse, the resultant High is subject to both sets of constraints. Fourth, I show that bounded spreading is best analyzed as a "minimal misalignment" of one edge of an input High Tone Span. Finally, I argue that the edge parameter in an ALIGN constraint must be able to be underspecified. Specifically, I motivate a constraint which forces one edge of a High Tone Span to be aligned with one edge of a stem, yet it doesn't matter which edge gets aligned. I show that it is not possible to assume instead that either a left or a right alignment constraint (or both) are at work.

The structure of the paper, then, is as follows. First I will present the Ekegusii forms to be accounted for, detailing the range of attested tonal patterns and showing that they can be predicted from the location of

the various High tones in the input (§1). Next, I will provide a brief summary of the major tenets of Optimality Theory, after which I will provide a full account of the Ekegusii facts using this model (§2). Finally I summarize and conclude (§3).

1. The Ekegusii data

In this section I will present the Ekegusii data to be accounted for. At different points I will employ certain derivational terms such as "bounded spread" or "unbounded spread" for two reasons. First, this will be a mnemonic aid the reader in remembering what the behavior of each type of High tone is like. Second, this will give the reader some idea as to how a derivational approach would account for the facts. As will become clear during the discussion of Optimality Theory, a feature can only literally "spread" under a rule-based approach, the resulting phonetic pattern being accounted for differently under a non-rule based approach such as Optimality Theory.

1.1. Local "spreading" of lexical and prefixal High tones

Ekegusii is similar to many Bantu languages in that verb roots are of two tonal types (cf. Guthrie (1967), Clements & Goldsmith (1984)).[2] Infinitival forms illustrating these two types are shown in (1) and (2). These have the structure: Preprefix /o-/ - Class Prefix /ko/ - Root - Final Vowel /-a/.[3]

(1)

ó-gò-kùn-à	'to touch'
ó-kò-rààm-à	'to abuse'
ó-gò-tènèn-à	'to stand'
ó-gò-sèrèèt-à	'to thatch'

(2) a.	ó-kò-ry-á	'to eat'	
	ó-gò-kór-á	'to do'	
	ó-gò-káàn-à	'to deny'	
	ó-gò-símék-à	'to plant'	
	ó-gò-kór-ér-à	'to do for'	
	ó-gò-símék-èr-à	'to plant for'	
	ó-kò-bwéékàn-à	'to resemble'	
	ó-gò-káán-èr-à	'to deny for'	
b.	ó-gw-ǃáát-á	'divide'	(</ko-át-a/)
	ó-gw-ǃáát-ér-à	'divide for'	(</ko-át-er-a/)
	ɔ́-kw-ǃɔ́ɔ́mán-à	'quarrel'	(</ko-ɔ́man-a/)
	ó-kw-ǃááór-à	'yawn'	(< /ko-áor-a/)
	ɔ́-kw-ǃɔ́ɔ́mán-èr-à	'quarrel for'	(</ko-ɔ́man-er-a/)

First, let us define the verbal 'stem' as the verb root plus any suffixes. (Cf. Myers (1987) for one example of the usefulness/reality of the notion "stem" in Bantu.) The difference then between the forms in (1) and (2) is that the stems in (1) are completely Low-toned while those in (2) contain at least one High-toned TBU. We attribute this difference to the underlying tonal status of the verb root. Following work by Pulleyblank (1986), Hyman & Byarushengo (1984) and others on other Bantu languages, we assume that the underlying tonal distinction is one of High versus toneless, i.e. Low tones are underspecified. We therefore assume that the roots found in (1) are underlyingly toneless (as are the Class Prefix and Final Vowel), while the roots in (2) have an underlying High.

Let us now consider the distribution of the surface High tones in (2). The difference between the roots in (2a) and (2b) is that the former begin with a consonant while the latter begin with a vowel. In (2a) all the forms but two begin with two High-toned morae. First, we see that

if the stem is monosyllabic, then the lone vowel bears a High tone.[4] In all other roots in (2a) except those of the type CVVCV (such *ó-gò-káàn-à* 'to deny') we can generalize that the first two *morae* of the stem are High-toned. This then is an argument for considering the TBU to be the mora and not the syllable. If the syllable were considered to be the TBU then stating the generalization becomes more complex, viz. while the first syllable of each stem is High toned, the second one is too as long as the first one is short. Furthermore, there is a surface contrast between long level High syllables, such as the one in *ó-gò-káán-èr-à* 'to deny for' and a long Falling syllable such as the one in *ó-gò-káàn-à* 'to deny' which we take as additional evidence that the TBU is the mora and not the syllable. To sum up to this point then, there are two kinds of roots: those which have a High linked to the initial TBU, and those which have no High at all. In the infinitival forms, the High generally "spreads" to the following TBU.

In the forms in (2b), which begin with a vowel, we see that the vowel of the class prefix /ko-/ has glided and induced compensatory lengthening of the stem-initial vowel (cf. Hayes (1989)). [5] The stem-initial long vowel in each case is High-toned as well as the immediately following TBU. There appear to be no Rising tones at all in Ekegusii. Thus, when a process such as gliding and compensatory lengthening occur, the resulting syllable surfaces with a level High tone and not a Rising tone.[6]

Having examined the tonal patterns of verbal infinitives, let us now turn to the finite verbal morphology. The structure of the finite verb in Ekegusii is shown in (3):

(3) Morphological structure of finite verbs:

Subject–Tense/Aspect–Object–[$_{stem}$ Root–Extensions –T/A–Final V

Only certain of these morphemes are contrastive for tone. We will see that object markers, extensions and the final vowel are always underlyingly toneless. The tense markers and the verb root contain morphemes of both the High and toneless varieties. While subject markers are generally toneless, they are morphologically assigned a High tone in certain tenses (as noted at different points in the discussion that follows).

Let us begin by considering tenses where the stem tone pattern is the same as it is in the infinitive. We consider the verb roots *timok* 'rest' (toneless) and *takun* 'chew' (H-toned).[7]

(4)

a.	tò- gà- tìmòk-èr-à we Cp rest A FV 'and we rested (applic)'	tò- gà- tákún-èr-à we Cp chew A FV 'and we chewed (applic)'
b.	tò- kà-nà-gò-tìmòk-èr-à we Cp C N rest A FV 'and they still rested (applic)'	tò-kà-nà-gò-tákún-èr-à we Cp C N chew A FV 'and they still chewed (appl.)'
c.	tó- ó- gó-tìmòk-èr-à we D N rest A FV 'we rest (applic)'	tó-ó-gó-tákún-èr-à we D N chew A FV 'we chew (applic)'

While the stem tones in (4) show the same two patterns as those in the infinitive (*ó-gò-tìmòk-èr-à, ó-gò-tákún-èr-à*) let us briefly consider the prefixes. The prefix /ko/ (> *go*) is diagnosed as underlyingly toneless as it has not contributed a High tone to forms such as (4b). However it surfaces as High in (4c). This is accounted for straightforwardly if we assume that it received its High from the preceding Tense marker /o-/. In other words, if we assume that /o-/ is

underlyingly High, then we can generalize that for both Highs in the verb root (also referred to as "lexical" Highs) and prefixal Highs, the High tone spreads to the following TBU. In (4c) we assume that the High on the subject marker /to-/ (which we assume is toneless in (4c)) surfaces with a High tone again due to the prohibition on Rising tones noted above in the discussion of (2b).

In the tenses found in (4) we find an unexpected tonal pattern in cases where 1) the stem is of the CVCV variety, 2) the verb root is High-toned and 3) the pre-stem TBU bears a High tone which has spread there from the preceding TBU. The UR of such forms is schematized below.

(5) ...CV-CV $[_S$ CVCV$]_W$
| |
H H

At this point, we would expect the High on the first prefix to spread to the following prefix and the High on the stem-initial TBU to spread to the following (word-final) TBU. While the prefixal High spreads as expected, the lexical High delinks and is displaced onto the word-final TBU. This is illustrated below.

(6) tó- ó- gó-tàm- á (< /to - ó - ko - tám - a/)
we D N run away FV
'we ran away'

The form in (6) is contrasted with (7a-b) which do not show anomalous tonal behavior.[8]

(7) a. tó- ó-gó-tám- ér-à (< /to - ó - ko - tám - er - a/)
we D N run away A FV
'we ran away (applic)'

b. tò- gà-tám- á (< /to - ka - tám - a/)
we Cp run away FV
'and we ran away'

The forms in (7a-b) illustrate that the anomalous stem tonal pattern with High-toned roots does not occur if 1) the stem is larger than CVCV (7a) and 2) if the pre-stem TBU does not bear a High (7b). For now let us simply note this anomaly. We will return to these forms and provide an account for them below.

1.2 Unbounded "spreading" of the grammatical High tones

In certain verb tenses, stems with underlyingly toneless roots surface with High-toned TBU's within the stem. This is aptly illustrated in the Habitual tense which lacks an overt tense marker, taking the form: subject marker - verb root - final vowel. Habitual forms with toneless roots are given in the left-hand column of (8), while Habitual forms with High-toned roots are given in the right-hand column.

(8)

a.	tò- sàb-á we ask FV 'we ask'	tò- tám- á we run away FV 'we run away'
b.	tò-tìmók-á we rest FV we 'rest'	tò-tákún-á we chew FV 'we chew'
c.	tò-tìmók-ér-á we rest A FV 'we rest (applic)'	tò-tákún-ér-á we chew A FV 'we chew (applic)'
d.	tò-ìrúrúk-ér-á we fly A FV 'we fly (applic)'	tò-úmérán-ér-á we rest A FV 'we rest (applic)'

In the left-hand column, we see that all TBU's within the stem except the first one are High-toned. This contrasts with the infinitival forms with toneless roots in (1) and the finite forms with toneless roots in the left-hand column of (4) where the stem TBU's surfaced as all-Low. The source of the High tones in the left-hand column of (8) cannot be the subject prefix, verb root, applicative extension, or final vowel, all of which are underlyingly toneless as seen in (4). It turns out that a process by which certain tenses contribute a High tone to the verbal stem is common within Bantu.[9] We will refer to this High tone as a 'grammatical' High as opposed to a prefixal High (e.g. on /o-/ in (1) and (2)) or a 'lexical' High associated with certain verb roots (cf. (2)). (This grammatical High is also sometimes referred to as the 'suffixal' High, as it is assumed to be linearly ordered after the verb root in order to account for the fact that it often affects TBU's following the root-initial TBU which may bear a lexical High.) We therefore assume that the tenses in (4) do not assign a grammatical High to the verb form, while the Habitual in (8) does. We see, then, in (8) that the

grammatical High has a clear effect not only on stems with toneless roots, but those with High-toned roots as well, as the latter surface with a High tone on every stem TBU instead of just the first two (cf. (2)). Various other verb forms which behave identically to the Habitual with respect to the tonal pattern of the stem, labeled Pattern I, are listed below.[10]

(9) Pattern I

a.	tó-ráà-tìmók-ér-á we S rest A FV 'we will rest'	tó-ráà-tákún-ér-á we S chew A FV 'we will chew'
b.	tó-ráà-mò-tìmók-ér-á we S 3sO rest A FV 'we will rest for him (applic)'	tó-ráà-mò-tákún-ér-á we S 3sO chew A FV 'we will chew for him (appl)'
c.	tw-áá-ráà-tìmók-ér-á we P S rest A FV 'we rested (applic)'	tw-áá- ráà-tákún-ér-á we P S rest A FV 'we chewed (applic)'
d.	tw-áá-ráà-tìmók-ét-é we P S rest P FV 'we rested'	tw-áá-ráà-tákún-ét-é we P S chew P FV 'we chewed'
e.	tó-ráà-tìmók-ér-é we S rest A FV 'we will rest (applic)'	tó-ráà-tákún-ér-é we S chew A FV 'we will chew (applic)'
f.	tw-áá-ká-mò-sàb-ér-ét-é we P Cp 3sO ask A P FV 'we asked for him'	tw-áá-ká-mò-tóm- ét-é we P Cp 3sO send P FV 'we sent him'
g.	tw-áá-ká- bà- bàgán- ír-é we P Cp 3pO separate P FV 'we just separated them'	tw-áá-ká-mò-tóm- ír-é we P Cp 3sO send P FV 'we just sent him'

A summary of the input/underlying representations (UR) and the output/phonetic representations (PR) of stem tones of Pattern I are

given below. H_g represents the grammatical High tone associated with these tenses. All High-toned morae in the PR are marked with an acute accent.

(10) Pattern I (pre-stem TBU is toneless)

a.	m [m m m m]	b.	m [m m m m] UR
			|
	H_g		H H_g
	m [m ḿ ḿ ḿ]		m [ḿ ḿ ḿ ḿ] PR

Let us next consider two other groups of forms which also show effects of a grammatical High, but where the surface tonal patterns are distinct in certain aspects from those seen in (8) and (9). In the forms below, which we will refer to as 'Pattern II', while the stem tonal pattern of the toneless roots is the same as those in (9), the stems with High-toned roots exhibit a different tonal pattern. Whereas the stems with High toned roots in the forms in (9) were all High, the stems with High-toned roots in (11) have a High tone on only the stem-initial and stem-final TBU's.

(11) Pattern II

a.	tw-áá-gá-tìmók-ét-é we P Cp rest P FV 'we rested'	tw-áá-gá-tákùn-èt-é we P Cp chew P FV 'we chewed'
b.	tw-áá-gá-tìmók-ír-é we P Cp rest P FV 'we just rested'	tw-áá-gá-tákùn-ìr-é we P Cp chew A FV 'we just chewed'
c.	tw-áá-mó-sàb-ér-á we P 3sO ask A FV 'we just asked for him'	tw-áá-mó-tákùn-èr-á we P 3sO chew A FV 'we just chewed for him'

d.	tw-áá-mó-sàb-ér-ét-é we P 3sO ask A P FV 'we rested for him(Yest.)'	tw-áá-mó-tákùn-èr-èt-é we P 3sO chew A P FV 'we chewed for him(Yest.)'
e.	tó-mó-tìmók-ér-é we 3sO rest A FV 'that we rest for him'	tó-mó-tákùn-èr-é we 3sO chew A FV 'that we chew for him'

It turns out that the difference between the stem tone Pattern I and stem tone Pattern II is predictable from the prefix tones. Stem Pattern I results when the pre-stem TBU is Low-toned, while stem Pattern II results when the pre-stem TBU is High. It should be remembered at this juncture that a phonetically High TBU can occur as a result of that TBU being underlyingly linked to a High, or as a derived result of local spreading from the previous TBU. In every case in Pattern II, the pre-stem High TBU is a derived High, receiving the High feature from the previous TBU. In (11a-d) the prefix /a-/ is underlyingly linked to a High tone while the following prefix, either /ka-/ or the Object Marker /mo-/ is underlyingly toneless. In (11e) the subject prefix is morphologically assigned a High tone in that tense, which spreads onto the following object marker. A summary of the input and output stem tones for Pattern II is given below.

(12) Pattern II (pre-stem TBU has derived High)

a.	b.	
m m[m m m m]	m m[m m m m]	UR
|	| |	
H H_g	H H H_g	
ḿ ḿ[m ḿ ḿ ḿ]	ḿ ḿ[ḿ m m ḿ]	PR

Next, let us examine a third set of stem tone patterns. Representative forms are given below. In these forms stems with

toneless roots and stems with High-toned roots both have the same tonal pattern, namely the stem-initial and stem-final TBU's are High-toned, while any intervening TBU's surface as Low.

(13) Pattern III

a.	tw-áá-tímòk-èr-á we P rest A FV 'we just rested'	tw-áá-tákùn-èr-á we P chew A FV 'we just chewed'
b.	tw-áá-tímòk-èt-é we P rest P FV 'we rested (Yest.)'	tw-áá-tákùn-èt-é we P chew P FV 'we chewed (Yest.)'
c.	tó-tímòk-èr-é we rest A FV 'that we rest for'	tó-tákùn-èr-é we chew A FV 'that we chew for'

Again, it is possible to correlate this Pattern (III) with the tonal status of the pre-stem TBU. In each case above the pre-stem TBU is underlyingly linked to a High tone (/a-/ in the case of (13a.b) and the Subject Marker in the case of (13c).[11] A summary of the stem tones in Pattern III is given below.

(14) Pattern III (pre-stem TBU has underlying High)

a.	m [m m m m] | H H_g ḿ [ḿ m m ḿ]	b.	m [m m m m] | | H H H_g ḿ [ḿ m m ḿ]

The patterns presented up to this point describe the surface patterns of all tenses involving the grammatical High but one. There is one tense, the Recent Past, in which the grammatical High tone docks onto

the stem-*initial* TBU. Examples of this, labeled Pattern IV, are given below.

(15) Pattern IV

tw-àà-tímòk-ìr-è	tw-àà-tákún-ìr-è
we P rest P FV	we P chew P FV
'we recently rested'	'we recently chewed (applic)')

First, we note that as there is only one tense in which the stem-initial TBU is targeted for docking, there is no tonal allomorphy conditioned by High toned prefixes (which generated Patterns II and III). Pattern IV is parallel to Pattern I in that the pre-stem TBU is toneless. However, the surface tone pattern in the form on the left with the toneless root is distinct from Pattern I in two respects. First, the grammatical High tone docks onto the stem-initial TBU of the toneless root, rather than the peninitial TBU. Second, the grammatical H does not undergo unbounded rightward spreading. The surface tone pattern of the form on the right with the High-toned root is also distinct from the one in Pattern I. In (15) we see that only the first two TBU's of the stem are High-toned (instead of every TBU being H-toned), identical to the tone pattern of H-toned roots without a grammatical High.

1.3 Summary and discussion of attested stem tonal patterns

While the analysis to be proposed below accounts for all four patterns discussed above, let us conclude this section by summarizing and comparing the first three patterns which all involve a grammatical High which targets the peninitial TBU of the stem. The following is a summary of the stem tonal patterns as determined by 1) the underlying tonal status of the root and 2) the underlying and surface tonal status of the pre-stem TBU. We consider stems with toneless roots in (16) and High-toned roots in (17).

(16) Tone Distribution in stems with toneless roots and a grammatical High

	Pre-stem TBU	Stem-initial TBU	Stem-internal TBU's	Stem-final TBU
I.	Toneless	Low	High	High
II.	High (derived)	Low	High	High
III.	High (UR)	High	Low	High

(17) Tone Distribution in stems with High-toned roots and a grammatical High

	Pre-stem TBU	Stem-initial TBU	Stem-internal TBU's	Stem-final TBU
I.	Toneless	High	High	High
II.	High (derived)	High	Low	High
III.	High (UR)	High	Low	High

In the summaries given above, each of the three tonal patterns are listed which correspond to the tonal status of the pre-stem TBU, i.e. whether it is I) not linked to a High tone in UR or Phonetic Representation (PR), II) not linked to a High in UR, but linked to a 'derived' one at PR (due to local spreading) or III) linked to High in UR and PR.[12] Stems with toneless roots show two distinct phonetic patterns: a stem-initial Low followed by all Highs, and a stem-initial and stem-final High separated by Lows. Stems with High-toned roots also show two phonetic patterns: all High as well as a stem-initial and stem-final High separated by Lows.

Schematic representations of the UR's and PR's of the three types of stem tonal patterns (determined by the tonal status of the pre-stem TBU) are repeated below for convenience and comparison in (18) - (20).

(18) Pattern one (pre-stem TBU is toneless)

a. m [m m m m] (cf (9)) b. m [m m m m] (cf. (9))

H_g H H_g

UR

m [m ḿ ḿ ḿ] m [ḿ ḿ ḿ ḿ] PR

(19) Pattern two (pre-stem TBU has derived High)

a. m m [m m m m] (cf. (11)) b. m m [m m m m] (cf. (11))

H H_g H H H_g

UR

ḿ ḿ [m ḿ ḿ ḿ] ḿ ḿ [ḿ m m ḿ] PR

(20) Pattern three (pre-stem TBU has underlying High)

a. m [m m m m] (cf. (13)) b. m [m m m m] (cf. (13))

H H_g H H H_g

UR

ḿ [ḿ m m ḿ] ḿ [ḿ m m ḿ] PR

Let us now formulate some generalizations about these configurations, focusing on the behavior of the underlying High tones. Let us begin with the behavior of the grammatical High. In certain configurations the grammatical High tone links to every TBU but the first one. This is clearly needed for (18a), (19a), and is likely also needed for (18b) (to which we return below). While the grammatical High, then, shows phonetic evidence of unbounded spread in the

configurations just discussed, in certain other configurations it does not. In (19b) and (20a-b) it must be linked to only the stem-final TBU at the time of PR.

Let us briefly now address the prefixal and lexical Highs. As noted earlier, prefixal Highs, like lexical ones, exhibit bounded rather than unbounded spread (cf. (4c)). This is clearly seen in (19a) and (20a), and can also be seen in (19b). A priori, it is perhaps unclear in (18b) as to whether the second TBU of the stem received its High tone from the lexical High or the grammatical High. Curiously, however, when we examine (19b) and (20b) we find no bounded spreading of the lexical High.

To sum up to this section, we have discussed three basic principles of Ekegusii tonology. First, prefixal and lexical Highs usually undergo bounded spread, though this is blocked in certain configurations. Second, grammatical Highs (in Patterns I-III) sometimes surface only on the stem-final TBU, and other times surface on every TBU of the stem but the first one. Third, when the morphology creates a situation where one might expect a Rising tone, a level High actually results. Therefore beyond the bounded High spreading and the Rise-to-level-High process, there are two important and somewhat anomalous phenomena in (18) - (20) which must be accounted for. First, we must account for the fact that bounded spread fails to apply to the lexical High in (19b) & (20b). Second, we must account for why the grammatical High links to only the stem-final TBU in (19b) and (20a-b), while it links to all stem TBU's but the first one in (18a-b) and (19a).

2. An Optimality Theoretic Account

2.1 Overview of Optimality Theory

I would now like to consider how these Ekegusii tonal facts might be accounted for within Optimality Theory. I will work within the Optimality model as described in McCarthy & Prince (1993a-b), Prince & Smolensky (1993) and as refined in subsequent work.

Within Optimality Theory, instead of deriving surface forms from underlying representations via the serial application of a number of phonological rules, a form is grammatical if it satisfies a ranked set of constraints better than any other possible candidate. The candidate set consists of forms created from a given input form by GEN, the component which generates permutations of the input. With respect to tone, it is assumed that GEN can manipulate both tones and their associations to TBU's. Thus, minimally, GEN can add and delete tones themselves, as well as manipulate (i.e. expand or reduce the size of) input High Tone Spans (HTS).

While the set of well-formedness constraints is considered to be universal, the constraints are violable and languages differ in how these constraints are ranked with respect to each other. The form judged to be grammatical is the one that is more harmonic or optimal than any other. Specifically a candidate C_x is more optimal than a candidate C_y if the highest ranking constraint which differentiates them (i.e. for which their violations are distinct) is violated more seriously by C_y. C_y violates a constraint more seriously than C_x if 1) C_y violates the constraint in any fashion and C_x does not or 2) if C_y violates a gradient constraint more egregiously than C_x. Examples of each type will be illustrated below.

In the discussion that follows, I will assume the theory of Correspondence outlined in McCarthy & Prince (1995). The theory contains three main elements outlined below:

(21) a. MAX-IO (X): Every element of type X in the input has a correspondent in the output.

b. DEP-IO (X): Every element of type X in the output has a correspondent in the input.

c. UNIFORMITY (H): No element X in the output has multiple correspondents in the input.

I understand *element* here to be either a segment, or subsegment (Zoll 1996), the latter being defined as a floating feature. In simple terms, MAX-IO penalizes the deletion of any element, DEP-IO penalizes any insertion, and UNIFORMITY penalizes fusion. In order to penalize feature changing, we rely on IDENT, given below.

(22) IDENT(F)

Correspondent segments have identical values for the feature F.

If x and y are segments and x is [γF] and x corresponds to y, then y is [γF]

As given in McCarthy & Prince (1995) this would assign a penalty both in cases where 1) a TBU bearing an H in the input no longer bears an H in the output and 2) a TBU not bearing an H in the input bears an H in the output. I will demonstrate below that these penalties must be distinguished. Therefore, we follow Orgun (1995, 1996) and Zoll (1996) in assuming that this penalty is only incurred in cases of absent or differing specifications, but not when the output correspondent is more specified than the input. In the present analysis, then, IDENT will only assign a penalty when an input H-toned TBU surfaces as toneless.

Constraints insuring that tones are linked and that TBU's are assigned a tone are given below:

(23) DEP-ET (M&P (1995)) (=*FLOAT)

Every tone must have a correspondent TBU

(24) MAX-ET (M&P (1995)) (=SPECIFY (T))

Each TBU must have a correspondent tone

In the discussion which follows, for heuristic reasons I choose to refer to these two constraints under the more mnemonic names of *FLOAT and SPECIFY (T) respectively. Let us now examine a hypothetical case where no spreading or delinking takes place, using the constraints motivated above. (New crucial ranking will be given below each tableau.)

(25) Default: maximum faithfulness

CVCVCVCV
\ /
H

Candidates	*FLOAT	MAX-IO (T)	IDENT (H)	DEP-IO (T)	SPEC (T)
a. ☞CVCVCVCV \ / H					* *
b. CVCVCVCV H	*!		* *		* * * *
c. CVCVCVCV		*!	* *		* * * *
d. CVCVCVCV \ | / H			*!		*
e. CVCVCVCV \ / | H H				*!	*

*FLOAT, IDENT(H), MAX-IO(T), DEP-IO(T) >> SPEC(T)

Candidate (25b) is not optimal as the High tone is floating. Candidate (25c) is ruled out because the input H does not have a corresponding output H, violating MAX-IO (T). Candidate (25d) violates IDENT, as an input H-toned TBU surfaces as toneless. Finally, candidate (25e) is not as optimal as (25a) because an additional High was inserted, violating DEP-IO (T).

We still need a way to penalize an input toneless TBU from surfacing as H-toned, as seen in the following tableau.

(26) CVCVCVCV
\ /
H

Candidates	*FLOAT	MAX-IO (T)	IDENT (H)	DEP-IO (T)	SPEC (T)
a. CVCVCVCV \ / H					* *
b. ☞ *CVCVCVCV \ | / H					*

As can be seen in the above tableau, in the absence of a constraint which penalizes spreading, the form which violates SPEC (T) the least (which forces spreading) will be optimal. One possible approach (cf. Myers (1996)) is to penalize spreading with a DEP-I/O constraint applied to association lines, requiring that associations in the output have a correspondent in the input. While this is one possible approach, let us consider another approach which does not rely on the correspondence of association lines themselves. The approach I will pursue here will be to invoke a constraint which simply penalizes every TBU which bears a High.

(27) *H

A TBU cannot be High-toned

This constraint, if ranked above SPEC (T), will correctly prohibit the spread of H, as seen in the tableau below.

(28) CVCVCVCV
\ /
H

Candidates	*FLOAT	IDENT (H)	MAX-IO (T)	DEP-IO (T)	*H	SPEC (T)
a. ☞ CVCVCVCV \ / H						* *
b. CVCVCVCV \ | / H					*!	*

*FLOAT, IDENT(H), MAX-IO(T), DEP-IO(T), *H >> SPEC(T)

The constraints discussed to this point, then, if ranked in the manner shown above, can effectively insure the default state of the output being identical to the input.

2.3 Unbounded spreading and the suffixal High

Let us now turn to Ekegusii data and begin by accounting for the HTS of the grammatical High. We will assume that unlike prefixal and lexical Highs which are each underlyingly linked to a specific TBU, grammatical Highs are floating in the input, being a morpheme contributed by certain tenses. The question then becomes one of how to constrain the docking of the floating High tone. In the Ekegusii data of Patterns I-III discussed above, we have seen that it sometimes docks onto the pen-initial TBU of the stem as well as all subsequent TBU's in the word, and sometime on only the stem-final TBU. As noted above in §1.2 there is one Pattern (IV) where the grammatical High is attracted to the stem-initial TBU. Bantu is replete with cases where tenses differ minimally as to which TBU is assigned a High tone (cf. Odden 1987, Polleto 1996, etc.). While there are potentially a number of different ways that such cases could be handled, I will assume that

certain tenses contribute a grammatical High tone and assign an accent to some TBU. Various constraints (to be detailed below) can then attempt to dock the grammatical High onto the accented TBU. (Cf. the *Tone to Accent Attraction Condition* proposed by Goldsmith 1987 and assumed in much subsequent work.) The formal assignment of the accent could be accomplished in various ways. One might assume that an iambic foot is aligned with the left edge of the stem for Patterns I-III, that a trochaic foot is aligned with the left edge in the case of Pattern IV, and that no foot is present in cases which do not involve a grammatical High. In the interest of space, I will not detail the morphologically conditioned constraints which insure the correct placement of the accent here, but will simply note the presence of a morphologically assigned accent on a TBU by underlining the vowel of that TBU. I will show below that several constraints must target the position of the accent assigned.

Let us now account for the left and right edges of the output HTS of the grammatical High in forms such as those in (29).

(29) to-tim<u>o</u>k-er-a tòtìmókérá 'we rest'

H

First, it is necessary to define the left edge of the HTS, which, as just discussed will be the accented TBU. In order to force the grammatical High to be realized on the accented TBU, I will assume the following constraint:

(30) TONE TO ACCENT ALIGNMENT (TAA)

The left edge of the HTS of a subsegment H must align with the left edge of the accented TBU.

This constraint will attempt to insure that the left edge of the HTS of a subsegment (defined in Zoll (1996) as a floating feature, which in Ekegusii will be the grammatical High) will be the leftmost member of an output HTS. We will see below that the requirement that the accented TBU be on the left edge and the requirement that the accented TBU be part of the HTS of the grammatical High (as opposed to to any High) are both necessary to account for all the data.

Let us now turn to defining the right edge of output HTS's involving the grammatical High. In cases of type (29) the right edge of the output HTS is the right edge of the prosodic word. This could be accounted for in various ways. One way to account for this would be a constraint which aligned the right edge of a HTS with the right edge of a word, as formalized in (31).

(31) ALIGN (H,R,PW,R)

> The right edge of a HTS must align with the right edge of a prosodic word.

There are two potential problems, however, in assuming that this constraint is responsible for the alignment of the right edge of the HTS in (29). First, lexical High tones do not undergo unbounded spreading. This fact, however, might be accounted for by some higher ranking constraint which mediates the effects of (31)—perhaps some locality constraint on linked H's insuring that their spreading is bounded (cf. Myers' (1996) LOCAL). A more difficult challenge, however, is accounting for the lack of unbounded spreading in grammatical High tones which dock onto the stem-initial TBU—Pattern IV. It should be recalled that in these cases, the grammatical H does not spread at all.

(32) to-a-timok-ire twààtímòkìrè ‘we recently rested (applic)’

H

I would like to propose that both of the above potential difficulties are avoided if we assume that what drives unbounded spreading is a constraint which insures that at least one edge of a HTS within the stem must align with a stem edge. This is given below.

(33) ALIGN (H,E,S,E)

Align an edge E of an output HTS with the edge E of the stem

This constraint will not force unbounded spreading of lexical Highs as they are already edge-peripheral (in this case stem-initial). In conjunction with TONE TO ACCENT ALIGNMENT (which effectively penalizes leftward spreading from the accented TBU), ALIGN (H,E,S,E) will insure that a grammatical High which docks onto the peninitial TBU of the stem undergoes rightward unbounded spreading in order that one edge of its output HTS, in this case the right one, is aligned to one edge of the stem. Finally, in the case where the grammatical H is attracted to the stem-initial TBU (by TAA), ALIGN (H,E,S,E) will not induce any rightward spreading as the left edge of the HTS is already aligned to the left edge of the stem. The tableau for (29) is given below.

(34) to-tim<u>o</u>k-er-a tòtìmókérá 'we rest'

H

Candidates	AL (ED)	TAA	*H
a. ☞to-tim<u>o</u>k-er-a \ | / H			* * *
b. to-tim<u>o</u>k-er-a | H	*!		*
c. to-tim<u>o</u>k-er-a \ / H	*!		* *
d. to-tim<u>o</u>k-er-a | H		*!	*
e. to-tim<u>o</u>k-er-a \ \ / / H		*!	* * * *
f. to-tim<u>o</u>k-er-a \ / H		*!	* *

AL (ED), TAA >> *H

The optimal candidate (34a) is the one in which the left edge of the HTS of the grammatical High aligns with the left ede of the accented TBU and the right edge aligns with the right edge of the word to satisfy ALIGN (H,E,S,E). Candidates (34b) and (34c) are ruled out as no edge of their output HTS's align with an edge of the stem. Candidates (34d-f) are not optimal due to a TAA violation as the accented TBU is not the left edge of the output HTS. In particular, (34f) shows that it is not enough that TAA simply insure that the accented TBU is High toned. Rather, TAA must insure that the accented TBU be the initial TBU of the output HTS of the grammatical High.

Below we turn to the tableau for the Recent Past form in which the stem-initial TBU is accented (Pattern IV).

(35) to-a-t̲imok-ire twààtímòkìrè 'we recently rested (applic)'

H

Candidates	AL (ED)	TAA	*H
a.☞ tw-a a-t̲imok-ire | H			*
b. tw-a a-t̲imok-ire \ / H	*!	*	* *
c. tw-a a-t̲imok-ire | H		*!	*
d. tw-a a-t̲imok-ire \ / H			* *
e. tw-a a-t̲imok-ire \ \ / / H			* * * *

In the above tableau we see that the grammatical form is the one where the High tone docks onto the accented TBU and does not spread. Candidate (35b) is not optimal as neither edge of the output HTS aligns with an edge of the stem. While the HTS of (35b) does indeed contain a stem-peripheral TBU, AL(ED) demands that either the right or left edge of the output HTS aligns exactly with a stem edge—something not true of this candidate. Candidate (35c) is ruled out because the left edge of the output HTS does not align with the left edge of the accented TBU. Finally, candidates (35d) and (35e) are less optimal than (35a) as they incur gratuitous *H violations, not forced by any higher constraint(s).

We emphaize here that it does not seem possible to use ALIGN (H,R,S,R) instead of ALIGN (H,E,S,E). While ALIGN (H,R,S,R) (crucially ranked above *H) would correctly account for the unbounded spreading in (34), it would incorrectly predict unbounded spreading in (35) as well.

2.4 Bounded Spreading and the lexical and prefixal Highs

Let us now turn to an account of the bounded spreading of the lexical High (i.e. the High supplied by the verb root) and the prefixal Highs. There seem to be two issues involved here. First, we must account for the binary nature of the spreading. Second we must account for why the constraints insuring bounded spreading do not adversely affect the grammatical Highs which undergo unbounded spreading. (We will also need to explain why the constraints inducing unbounded spreading of the grammatical High do not affect the lexical and prefixal Highs.) Let us consider the former question first: how can boundedness in spreading be accounted for generally? One possibility is a constraint which would require that High Tone Spans be binary (i.e. contain exactly two TBU's). This is given below.

(36) DOM BIN (HTS) (cf. M&P 1993)

A High Tone Span must contain exactly two TBU's

If we require that the left edge of an output HTS must be aligned with the left edge of an input H, abbreviated by ALIGN (H,L) below, then DOM BIN will successfully force bounded spreading in the forms in (44) as illustrated schematically below.

(37) CV[CVCVCV
|
H

Candidates	AL(H,L)	DOM BIN	*H
a. ☞ CV[CVCVCV \ / H			* *
b. CV[CVCVCV \ / H	*!		* *
c. CV[CVCVCV | H		*!	*
d. CV[CVCVCV \ | / H		*!	* * *

DOM BIN >> *H

Candidate (37b) is not optimal as the left edge of the output HTS is not aligned with the left edge of the stem. Candidates (37c) and (37d) are less optimal than (37a) as they do not contain exactly two TBU's.

An analysis involving DOM BIN runs into problems, however, in certain Ekegusii forms. As discussed above in (2b), Ekegusii has another tonal process which spreads a High tone leftward onto an adjacent toneless tautosyllabic mora. This can be thought of as a process in which Rising Tones, unattested in the language, are resolved into level High tones. (/o/ glides before a following V in the forms in (38a-c) inducing compensatory lengthening on that V.)

(38) Resolution of Rise to High in Ekegusii

a. tò-kà-nà-gw-áát-ér-à (< /to-ka-na-ko-át-er-a/)
'and we still divided for'

b. tò-kà-nà-kw-ááór-à (< / to-ka-na-ko-áor-a/)
'and we still yawned'

c. tò-kà-nà-kw-ɔ́ɔ́mán-èr-à (< / to-ka-na-ko-ɔ́man-er-a/)
'and we still quarreled for'

d. tó-ó-gó-tìmòk-à (< /to-ó-ko-timok-a/)
'we rest'

As can be seen in the forms in (38), the rightward bounded spreading of an input H occurs even when (bounded) leftward spreading takes place to resolve a potential Rising tone to a level High. It turns out, then, that while DOM BIN can force bounded spreading in (37) by insisting the HTS domain is binary, it will not induce any rightward bounded spreading in (38) as the leftward spread of the High already creates a binary tonal domain. This is clearly seen in the tableau below.

(39) CV -VCVCV
|
H

Candidates	*RISE	DOM BIN	*H
a. CVVCVCV \ | / H		*!	***
b. CVVCVCV | / H	*!		**
c. CVVCVCV \ \ / / H		*!	****
d. ☞ * CVVCVCV \ | H			**

Candidate (39b) is not optimal as it violates *RISE. Candidates (39a) and (39c) are both worse than (39d) in that they violate DOM BIN, incorrectly predicting (39d) to be the optimal form. Finally, it seems unclear how a DOM BIN constraint could be modified in an explanatorily adequate way to apply only to HTS's of linked Highs and not grammatical Highs, the latter of which are rarely binary in Ekegusii. I therefore conclude that DOM BIN by itself it not sufficient to account for bounded spreading, at least in Ekegusii.

Another way to analyze bounded spreading, and the one I will adopt here, is to force rightward spreading by a constraint which forbids the right edge of an input HTS to be aligned with the right edge of an output HTS. If such a constraint, formalized in (40), immediately dominates a constraint which attempts to align the right edge of the HTS in the input with the right edge of the HTS in the output, given in

(41), then the result is a "minimal misalignment" of the right edge of the input and output HTS's (to be illustrated in (42) below).

(40) *ALIGN (H,L)-I/O

The right edge of a HTS in the output must not align with the right edge of a HTS in the input.

(41) ALIGN (H,L)-I/O

The right edge of a HTS in the output must align with the right edge of a HTS in the input.

We will see in the discussion that follows that both of these constraints (as well as several others to be discussed below) are sensitive to the lexical domains in which they apply, i.e. a violation of some constraint X at one lexical level (e.g. the stem) might be ranked above some other constraint Y, but at another lexical level (e.g. the word) X might be ranked below Y. It will be shown that there are two lexical domains (or strata) which are relevant in Ekegusii: the stem and the prosodic word.[13] I will assume a single set of constraints where certain constraints are marked as being applicable when the largest domain containing the violation is 1) the stem or 2) the prosodic word. This will be indicated with -S and -W annotations respectively in the tableaux. Below I briefly contrast this approach with one in which the stem-level constraints produce an output stem which is then fed into a word-level component.

The effect of constraints (40) and (41) (both at the level of the stem) on a lexical High tone is illustrated in (42).

(42) to-ga-takun-a tògàtákúnà 'and we chewed' (cf. (39))
|
H

Candidates	*FLOAT	*AL (H,R)-S	AL (H,R)-S	IDENT (H)	*H
a. ☞ to-ga- takun-a \ / H			*		* *
b. to-ga-takun-a H	*!			*	
c. to-ga-takun-a | H		*!			*
d. to-ga-takun-a \ / H		*!			* *
e. to-ga-takun-a \ | / H			**!		***
f. to-ga-takun-a | H			*	*!	*
g. to-ga-takun-a \ | / H			*		***!

*AL (H,R)-S >> AL (H,R)-S, *H; IDENT (H) >> *H

The optimal candidate (42a) is the one in which the lexical High has undergone bounded spreading (i.e. minimal displacment of the right edge) to conform with *AL(H,R)-S and AL(H,R)-S. Candidate (42b) is ruled out because the High tone is floating. Candidates (42c-d) are ruled out because the lexical H did not spread rightward, i.e. the right edge of the output HTS is still aligned with the right edge of the input HTS. While right edge of the HTS in candidate (42e) is misaligned, the misalignment in not minimal, as evidenced by the more egregious

violation of AL(H,R)-S. The right edge of the HTS of candidate (42f) is minimally misaligned, but it violates IDENT (H) since an input High-toned TBU surfaces as toneless. Finally, the misalignment of the right edge of the HTS in (42g) is minimally misaligned, but it is not as optimal as (42a) due to an additional unforced violation of *H.

We now return to the question of how to force bounded spreading of linked lexical Highs while forcing unbounded spreading of floating grammatical Highs. We note here that the ALIGN and *ALIGN constraints, as formalized in (40) and (41), will only affect linked Highs as what is being compared in each case is an edge of an input High-toned TBU with an output HTS. As the grammatical High has no input High-toned TBU in the input, neither of these constraints will ever influence its behavior. Conversely, in cases of bounded spreading, such as the one in (42), the lexical H will always be stem-initial and therefore satisfy AL(H,ED), the constraint which forces unbounded rightward spreading of the grammatical High.

2.5 Multiple Highs within the stem and the OCP

We are now ready to consider cases involving multiple underlyingly High tones. Let us first consider forms which contain both a grammatical and a lexical High.

(43) to-tak<u>u</u>n-er-a tòtákúnérá ‘we chew (applic.)’

H H

I assume that in these forms the TAA will force the grammatical High to dock onto the accented (peninitial) TBU of the stem. This, however, yields a configuration in which two High tones are linked to immediately adjacent syllables. This configuration has been shown by Leben (1972), Goldsmith (1976), and others to be a dispreferred one

cross-linguistically and ruled out (= penalized in OT terms) by the Obligatory Contour Principle, formalized in (44). I follow Myers (1996) in assuming that this is a violable OT constraint.

(44) OCP: * m m
| |
H H

Given the surface representation of forms such as the one in (44) where every TBU in the stem surfaces as High-toned, two possible analyses present themselves: 1) the two High tones fuse into a single High tone, thus avoiding an OCP violation, or 2) OCP violations (at least within the stem) are simply tolerated. Let us consider the first possibility. Recall that the penalty for fusion is UNIFORMITY (21c), repeated below for convenience.

(45) UNIFORMITY (X): No element X in the output has multiple correspondents in the input

We will see in the discussion that follows that like the *AL(H,R) and AL(H,R) constraints motivated above, both OCP and UNI violations in Ekegusii are sensitive to the domains in which they apply. I will therefore annotate them in the tableaux for the domain (either Stem or Word) in which they apply.

Let us first pursue an analysis where surface representations of forms such as (43) do not violate the OCP. Toward this end, let us consider the tableau below where the OCP is ranked highly.

(46) to-tak<u>u</u>n-er-a tòtákúnérá ‘we chew (applic.)’

H H

Candidates	OCP-S	TAA	UNI -S	*AL (H,R)-S	AL (H,R)-S	IDENT	*H
a. to-tak<u>u</u>n-er-a H H	*			*			****
b. to-tak<u>u</u>n-er-a H H		*!		*			**
c. to-tak<u>u</u>n-er-a H H		*!			*		***
d. to-tak<u>u</u>n-er-a H,		*!	*		***		****
e. ☞ *to-tak<u>u</u>n-er-a H,			*!		***	*	***

The first important issue that arises here concerns how to evaluate fused High tones (which are marked with a comma for easy identification in the tableaux). This issue is not a trivial one as the fused High’s component input Highs, one being linked and one being floating, are not subject to the same set of constraints. Linked Highs are subject to *ALIGN(H,R)-S and ALIGN(H,R)-S, while floating tones are not. Conversely, floating tones are subject to Tone to Accent Attraction while linked Highs are not. I would like to argue that since a fused High H_f is nothing more or less than two distinct High tones H_1 and H_2 acting as a single High, it is subject to all constraints pertaining to H_1 and H_2 (and may, in fact, be subject to additional constraints specific to fused elements as we will see below.) Therefore, in the case of (46) the

fused High, made up of a linked lexical High and a floating grammatical High, will be subject to both *AL(H,R)-S which extends the right edge of the lexical High rightward, and TAA, which demands that the left edge of the HTS align with the left edge of the accented TBU. We return to this issue again shortly below.

Returning to the tableau in (46), when the OCP-S is highly ranked, candidate (46a) will be excluded. The problem is whether it is possible to rank the constraints in such a way that candidate (46d), which has the correct surface pattern, is optimal. However, careful consideration of the tableau in (46) reveals that no matter how the constraints are ranked, candidate (46c) will always fare better than (46d). As seen in the tableau, if TAA is ranked above UNI-S (something which will be justified below), then candidate (46c) actually emerges (incorrectly) as the predicted optimal form. I conclude here then, that the surface form of (46) does not result from a fusion of the two H tones. Instead I argue that it results from the configuration in (46a) which violates the OCP. (This point will be further justified on the basis of other forms below.)

Given a low ranking for OCP-S and a high ranking of UNI-S the correct form is predicted as shown in (47). That the OCP (as it applies to tone) is in fact sometimes violated has been demonstrated for a number of languages in Odden (1986). Cf. Myers (1996) who accounts one Bantu cases in an OT framework, where higher ranking constraints sometimes force an OCP violation.

(47) to-tak<u>u</u>n-er-a tòtákúnérá ‘we chew (applic.)’

H H

Candidates	TAA	UNI-S	*AL (H,R)-S	AL (H,R)-S	OCP-S	*H
a.☞ to-tak<u>u</u>n-er-a			*		*	****
b. to-tak<u>u</u>n-er-a	*!		*			**
c. to-tak<u>u</u>n-er-a	*!			*		***
d. to-tak<u>u</u>n-er-a	*!	*		***		****
e. to-tak<u>u</u>n-er-a		*!		**		***

TAA >> OCP-S, *AL(H,R)-S; UNI-S >> *AL(H,R)-S

The tableau in (47) differs from tableau (46) in that the OCP has been ranked relatively lowly. The optimal candidate (47a) is the one in which the HTS of the grammatical High extends from the accented TBU to the right edge of the word, causing a stem-level OCP violation. Candidates (47b-d) are not as optimal as (47a) due to TAA violations, and candidate (47e) is ruled out because it violates UNI-S. Returning to the issue of constraint applicability to fused Highs, it should be apparent that if fused Highs were not subject to constraints pertaining to floating Highs, viz. TAA, then (47e) would incorrectly be judged more optimal than (47a).

UNI-S, however, is not undominated. When the stem-initial TBU is accented (Pattern IV), a violation of UNI-S is forced by the TAA as seen below.

(48) to-a-takun-ire twààtákúnìrè 'we recently rested (applic)'
|
H H

Candidates	*FLOAT	AL (ED)	TAA	UNI -S	*AL(H)-S	AL(H)-S
a. ☞ tw-a a-takun-ire \ / H,				*		*
b tw-a a- takun -ire \ / H H	*!		*			*
c. tw-a a- takun -ire | | H H		*!	*		*	
d. tw-a a- takun -ire | \ |/ H H			*!		*	
e. tw-a a- takun -ire \ / | H H			*!			*
f. tw-a a- takun -ire | H,				*	*!	

TAA >> UNI-S

The optimal candidate (48a) is the one in which the lexical and grammatical Highs have fused, where the right edge of the fused High is minimally misaligned with respect to the right edge of the input lexical High. Candidate (48b) is ruled out because the grammatical H is left floating. Candidate (48c) is not optimal because no edge of the HTS of the grammatical High is aligned with a stem edge. Candidates (48d-e)

are ruled out because the accented TBU is not at the left edge of the HTS of the grammatical High. (These candidates illustrate that the TAA must insure that the accented TBU is at the left edge of the HTS of the grammatical H (a "subsegment" H) and not just any HTS.) Finally, candidate (48f) is not as optimal as (48a) since the right edge of the fused High tone is not (minimally) misaligned from the right edge of the linked input High.

I assume a constraint dubbed the "Twin Sister Convention" in the literature (Clements & Keyser 1983, Odden 1986) rules out the possibility of both Highs linking to the same TBU, as illustrated in (50).

(49) TWIN SISTER

(50) to-a-takun-ire twààtákúnìrè 'we recently rested (applic)'

Candidates	TWIN	UNI-S	*AL (R)-S
a. ☞tw-a a- takun -ire \ / H,		*!	
b. tw-a a- takun -ire |\ H H	*!		*

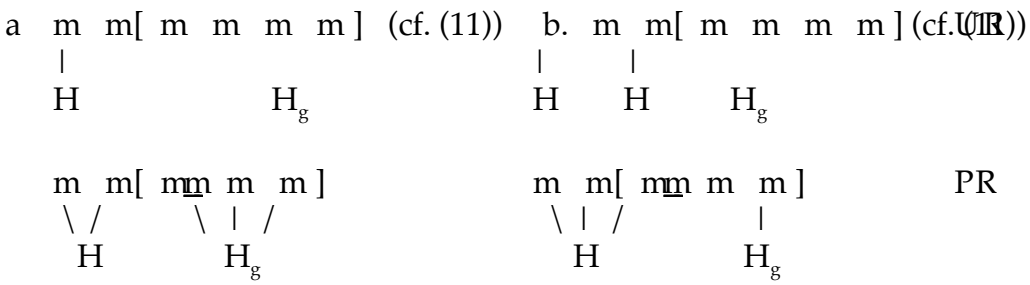
TWIN >> UNI-S

2.6 Multiple Highs within the prosodic word and the OCP

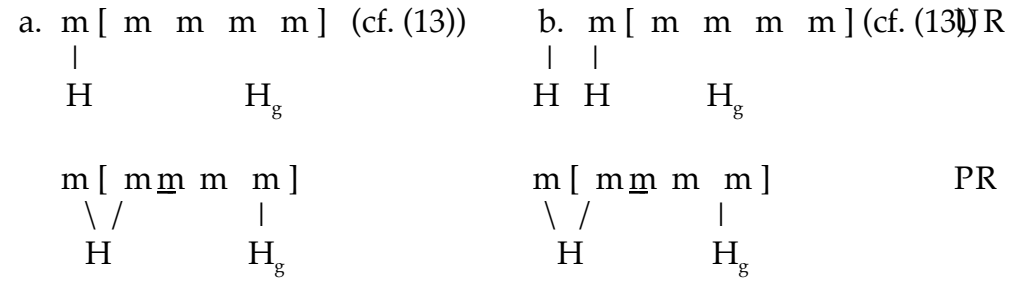
Let us now turn to forms with a prefixal High. We will see that the driving force behind the analysis of these forms (of Patterns I-III) is that

while OCP violations are tolerated within the stem, they are not tolerated at the level of the word (i.e. across the stem). This accounts for the fact that the grammatical H will not link to the second TBU of the stem if a pre-stem prefixal High tone has spread onto the stem-initial TBU (Pattern IIIa), as such docking would cause a word-level OCP violation (cf. 52a). This analysis will also account for the lack of peninitial docking in forms with both prefixal and lexical Highs (Patterns IIb, IIIb) if we assume that prefixal and lexical Highs undergo fusion. Any peninitial docking in such form would then incur a word-level OCP violation and not a stem internal one (cf. 51b, 52b). Below, then, is a summary of my proposed Input and Output forms for Patterns II and III (all of which involve prefixal Highs).

(51) Pattern II (pre-stem TBU has derived High)



(52) Pattern III (pre-stem TBU has underlying High)



Let us now consider each of these patterns in detail. We begin with forms such as those in (52a) which have a toneless root and a High linked to the stem-initial TBU. The input form is that given below.

(53) to-a-tim<u>o</u>k-er-a twáátímòkèrá 'we just rested (applic)'
|
H H

First it should be noted that we must account for the fact that the first syllable bears a level High tone and not a Rise as would be predicted by *H. We account for this here by positing (54) which will insure that the left edge of a HTS is always aligned to the left edge of a syllable.[14]

(54) ALIGN (H,L,s,L) (= *RISE)

Align the left edge of a HTS with the left edge of a syllable

This constraint is undominated, and illustrated in (55). (We account for the behavior of the floating High below.)

(55) to-a-tim<u>o</u>k-er-a twáátímòkèrá 'we just rested (applic)'
|
H H

Candidates	ALIGN (H,L,s,L)	*H
a. tw-a a-tim<u>o</u>k-er-a \ | H H		*
b. tw-aa-tim<u>o</u>k-er-a | H H	*!	

ALIGN (H,L,s,L) > *H

Let us now complete our account of forms of type (53). In order to illustrate the need for certain constraints to be sensitive to lexical

domains (in this case the stem and prosodic word), let us briefly consider the prediction made by the constraints (and their current ranking) under the assumption that the constraints simply apply across the board.

(56) to-a-timok-er-a twáátímòkèrá 'we just rested (applic)'
|
H H

Candidates	TAA	UNI	*AL (H,R)	AL (H,R)	OCP
a. tw-a a-timok-er-a \ | / | H H	*!			*	
b. tw-a a-timok-er-a \ | \ | / H H			*!		
c. ☞ *tw-a a-timok-er-a \ | / \ | / H H				*	
d. tw-aa-timok-er-a \ | / H,		*!		****	
e. tw-aa- timok-er-a \ \ / / H,	*!	*		* *	
f. tw-aa- timok-er-a \ \ / H,	*!	*		*	

We can see that regardless of the relative ranking of TAA and UNI (not yet established), candidate (56c), where TAA is obeyed at the expense of a low level OCP violation, emerges as the optimal candidate given the rankings thus far established. If, however, we assume (as anticipated above) that certain constraints are marked for the lexical

domain in which they apply, then the correct surface form (56a) can be straightforwardly predicted as seen in (57).

(57) to-a-timo̲k-er-a twáátímòkèrá 'we just rested (applic)'
|
H H

Candidates	*AL (H,R)W	OCP-W	TAA	UNI-W	AL (H,R)W	OCP-S
a.☞ tw-a a-timo̲k-er-a \ | / | H H			*		*	
b. tw-a a-timo̲k-er-a \ | \ | / H H	*!					
c. tw-a a-timo̲k-er-a \ | / \ | / H H		*!			*	
d. tw-a a-timo̲k-er-a \ \ / / H,			*	*!	* *	
e. tw-a a-timo̲k-er-a \ \ / H,			*	*!	*	

UNI-W >> AL(H,R)-W,*AL(H,R)-W, OCP-W >> TAA

The optimal candidate (57a) is the one in which the prefixal High undergoes bounded spreading and the grammatical High, to avoid a word-level OCP violation, docks onto the word final TBU to satisfy ALIGN (H,E,S,E). The above tableau illustrates that, e.g. while TAA is enforced even at the expense of a stem level OCP violation (cf. (47)), it is not enforced if a word level OCP violation would result (57c). This seems to be a correct generalization, i.e. a grammatical High will link to an accented TBU only if it doesn't cause a word-level OCP violation (as opposed to a stem-level one). Similarly if the language must choose

between violating the word level *AL(H,R)-W constraint, which forces spreading of a prefix H or violating TAA, it will violate TAA (cf. (57a-b)). But if the choice is between a stem level *AL(H,R)-S violation and TAA, it will violate *AL(H,R)-S (cf. (47)). (57d-e) are not as optimal as (57a) as fusion violates UNI-W.

Let us briefly consider one additional possible output for (57) involving tone fusion. Consider the following tableau.

(58) to-a-timok-er-a twáátímòkèrá 'we just rested (applic)'
|
H H

Candidates	*AL (H,R)W	OCP-W	TAA	UNI-W	AL (H,R)W	IDENT
a. tw-a a-timok-er-a \ | / | H H			*!		*	
b. ☞ *tw-aa-timok-er-a \ | / H,				*	****	*

I will show below on the basis of other forms that TAA must be ranked higher than UNI-W, AL(H,R)-W and IDENT. In order to insure that (58a) is more optimal than (58b) we must somehow constrain tone fusion. To this end I propose a constraint which demands that an output HTS of a fused High minimally contain the TBU's associated with the input Highs which are being fused. What this constraint effectively does is to disqualify candidates such as (58b) which avoid an apparent (fatal) MAX-I/O (H) violation through fusion. In derivational terms, the constraint penalizes forms in which fusion is concomitant with delinking.

(59) Fused High Requirement (FHR)

A High Tone Span of a fused High in the output must contain all the TBU's of the input HTS's of the individual H's which are being fused.

The effects of (59) can be seen in (60).

(60) to-a-tim<u>o</u>k-er-a twáátímòkèrá 'we just rested (applic)'

H H

Candidates	OCP-W	FHR	TAA	UNI-W	AL (H,R)W	IDENT
a. ☞ tw-a a-tim<u>o</u>k-er-a			*		*	
b. tw-aa-tim<u>o</u>k-er-a		*!		*	****	*

FHR >> TAA

Before moving to the next type of tonal configuration, let us briefly examine the issue of how best to represent the sensitivity of various constraints to different lexical domains, in this case that of the stem and that of the prosodic word. While there are potentially many ways to deal with this issue, I wish to briefly contrast the approach taken here, viz. to annotate certain constraints as to the domain/level at which they apply, with an approach in which a block of constraints in a stem domain produces an output which is then fed to another block of constraints in a word domain (where the ranking of the constraints in the two domains may vary). I will refer to these contrasting approaches as the "single-block" and "double-block" models.

Let us briefly consider how the double-block model would handle forms such as the one in (57). The input to the stem block would be the configuration in (61).

(61) tim<u>o</u>k-er-a

H

It should be noted here that the output of the stem block for (61) will serve as the input to both words of type (57) *twáátímòkèrá* 'we just rested (applic)' (Pattern IIIa), as well as words of type (34) *tòtìmókérá* 'we rest' (Pattern (Ia) and *tw-áá-gá-tìmók-ét-é* 'we rested' (11a) (Pattern IIa). If we assume that both TAA and ALIGN (H,ED) are both highly ranked (as they are in the current single-block proposal), then the output of the first block will be the structure in (62).

(62) tim<u>o</u>k-er-a
\ | /
H

It should be noted here that this structure will remain unchanged in forms of Patterns Ia and IIa. In forms of Pattern IIIa (57), the input to the second block will be the configuration in (63).

(63) to-a-tim<u>o</u>k-er-a twáátímòkèrá 'we just rested (applic)'
| \ | /
H H

Given the rankings established in the one-block model (which would be independently needed in the second block of the two-block model) an incorrect output is predicted as shown in (64).

(64) to-a-tim<u>o</u>k-er-a twáátímòkèrá 'we just rested (applic)'

	\	/
H		H

Candidates	OCP	UNI	AL (H,R)	IDENT	*H
a. tw-a a-tim<u>o</u>k-er-a \ | / | H H			*	* *	* * * *
b. ☞*tw-a a-tim<u>o</u>k-er-a \ | / \ / H H			*	*	* * * * *

Candidate (64b) is incorrectly predicted to be optimal, as it violates IDENT less than (64a), removing the High specification from only one TBU instead of two. To sum up this point, attraction of the grammatical High to the accented TBU must be blocked when it would cause a word-level OCP violation. However, under the two-block approach, at the time that the grammatical H is to dock onto the accented TBU (a stem-level operation), it is impossible to tell whether this will incur a word-level OCP violation as the prefixal H's, which potentially spread into the stem, are not yet present. This is not a problem under the one-block approach as the tones (of the grammatical, lexical, and prefixal varieties) are all present, providing a way to prevent tone to accent attraction just in the case that it would cause a word-level OCP violation.

Let us now turn to a configuration of type (52b) involving three tones which also results in a surface form where (within the stem) only the stem-initial and stem-final TBU's are High-toned.

(65) to-a-tak<u>u</u>n-er-a twáátákùnèrá ‘we just chewed (applic)’

	H H H

Candidates	*AL (H,R)W	OCP-W	TAA	UNI-S	*AL (H,R)S	AL (H,R)S	UNI-W
a.☞ tw-a a-tak<u>u</u>n-er-a \ | / | H, H			*		*		*
b. tw-a a-tak<u>u</u>n-er-a \ / | \ | / H H H	*!	*			*		
c. tw-a a-tak<u>u</u>n-er-a \ / | / | H H H	*!	*	*			*	
d. tw-a a-tak<u>u</u>n-er-a \ | / \ | / H, H		*!			*		*

Candidates (61b,c) are ruled out due to the lack of spreading of the prefixal High. (65a) avoids a *AL(H,R)-W violation as the right edge of the fused HTS (into which the prefix is an input) is not aligned with the right edge of the input prefixal High. Candidate (65d) is not optimal as it incurs a word level OCP violation. Before leaving this type of form, we note the following incorrect prediction.

(66) to-a-tak<u>u</u>n-er-a twáátákùnèrá ‘we just chewed (applic)’
| |
H H H

Candidates	*AL (H,R)W	OCP-W	TAA	*AL (H,R)S	AL (H,R)S	UNI-W	AL (H,R)-W
a. tw-a a-tak<u>u</u>n-er-a \ | / | H, H			*	*!		*	* *
b.☞ *tw-a a-tak<u>u</u>n-er-a \ \ / / | H, H			*		*	*	* * *

Given that *AL (H,R)-S >> AL (H,R)-S >> AL(H.R)-W, regardless of how the other constraints are ranked, candidate (66b), where the lexical High undergoes bounded spreading, will always be better than (66a). What then explains the fact that the lexical H must not undergo bounded spreading in forms of this kind? We noted above in §1 that the lexical High undergoes bounded spreading when no grammatical High is present or when the grammatical High is attracted to a stem-initial accented TBU. It does not spread when the second TBU of the stem is accented. The generalization, then, seems to be that only subsegment Highs (i.e. grammatical Highs in the case of Ekegusii) can link to the accented TBU. This generalization can be captured by positing a constraint which prohibits an accented TBU from being a part of any HTS. Such a constraint would be ranked below TAA, so that grammatical Highs are forced to link to the accented TBU, but be ranked above *AL(H,R)-S, blocking the otherwise productive process of bounded spreading of lexical High tones. This constraint, given in (67) and illustrated in (68) is an adaptation of the AVOID PROMINENCE constraint proposed in Kisseberth (1993) and modified slightly in Ham

(1996) to penalize the linking of a High tone to a metrically prominent syllable in IsiXhosa.

(67) AVOID PROMINENCE (AP)

A metrically prominent TBU is not a member of any HTS

* V
|
H

(68) to-a-tak<u>u</u>n-er-a twáátákùnèrá 'we just chewed (applic)'
| |
H H H

Candidates	*AL (H,R)W	OCP-W	TAA	UNI-S	AP	*AL (H,R)S	AL (H,R)S
a. ☞tw-a a-tak<u>u</u>n-er-a \ | / | H, H			*			*	
b. tw-a a- tak<u>u</u>n-er-a \ \ / / | H, H			*		*!		*

FAR >> *AL(H,R)-S

AVOID PROMINENCE, (crucially) ranked above *AL(H,R)-S, will rule out candidate (68b) in which the accented TBU is part of the HTS of the fused High.

Let us now turn to third type of configuration (involving the grammatical High) in which delinking was required, where again we see that the optimal form results from fusing the prefixal and lexical Highs via the constraints motivated above.

(69) to-a-ga-takun-et-e twáágátákùnèté ‘we chewed’

	H H H

Candidates	*AL (H,R)W	OCP -W	TAA	*AL (H,R)S	AL (H,R)S	UNI -W	AL (H,R)W
a.☞tw-a a-ga-tak<u>u</u>n-et-e \ \ / / | H, H			*	*		*	* *
b. tw-a a-ga-tak<u>u</u>n-et-e \ | | \ | / H H H	*!			*			
c. tw-a a-ga-tak<u>u</u>n-et-e \ | / | \ | / H H H		*!		*			*
d. tw-a a-ga-tak<u>u</u>n-et-e \ \ / / \ | / H, H		*!		*		*	* *

Candidate (69b) is ruled out because the prefixal H did not spread and candidates (69c,d) are ruled out due to word-level OCP violations. Candidate (69a) avoids and OCP-W violation by fusing the prefixal and lexical Highs and failing to associate the grammatical High to the accented TBU.

We now turn to forms of type (5) discussed above in which the lexical H undergoes bounded displacement. It should be recalled that these forms have neither a grammatical High nor an accented TBU. In such cases a lexical High on a CVCV stem displaces to the following (word-final) TBU just in case a prefixal H spreads to the pre-stem TBU. We analyze such cases as another means provided by the language to avoid a word-level OCP violation. This is illustrated in (70).

(70) to-o-go-tam-a tóógótàmá 'we ran away'
| |
H H

Candidates	*AL (H,R)W	OCP -W	*AL (H,R)S	AL (H,R)S	UNI -W	AL (H,R)W	IDENT
a. ☞ to-o-go-tama \ | / | H H				*		*	*
b. to-o-go-tama \ | \ / H H	*!						
c. to-o-go-tama \ | / \ / H H		*!					
d. to-o-go-tama \ \ | / H,			*!		*	* *	
e. to-o-go-tama \ | / H,			*!	*	*	*	*
f. to-o-go-tama \ \ | / / H,				*	*!	* * *	

either UNI-W or AL(H,R)-W >> IDENT (H)

The optimal candidate is the one where the prefixal H has undergone bounded spreading and the lexical High displaces to the following TBU. Candidate (70b) is disqualified due to the lack of spreading of the prefixal High. Candidate (70c) incurs a fatal word-level OCP violation. Candidates (70d,e) are disqualified due to the lack of spreading/displacement of the lexical High. Candidate (70f) is less optimal than (70a) as word-level fusion has taken place.

Finally, let us turn to forms such as the one in (71) (cf. (7a)) which is similar to the one in (70), except that the stem contains three TBU's

instead of two. We recall that in these forms the lexical High does not displace, as it did in (70), but instead undergoes bounded spreading as seen in (71).

(71) to-o-go-tam-er-a tóógótáméràˈwe ran away (applic)'
| |
H H

Candidates	AL (H,E)	*AL (R)-W	OCP -W	*AL(R) -S	AL(R) -S	UNI-W	AL(R)-W
a. ☞ to-o-go-tam-er-a \ \ | / / H,					*	*	* * *
b. to-o-go-tam-er-a \ | / | H H	*!				*		*
c. to-o-go-tam-er-a \ | | H H		*!		*			
d. to-o-go-tam-er-a \ | / \ / H H			*!		*		*
e. to-o-go-tam-er-a \ \ | / H,				*!		*	* * *
f. to-o-go-tam-er-a \ | / | H H					**!		*

AL(R)-S >> UNI-W, AL(R)-W; AL(H,ED) >> UNI-W

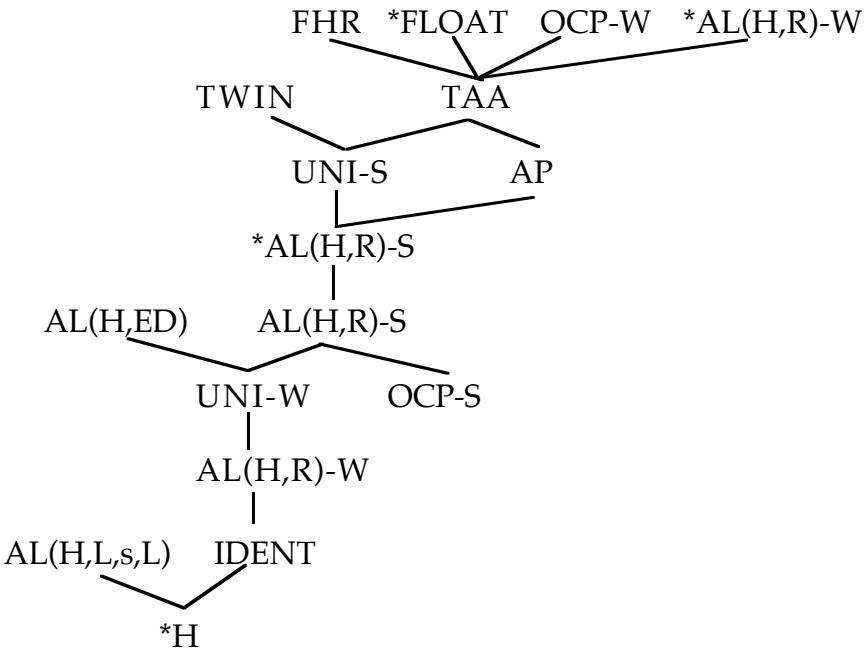
The optimal form is the one where the two Highs have fused, and where the lexical High has undergone bounded spreading. Candidate (71b) is ruled out because the grammatical H does not align to a stem edge. Candidate (71c) is not optimal due to the lack of rightward spreading of the prefixal High. Candidate (71e) is ruled out due to the lack of spreading of the lexical High. Candidate (71f) is less optimal

than (71a) due to a more than minimal misalignment of the lexical High. Finally, we not that while candidate (71d) shows the correct surface pattern, we assume the structure of the optimal form is (71a) due to candidate (71d)'s incursion of a word-level OCP violation.

3. Summary and Conclusion

I have presented a wide and complex array of forms found in the Ekegusii verbal system. We have seen that the surface tonal pattern on the verb stem is determined by a variety of factors including the presence or absence of a) prefixal Highs, b) a lexical High, and c) a grammatical suffixal High. I have shown that the tonal allomorphy in verbs, though quite complex, is completely systematic and predictable from the location of the underlying tones. The Optimality Theory account of these facts made use of a limited set of universal constraints, most of which have been attested in various other accounts of tonal (as well as non-tonal) systems. The final ranking of the constraints motivated in the analysis is given in (72)

(72) Summary of constraint rankings



To conclude, let us summarize major aspects of the behavior of the prefixal, lexical and grammatical High tones. Prefixal and lexical highs are linked in the input. The *AL(H.R) and AL(H,R) constraints combine to induce a minimal misalignment of the right edge of their HTS's. This results in rightward bounded spreading. Rightward spreading is never blocked in the case of prefixal Highs, but is blocked in the case of lexical Highs by AVOID PROMINENCE if spreading would be onto an accented TBU.

Word-level OCP violations are never tolerated in Ekegusii. In every case but one, an OCP violation between a prefixal and lexical High is avoided by fusing the two Highs. In the case of CVCV stems (with no grammatical High) the lexical High can displace to the stem-final TBU to avoid a word-level OCP violation, as violating IDENT is not as egregious as violating UNI-W. In longer stems fusion (violating UNI-

W) is preferable to displacing the High one TBU to the right (violating AL (H,E,S,E) or displacing the High to the end of the word (violating AL(H,R)-S in a more than minimal fashion).

Let us now turn to forms with grammatical Highs. Grammatical Highs attempt to dock onto the accented TBU to comply with TAA. This will be blocked if a word-level OCP violation would result, but will occur in spite of a stem-level OCP violation, as OCP-S is low ranking. Unless the grammatical High docks onto the stem-initial TBU (Pattern IV), ALIGN (H,E,S,E) will force it to spread to the stem-final TBU in order that at least one edge of its HTS is aligned with a stem edge.

In the course of analyzing the various tone patterns attested in Ekegusii, several points of theoretical interest have emerged. I have attempted to show that certain constraints are more strictly enforced at one lexical level than at another. To best account for this, I have argued that a single pass through a constraint ranking, where constraints are annotated for the lexical domain in which they apply, is superior to an account in which a block of constraints (in a stem domain) produces an output which is then fed to another block of constraints (in a word domain). Second, I have argued that Ekegusii has a morphologically assigned accent which interacts with both the linked and floating tones, although in different ways. I proposed two general constraints which help define the interaction of tone and accent: TAA and AVOID PROMINENCE, both of which find precedents in the phonological literature. Third, I have shown that in certain circumstances two High tones must fuse, and that when they do, the resulting High is subject to all the constraints which hold of each the two input Highs, which can

be distinct sets of constraints. Fourth, I have argued that bounded spreading (which affects both lexical and prefixal Highs) is best analyzed as a "minimal misalignment" of the right edge of the input HTS. At least for Ekegusii this seems preferable to a constraint which blindly insures that HTS's are binary. Finally, I argued that the most insightful generalization about the HTS of grammatical Highs is that at least one edge must align with a stem edge. To account for this formally, I have proposed that the edge parameter in an ALIGN constraint must be able to be underspecified.

References

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

Clements. G.N. & S. Keyser (1983). *CV Phonology*. Cambridge: MIT Press.

Goldsmith, J. (1976). *Autosegmental Phonology*. Ph.D. dissertation, MIT (distributed by IULC).

Goldsmith, John (1987). Tone and Accent and Getting the Two Together. *BLS* 13. 88-104.

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

Ham, Bill (1996). The tonology of IsiXhosa verbal paradigms: a comprehensive non-derivational account. Manuscript. Cornell University.

Hayes B (1989). Compensatory Lengthening in Moraic Phonology. *Linguistic Inquiry* 15: 33-74.

Hewitt, M & A. Prince (1989). OCP, locality, and linking: The N. Karanga verb. *Proceedings of the West Coast Conference on Formal Linguistics* 8, 176-91. Stanford: Stanford Linguistics Association.

Hubbard, Kathleen (1994). Optimality and Tone: Evidence from Bantu. Manuscript. U.C. Berkeley.

Hyman, Larry M. and E. Byarushengo (1984). A Model of Haya Tonology. In G.N. Clements and J. Goldsmith (eds) *Autosegmental Studies in Bantu Tone*. Dordrecht: Foris.

Hyman, Larry & F. Katamba (1993). A New Approach to Tone in Luganda. *Language* 69. 34-67.

Hyman, L. & A. Ngunga (1994). On the non-universality of tonal association 'conventions': evidence from Cigao. *Phonology* 11:1, 25-65.

Kisseberth, C. (1993) Optimal Domains: A Theory of Bantu Tone. A Case Study from Isixhosa. Paper given at ROW-1, Rutgers University.

Leben, William (1973). *Suprasegmental Phonology*. Ph.D. Dissertation, MIT.

McCarthy, John and A. Prince (1993a). *Prosodic Morphology I*, RuCCS TR-3. U-Mass, Amherst and Rutgers University, New Brunswick.

McCarthy, John and A. Prince (1993b). *Generalized Alignment*, RuCCS TR-7. U-Mass, Amherst and Rutgers University, New Brunswick.

McCarthy, John and A. Prince (1995). Faithfulness and Reduplicative Identity. In J. Beckman et al. (eds.) *Papers in Optimality Theory*. Amherst: GLSA. 259-384.

Myers, Scott. (1987). *Tone and the Structure of Words in Shona*. Ph.D. dissertation. Amherst: Graduate Linguistic Students Association.

Myers, Scott (1996). OCP Effects in Optimality Theory. Ms. University of Texas.

Odden, D. (1986). On the Role of the Obligatory Contour Principle. *Language* 62.2: 353-383.

Odden, D. (1987). Predictable Tone Systems in Bantu. In H. van der Hulst & N. Smith (eds.) *Autosegmental Studies on Pitch Accent*, Dordrecht: Foris. 225-252.

Orgun, Orhan (1995). Correspondence and Identity Constraints in Two-level Optimality Theory. WCCFL 14.

Orgun, Orhan (1996). Reduplicative Overcopying through Correspondence. Paper presented at LSA, San Diego, CA.

Poletto, R. (1995). Constraints on Tonal Association in Olusamia: An Optimality Theoretic Account. Manuscript. Ohio State University.

Prince, Alan and P. Smolensky (1993). *Optimality Theory: Constraint Interaction in Generative Grammar*, RuCCS TR-2. Rutgers University, New Brunswick, and University of Colorado, Boulder.

Pulleyblank, D. (1986). *Tone in lexical phonology*. Dordrecht: Foris.

Whiteley, W. H. (1960). *The Tense System of Gusii*, East African Kampala, Uganda: Institute of Social Research.

Zoll, Cheryl (1996) *Parsing Below the Segment in a Constraint Based Framework*. PhD dissertation. University of California, Berkeley.

Notes

[1] All the data were elicited from Achenchi Ndemo, a native speaker of Ekegusii (Guthrie E-42).

[2] See Odden (1987) for a discussion of Bantu languages where this distinction is not underlyingly present in verb roots.

[3] Dahl's Law is operative in Ekegusii which voices and fricates a /k/ if the following C is a voiceless obstruent. (Thus *g* is being used to represent a voiced velar fricative in all cases except where is follows a nasal in which case it is a stop.)

[4] Curiously, it seems that all monosyllabic verb stems in Ekegusii have roots which are underlyingly High-toned; even roots which bore a Low tone in Proto Bantu. E.g. *ó-kò-gw-á* 'fall, fail' (*gù), *ó-gò-sy-á* (*cì).

[5] It turns out that gliding is usually not triggered before roots beginning with /i/ or /u/.

[6] The tonology of the Preprefix, which induces a downstep in (2b), is somewhat exceptional in infinitival forms and will not be discussed further here.

[7] The following abbreviations will be used for the various verbal markers. The labels largely follow Whiteley (1960). I note here that the felicitous gloss (given by my consultant) cannot always be arrived at by compositionally combining the semantics of the individual morphemes.

P	Past
C	Continuity (general)
Cp	Continuity (past)
S	Sequential
N	Nonspecific
D	Duration
FV	Final Vowel

A Applicative
3sO 3rd sg. object
3pO 3rd pl. object

[8] There is no tense where the pre-root TBU is High and where there is no grammatical High.

[9] Previous studies of Bantu languages showing that certain tenses assign a grammatical High tone to some TBU at a fixed position in the stem (e.g. the initial, the second, the penultimate or final, depending on the tense) include Goldsmith (1987) on various Lacustrine Bantu languages, including KiHunde, Bukusu, Haya, Luganda & Shi; Odden (1987) on Kinga, Safwa, Hibena-Kihehe, Kimatuumbi, Makua and Kikuria; Hyman & Katamba (1993) on Luganda; Hubbard (1994) on Runyambo & Kikerewe; Hyman & Ngunga (1994) on Ciyao; Hewitt and Prince (1989) on Shona.

[10] Some prefixes show morphologically conditioned tonal behavior. E.g., as was noted above, in certain tenses subject markers are High-toned (cf. (9a,d)). Additionally, the prefix /raa-/ is always phonetically Falling (even when preceded by a toneless TBU).

[11] It is clear that the differences in tone patterns noted are directly correlated with the tonal status of the pre-stem TBU and do not directly follow from the tense of the verb alone. This can be seen by noting that two forms of the same tense can have different tonal patterns depending, e.g., on the presence of an object marker. E.g. verbs without an object marker which fall into pattern three due to the fact that the pre-stem TBU bears a High tone, become part of pattern two when they contain an object marker, as the object marker is now the pre-stem TBU and bears a derived High. (Cf. (13a-c), (11c-e).) Verbs without an

object marker which are part of the second pattern become part of the first pattern when they have an object prefix for the same reason. (Cf. (11a-b), (9f-g).)

[12] I have found no cases of the fourth logical possibility: linked to High in UR, but not PR.

[13] It has been shown in numerous Bantu languages that it is necessary to define the word and stem as possible domains in which phonological rules may apply. See, e.g. Myers (1987, 1996).

[14] This constraint is also employed in Poletto's (1995) account of Olusamia. Alternatively, these facts could be accounted for by positing a constraint which prohibits Rising tones (e.g. *RISE).