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Cyclicity in the phrasal phonology of Kivunjo Chaga

McHugh, Brian David, Ph.D.

University of California, Los Angeles, 1990

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Los Angeles

Cyclicity in the Phrasal Phonology

of Kivunjo Chaga

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Linguistics

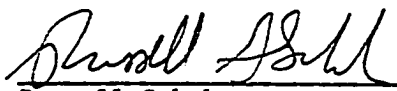
by

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1990

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The dissertation of Brian David McHugh is approved.



Russell Schuh



Marianne Celce-Murcia



Bruce Hayes, Committee Chair

University of California, Los Angeles

1990

To my father

RAYMOND JOHN MCHUGH

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ABSTRACT OF THE DISSERTATION

Cyclicity in the Phrasal Phonology of Kivunjo Chaga

by

Brian David McHugh

Doctor of Philosophy in Linguistics

University of California, Los Angeles, 1990

Professor Bruce Hayes, Chair

This dissertation is a study of cyclicity in the phrasal phonology of Kivunjo Chaga a Bantu language of Tanzania. My primary aim is to lend support to Prosodic Hierarchy theory, but with one modification: cyclic application of rules. My empirical base consist of the elaborate system of Kivunjo Chaga tone sandhi, in which it is necessary to posit both lexical tone and stem-penultimate accent. In discussing the mechanics of phrasal tone-accent rules in Kivunjo, I argue for underspecification of tone features. In an appendix I also propose a hierarchical representation of tone and accent as daughters of a single suprasegmental root tier that serves the dual function of providing tone-bearing units and bottom-line accentual grid marks.

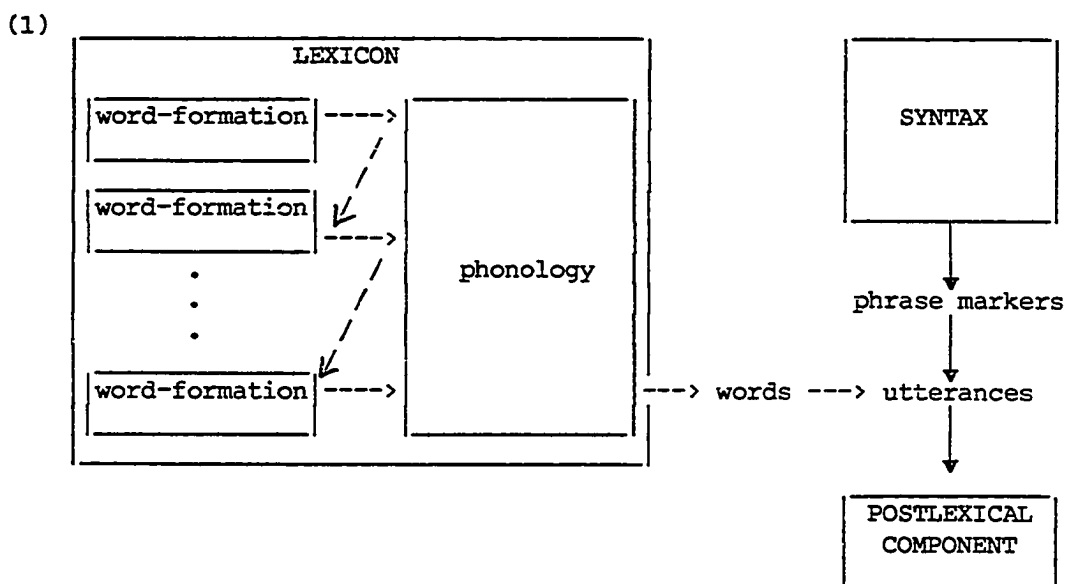
CHAPTER 1: INTRODUCTION

This dissertation is a study of cyclicity in the phrasal phonology of Kivunjo Chaga, a Bantu language of Tanzania. My primary aim is to lend support to Prosodic Hierarchy theory, only with one modification: cyclic rule application. My database consists of the elaborate system of Kivunjo Chaga tone sandhi, in which it is necessary to posit both lexical tone and stem-penultimate accent. In discussing the mechanics of phrasal tone-accent rules in Kivunjo, I argue for underspecification of tone features. In an appendix I also propose a hierarchical representation of tone and accent as daughters of a single suprasegmental root tier that serves the dual function of providing tone-bearing units and bottom-line accentual grid marks.

1.1. The cycle in phrasal phonology

In The Sound Pattern of English (SPE), Chomsky and Halle (1968) maintained that all phonological rules may apply cyclically, and that cyclicity of phonological rules reflects the nested bracketing structure, both morphological and syntactic, of the strings to which those rules apply. However, the organization of the grammar assumed in SPE did not force cyclicity on phonological rules. The structure-building component (syntax and morphology) interacted with the phonological component only once in the derivation: its final output served as the input to the phonology. Thus it is equally conceivable that in such a framework phonological rules should fail to refer to bracketing entirely, or that they should refer to bracketing information in a noncyclic fashion.

The theory of Lexical Phonology (Kiparsky 1982, Mohanan 1982, 1986) has brought a partial remedy to the lack of a principled account for cyclicity by proposing that cyclicity correlates with the type of domain in which a rule applies. In this theory only lexical phonological rules -- those which apply word-internally -- are cyclic. Their cyclicity follows from the structure of the lexicon, in which morphological rules are interleaved with phonological rules, as shown in (1) below.



The claim made by Lexical Phonology is that only through such interaction between a structure-building component and the phonology can phonological rules apply to nested structures in a cyclic manner.

By that criterion, then, Lexical Phonology predicts that sentence-level, or postlexical rules will not apply cyclically to syntactic trees. This is because phrase structure rules are fundamentally different from word-formation rules in nature. While word-formation

rules are additive, creating structure from the inside out, phrase structure rules (or their equivalents in various syntactic frameworks) are elaborative, filling structure in from the top down, as illustrated in (2) below. Thus, while in the lexicon a cycle of phonological rules applies each time new phonological material is added to the representation, in the syntax insertion of phonological material (i.e. lexical insertion) does not take place until the end of the derivation, at which point the entire utterance is already present, and no further material will be added. Therefore, since phonological material is added to the syntactic string only once, there can be no justification for sentence-level cyclicity on this view.

(2) a. Word formation

b. Phrase structure elaboration

[root]	[S]		
[[root]affix]	[S[NP	][VP]]	
[[[root]affix]affix]	[S[NP	][VP[V	][NP]]]
	[S[NP[N	]][VP[V	][NP[N]]]]
	[S[NP[NJohn]]][VP[Vlikes]]	[NP[NBill]]]		

While Lexical Phonology does not rule out all reference to syntactic structure by postlexical rules, Kiparsky (1982) implicitly viewed the postlexical component as devoid of stratal organization, and portrayed the canonical postlexical rule as one that applies across the board, without reference to morphological or syntactic structure.

However, the large and growing literature on phonology-syntax interaction has yielded a wealth of data on sentence-level phonological rules that refer to syntactic structure. From that literature,

claims of sentence-level cyclicity have also arisen (Dresher 1983, Selkirk 1984, Kaisse 1985, Shih 1986, Chen 1986, 1987, Odden 1988). The emerging consensus appears to be that Kiparsky and Mohanan's postlexical component actually comprises two distinct classes of rules, which I will call phrase-level (p-level) and utterance-level (u-level). P-level rules are sensitive to syntactic structure and, as I will argue here, also apply cyclically. U-level rules, on the other hand, do not refer to bracketing and do not apply cyclically. Since their domain is the entire utterance, we may assume that u-level rules will apply after p-level rules.

One theory that has been proposed to describe and predict the behavior of p-level rules is the Prosodic Hierarchy (Selkirk 1980, 1986, Nespor & Vogel 1982, 1986, Hayes 1989). The central insight of Prosodic Hierarchy theory is that phrasal rules do not refer directly to syntactic structure, but rather to a modified "prosodic" structure derived by rule from syntactic trees. Modification of syntactic structure is necessary since prosodic domains are often not coextensive with syntactic phrases (Selkirk 1980, Nespor & Vogel 1982, 1986, McHugh 1987, Hayes 1989). In (3) I cite the parametrized algorithm Nespor & Vogel (1986) use to define the phonological phrase (p-phrase) cross-linguistically.

(3) Phonological Phrase Formation (Nespor & Vogel 1986)

I. ϕ domain

The domain of ϕ consists of a C [clitic group] which contains a lexical head (X) and all Cs on its nonrecursive side up to the C that contains another head outside of the maximal projection of X.

II. ϕ construction

Join into an n-ary branching ϕ all Cs included in a string delimited by the definition of the domain of ϕ .

III. ϕ relative prominence

In languages whose syntactic trees are right branching, the rightmost node of ϕ is labeled s; in languages whose syntactic trees are left branching, the leftmost node of ϕ is labeled s. All sister nodes of s are labeled w.

ϕ Restructuring (optional/obligatory/absent)

A nonbranching ϕ which is the first complement of X on its recursive side is joined into the ϕ that contains X.

Prosodic domains are arranged in a hierarchy, as in (4):

(4) word	W	W	W	W	W	W	W	W
CG-level rules:	[-----][---][---][-----][-----]							
clitic group	CG		CG		CG		CG	
P-level rules:	[-----]				[-----]		[-----]	
p(honological)-phrase	P				P		P	
I-level rules:	[-----]						[-----]	
intonational phrase	I						I	
U-level rules:	[-----]							
utterance	U							

Example (4) implies two assumptions about the nesting of prosodic domains within larger domains and the relative ordering of rules of different levels:

(5) Strict Layer Hypothesis (Selkirk 1984, Nespor & Vogel 1986)

- a. A given nonterminal unit of the prosodic hierarchy, x^p , is composed of one or more units of the immediately lower category, x^{p-1} .
- b. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

(6) Domain Ordering Hypothesis (my name for Selkirk 1980, ex. 41)

A rule with a domain D_i will apply before a rule with a domain D_j , if D_j includes D_i .

In this framework, rules that apply within prosodic domains are level-specific, not cyclic. However, if the same inventory of rules were to apply at each level, we could motivate a phrasal cycle by proposing that phonological rules be interleaved with prosodic domain construction rules:

(7) word	W	W	W	W	W	W	W	W
Cycle 1:	[-----]	[---]	[---]	[-----]	[-----]	[-----]	[-----]	[-----]
clitic group	CG	CG	CG	CG	CG	CG	CG	CG
Cycle 2:	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]
p(honological)-phrase	P	P	P	P	P	P	P	P
Cycle 3:	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]
intonational phrase	I	I	I	I	I	I	I	I
Cycle 4:	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]	[-----]
utterance	U	U	U	U	U	U	U	U

This would in effect yield a "compounding-style" cycle, analogous to morphological compounding. In compounds, each component is a lexical stem or word, which may undergo rules on its own cycle before being compounded. Thus the entire word undergoes rules on every cycle, as shown in (8a). Likewise, in a compounding-style phrasal cycle the entire utterance would undergo rules on each cycle, as shown in (8b). The lower-case sigmas in (8) represent syllables.

(8) a. Compounding-style cycle in
lexical phonology:

Cycle 1: $[[\sigma \sigma]_w [\sigma \sigma]_w]_w$
 $\langle \text{-----} \rangle \langle \text{-----} \rangle$
rules rules
Cycle 2: $\langle \text{-----} \rangle$
rules

b. Compounding-style cycle in
phrasal phonology:

Cycle 1: $[[\sigma \sigma]_w [\sigma \sigma]_w]_p$
 $\langle \text{-----} \rangle \langle \text{-----} \rangle$
rules rules
Cycle 2: $\langle \text{-----} \rangle$
rules

The data to be considered in the present study, however, suggest an "affixation-style" cycle. In such a cycle, only a portion of the utterance is parsed into prosodic domains at first, and then newly parsed material is added on each successive cyclic level, as illustrated in (9b). This parallels the morphological process of affixation, in which a stem alone undergoes rules on the first cycle, while affixes do not undergo rules until the cycle on which they are added to their bases, as in (9a).

(9) a. Affixation-style cycle in
lexical phonology:

Cycle 1: $[[\sigma \sigma]_{st} [\sigma \sigma]_{af}]_w$
 $\langle \text{-----} \rangle$
rules
Cycle 2: $\langle \text{-----} \rangle$
rules

b. Affixation-style cycle in
phrasal phonology:

Cycle 1: $[[\sigma \sigma]_w [\sigma \sigma]_w]_p$
 $\langle \text{-----} \rangle$
rules
Cycle 2: $\langle \text{-----} \rangle$
rules

The algorithm by which syntactic structures are parsed into p-phrases in Kivunjo Chaga appears in (10). As Kivunjo is an almost exclusively right-branching language, part I of Nespor & Vogel's definition of the p-phrase in (3) is largely irrelevant. The restructuring provision of (3), however, is obligatory for Kivunjo.

(10) Kivunjo Chaga p-phrase formation

For each pair of consecutive words X and Y,

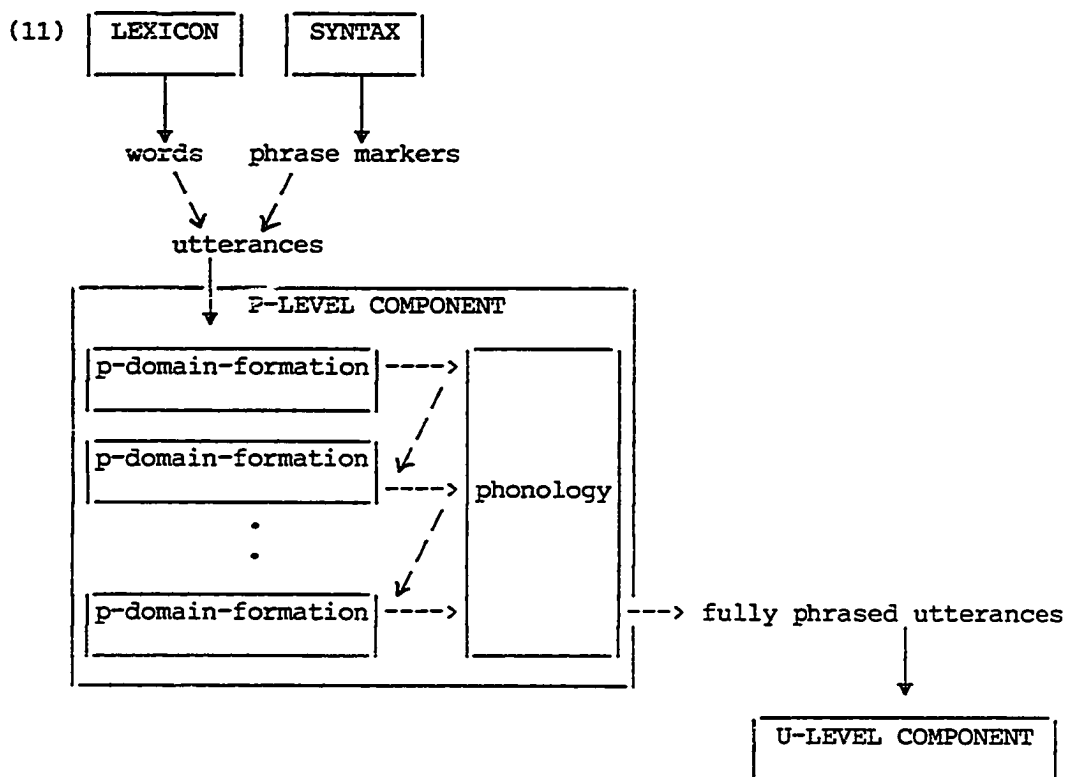
- (a) if X p-governs Y, then X and Y
form part of a single p-phrase;
- (b) otherwise they are phrased separately.

Definition of p-government

X p-governs Y if X is the head of a
maximal projection that dominates Y,

The effect of this parsing algorithm is that maximal binary right-branching structures which satisfy a simple head government criterion constitute p-phrases. As stated in (10), the p-phrase formation rule proceeds iteratively from left to right, examining in turn each pair of words in the utterance. The interleaving of phonological rules with each step in this parsing process, then, derives cyclicity for p-level rules.

In (11) I present a model of the organization of the sentence-level phonology. In Kivunjo, as we will see by the end of Chapter 3, only three prosodic constituents need be postulated: the phonological word, the p-phrase and the utterance. The two domain-formation processes relevant to cyclicity consist of an algorithm that builds phonological words out of morphosyntactic or lexical words, and one that builds p-phrases out of phonological words:



This proposal is not incompatible with Lexical Phonology, but rather enriches it by applying the principles underlying Lexical Phonology to another component of the phonology. The model in (11) adds no complication to the theory since it is based on the simple assumption that a cycle of phonological rules applies every time new structure is created out of or added to old structure. The u-level component is non-cyclic not by stipulation, but by the fact that its domain is the maximal one, namely the entire utterance. This parallels Kiparsky's (1984) and Booij & Rubach's (1987) proposals that the final stratum in the lexicon be noncyclic.

The structure shown in (11) above will give rise to an affixation-style cyclic derivation such as that schematized in (12):

(12)

W W W W W

p(hrase)-level rules:

$$\begin{array}{l}
 u[p[--- \\
 u[p[--- ---]p \\
 u[p[--- ---]p[---]p \\
 u[p[--- ---]p[---]p[---]p \\
 u[p[--- ---]p[---]p[---]p[---]p]u \\
 u[p[--- ---]p[---]p[---]p[---]p[---]p]u
 \end{array}$$

u(tterance)-level rules:

$$u[-----]u$$

The algorithm in (10), proceeding as it does from word to word, predicts that p-level rules will cycle on the word, not the p-phrase. The utterance is parsed strictly from left to right, regardless of the relative nestedness of each constituent. In this regard my model of cyclicity differs from that which Chen (1986) envisions for Mandarin, in which the first cycle does not necessarily apply within the left-most domain in the utterance, and in which the foot, not the word, is the primary cyclic domain.

1.2. General background on Chaga

Chaga is the name used to designate the language, or group of closely related languages, spoken on and around the habitable slopes of Kilimanjaro in northern Tanzania. It belongs to the Bantu language family, and is classified by Guthrie (1971, v.2) as E60; a more recent classification by Nurse (1979) places it in its own group with Dawida, of unclear relationship to other northeastern Bantu languages.

Internally, Chaga exhibits considerable dialect variation. Virtually every locality on Kilimanjaro has its own dialect or variety of Chaga, at least slightly different from that of its neighbors. These individual dialects fall into roughly three major groupings:

East (Kirombo), Central (incl. Kimochi, Kivunjo) and West (incl. Kimachame, Kikibosho) (see Nurse (1979) and Philippon (1982) for a more detailed internal classification of Chaga dialects on the basis of segmental phonology and lexicostatistics). Mutual intelligibility between nonadjacent dialects from different groups can be quite low, but not enough is known about the dialect situation to tell whether these major dialect groups are more correctly considered separate languages. Certainly, speakers themselves often refer to their language by the major dialect group's name, rather than by the name Kichaga (the Swahili name for Chaga) or Kicaka (a Chaga adaptation of the Swahili name). But it is possible that this is for political rather than linguistic reasons, since the major dialect groups also correspond to political divisions. In any event, throughout this thesis I will generally refer to the object of study as Kivunjo or Kivunjo Chaga. This is because it appears from my limited sampling of data from Kirombo, Kimochi and Kimachame that many of the rules and crucial rule orderings of Kivunjo are not necessarily found in other varieties of Chaga. Finally, there are also Chaga speakers living in the plains below Kilimanjaro, and in nearby Arusha Chini, Meru and Kahe. According to Nurse, these people speak dialects derived from those spoken on the mountain, but too little is known about their Chaga to say for certain.

Currently, due to increased mobility and the Tanzanian government's efforts to foster Swahili as a national language and discourage "tribalism", the use of Chaga is starting to wane. Many young adults from Kilimanjaro today speak a form of Chaga heavily influenced by

Swahili, if they speak it at all. Educated speakers in their thirties and forties, however, are typically familiar with the language as spoken by their parents and grandparents, having been brought up speaking only Chaga until they were sent off to school. While around their parents they are expected to speak only Chaga and to avoid using borrowings, among themselves they engage in a great deal of code switching between Chaga, Swahili, and English, and in their Chaga they often use Swahili and English borrowed lexical items in preference to their Chaga counterparts. Nonetheless, the Chaga spoken by this generation is grammatically intact, affected by Swahili only in lexical borrowings. These speakers apply a markedly different set of morphological, syntactic, and phonological rules from those of Swahili.

There is little written literature in Chaga. Around the turn of the century, Lutheran missionaries who came to Kilimanjaro made an effort to learn and codify Chaga so as to translate the Bible and preach in the vernacular. Consequently, a Chaga Bible exists, as well as some prayer books. A Chaga language newspaper, Komkya, was published for a period some decades ago. To this day, young children in Lutheran schools are taught to read and write Chaga in the orthography developed by the Lutheran missionaries. Young children in Catholic schools, however, are taught in Swahili.

Until recently, the linguistic literature on Chaga was not extensive. The earliest work is limited to two grammars and a dictionary written by German missionaries in the first half of this century:

Raum's (1909) grammar of Kimochi, Augustiny's (1914) grammatical sketch of Kimachame, and Müller's (1947) dictionary of Kimachame. Although these works contain a wealth of information on the segmental morphology of their respective dialects, none of them makes more than a passing reference to the existence of tone, which in fact performs a considerable contrastive function and plays a major role in the lexical and phrasal phonology of the language.

The first linguistic study of Chaga to focus on tone is a presentation of some baffling tone sandhi paradigms in Kimachame by Sharp (1954). Nurse and Philippson's (1977) article identifies a tone shift rule in Kimochi, and analyzes certain lexical and phrasal tone alternations. Saloné (1980) applies the theory of Natural Generative Phonology to vowel coalescence phenomena in Kimochi. My own previous work (McHugh 1984, 1985, 1986, 1987, forthcoming) has focused on the phrasal tonology of Kivunjo and its interaction with syntax. I obtained my data through close work with three Kivunjo speakers, Lioba Moshi and Ladislaus Semali of Kirua, and Eliawonyi Meena of Mamba, from October 1982 to August 1987 in Los Angeles.

1.3. Segmental inventory and syllable structure of Chaga

1.3.1. Vowels

Chaga has a standard five-vowel system, given in (14) below. None of the vowels have noteworthy allophonic variants. The mid vowels are phonetically tense [e] and [o].

(14)

	front	back
high	i	u
mid	e	o
low		a

Chaga's five vowel system differs from the seven-vowel system reconstructed for Proto-Bantu. According to Nurse (1979), the Proto-Bantu high vowels /i, ɨ, u, ʉ/ have merged to /i, u/ in Chaga. The numerous liquids, fricatives and affricates of Chaga derive mostly from Proto-Bantu stops by a series of sound changes detailed in Nurse (1979) and Philippson (1982). Readers familiar with Bantu will note that some of these sound changes are evident from the table of concords presented in section 1.4 below.

1.3.2. Consonants

Below is a chart of the consonant inventory of KiVunjo Chaga. For each sound I give the orthographic symbol I will be using here, followed by the phonetic symbol for that sound in square brackets.

(15)		labial	dental/ ¹ alveolar	alveo- palatal	palatal ²	velar	glottal
stops	voiceless	p [p]	t [t]		ky [k ^y] (k/_e,i)	k [k]	
	voiced	b [b] ³	d [d]			g [g] ³	
	prenas- salized ⁴	mb [mb]	nd [nd]		ngy [ng ^y] (ng/_e,i)	ng [ng]	
affri- cates	voiceless	pf [pf]	ts [ts]	c [t ^s]			
	prenas- salized ⁴	mv [mbv]	nz [ndz]	nj [nd ^z]			
frica- tives	voiceless	f [f]	s [s]	sh [ʃ ^v]			h [h]
	voiced	w [ɸ] ⁵ /_e,i			ghy [ɣ ^y] ⁶ (gh/_e,i)	gh [ɣ] ⁵	
nasals		m [m]	n [n]		ny [ñ]	ng' [n]	
liq- uids ⁷	laterals		l [l]	ly [l ^y]			
	trill/tap		r [r]				
	flap		lr [ɾ]				
	approx- imant		zr [ɻ]				
glides		w [w] ^{5,6} /_a,o,u			y [y] ⁵		

Notes on the consonant chart:

1. With the exception of /d/, the stops, nasals and laterals in this column are dental, while the affricates, fricatives, nonlateral liquids and /d/ are alveolar.

2. Palatal obstruents do not contrast with their velar counterparts before the high front vowel /i/. Consequently I omit the orthographic y in this position. It has been my observation that the same contrast is also lacking before the mid front vowel /e/. However, speakers often write these sounds with the y before /e/, but not consistently. This orthographic distinction does not correspond to a phonetic distinction within Chaga, but rather reflects the phonetic difference between the slightly fronted velar allophones of /k,ng/ found before front vowels in Swahili and the fully palatal allophones of /k,ng/ found before front vowels in Chaga. The Lutheran orthography is similarly inconsistent in this regard before both /e/ and /i/, even on separate occurrences of the same morpheme.

3. The consonants /b/ and /g/ appear to be found only in unassimilated (i.e. non-Chaga-ized) lexical items borrowed from Swahili. I have not encountered any examples of /gy/ because, as explained in note 2 above, Swahili does not palatalize velars before front vowels.

4. Prenasalized consonants are not underlyingly unitary segments, but rather consonant clusters. In many cases they can be shown to be formed from the combination of a nasal with another consonant of the same place of articulation. Prenasalized consonants are syllabified by speakers as onsets, not as heterosyllabic clusters.

5. The voiced bilabial fricative [ɸ] is the allophone of /w/ that appears before the front vowels /e/ and /i/. The glide [w] is in complementary distribution with [ɸ], appearing only before the back

vowels /a, o, u/.

6. The voiced velar fricative /gh/ may be realized phonetically as [w]. Likewise, the voiced palatal fricative /ghy/ is often realized phonetically as the palatal glide [y]. Not all instances of [w] and [y], however, are derived from these optional alternations.

7. Chaga laterals are often produced with attendant friction, and the dental lateral /l/ is usually velarized. The approximant /zr/ is sometimes also realized as a retroflex fricative. For details, see Davey, Moshi and Maddieson (1982).

1.3.3. Syllable structure

The Kivunjo syllable template is as given in (16):

(16) ((N)C)V

Closed syllables are ruled out, and the only complex onsets permitted are ones which consist of a nasal followed by a homorganic obstruent. There is no distinction within single syllables between long and short vowels. All sequences of identical vowels are therefore underlyingly heterosyllabic. On the surface, it appears that adjacent syllable nuclei not separated from one another by onsets are resyllabified as single syllables at speech rates faster than careful speech. The nasal consonant /m/, and in faster speech styles /l,ny,ng'/ also, may function as a syllabic nucleus. Since these syllabic sonorants may always be derived from underlying sequences of sonorant plus high vowel, they never cooccur with any kind of onset.

1.3.4. Orthography

The orthography I use in the present work is reflected in charts (14) and (15) above. It differs from others used in the literature in its representation of the following segments and sequences. In the last row I indicate that the Lutheran orthography is not always consistent in distinguishing single vowels from sequences of identical vowels.

(17)	this thesis	Lutheran	Moshi (1986)	McHugh (1984-87)
[ɹ]	zr	<u>r</u>	zr	zr
[ɽ]	lr	<u>ɽ</u>	dl	d
[ñ]	ny	ny	ny	ny n/_i
[ɣ]	gh	g	gh	gh
[tʃ]	c	ch	ch	c
[kʲ]	ky k/_e,i	ky k,ky/_e,i	ky k/_e,i	ky k/_e,i
VV	VV	V,VV	VV	VV

1.4. Chaga morphology

Like other Bantu languages, Chaga has an extensive inventory of noun classes, and a rich system of agreement morphology appearing on adjectives, determiners, quantifiers, and verbs. In addition to subject agreement, verbs may also host one or more pronominal object proclitics. I tabulate the class concords for Kivunjo in (18), mark-

ing tones on those which consistently receive L(ow) tone from the constructions they appear in (adjective, determiner affixes) and those which have lexically specified tone -- L on Classes 1, 4 and 9, H(igh) on all other classes (quantifier, object clitics).

(18) Noun class concords

class	subject	object	noun	adjective	demonstr.	quantifier
1 { 1sg.	ngi-	ngĩ-	m(u)-	mù-	-cù	ù-
2sg.	u-	kù-				
3sg.	a-	mù-				
2 { 1pl.	lu-	lú-	wa-	wà-	-wà	wá-
2pl.	mu-	mú-				
3pl.	wa-	wá-				
3 (sg.)	u-	ù-	m(u)-	mù-	-cù	ù-
4 (pl.)	i-	ĩ-	m(i)-	ngĩ-	-ĩ	ĩ-
5 (sg.)	lyi-	lyĩ-	ø-, i-	lyĩ-	-lyĩ	lyĩ-
6 (pl.)	gha-	ghá-	ma-	mà-	-ghà	ghá-
7 (sg.)	ki-	kĩ-	ki-	kĩ-	-kĩ	kĩ-
8 (pl.)	shi-	shĩ-	shi-	shĩ-	-shĩ	shĩ-
9 (sg.)	i-	ĩ-	ø-, n-	ngĩ-	-ĩ	ĩ-
10 (pl.)	tsi-	tsĩ-	ø-, n-, ngi-	tsĩ-	-tsĩ	tsĩ-
11 (sg.)	lu-	lú-	u-	lù-	-lù	lú-
12 (sg.)	ka-	ká-	ka-	kà-	-kà	ká-
14 (sg.)	u-	ù-	u-	ù-	-ù	ù-
15 (sg.)	ku-	kù-	ku-	kù-	-kù	kù-
16	ha-	há-	ha-	hà-	-hà	há-
17	ku-	kú-	ku-	kù-	(-pf-)	kú-

As in most other Bantu languages, the verb in Chaga may contain a large number of inflectional prefixes and both derivational and inflectional suffixes. A morphological verb template appears in (19):

(19) Kivunjo verb morphology template

(FOC)-SM-(NEG)-(TM)₀-(OC)₀-ROOT-(EXT)₀-FV

FOC = focus marker /n/

SM = subject marker

NEG = negative morpheme /la/

TM = tense marker

OM = object clitic

EXT = extension (derivational)

FV = final vowel

Finite verbs contain at minimum a subject marker, root and final vowel, while nonfinite verbs need only have a root and a final vowel. Either type of verb may possess more than one tense marker, object marker or extension, or it may have none at all. With multiple tense markers possible, an enormous number of simple and compound tenses exist in Kivunjo, as well as in other varieties of Chaga. Each tense further has several variants, often distinguished only by tone.

1.5. Chaga syntax

In its basic syntactic type, Chaga follows the typical Bantu pattern in being head-initial across the board. Thus verbs, nouns, prepositions and adjectives all precede their complements and modifiers. Consistent with X-bar theory, the specifier position in Chaga appears to lie before the head, with the result that the basic sentential word order is SVO. The subject position may be phonologically empty, as Chaga is a pro-drop language. Similarly, the cliticization of object pronouns to the verb can sanction empty object slots, leaving the verb as the only essential element of a sentence with verbal predicate. Sentences containing nonverbal predicates must contain a form of the verb 'to be' or the copulae nyi and ci. In addition to subject and object positions, nouns may also appear in topic or focus position, both of which precede the subject. Focus position is syntactically like a cleft construction, but used more widely than in English, as it is the landing site of WH movement. Although some complement clauses have overt complementizers, relative clauses are not introduced by any syntactic constituent. Rather, they are distin-

guished from main clauses through verb morphology and phonological phrasing. I give a more detailed survey of Kivunjo Chaga syntax in Appendix C.

1.6. Kivunjo tone sandhi

A striking feature of Kivunjo Chaga is its intricate system of tone sandhi, along with its considerable tonal variety on the surface. From underlying H and L tones the tonology of Kivunjo derives a surface inventory of three level and five contour tones, plus a downstep that may precede either H or S(superhigh) tone. I list these tones in (20) below, along with the symbols I will use throughout the thesis to represent them:

(20) Kivunjo Chaga surface tones

` = L (low)	! = ! (downstep)	v = \widehat{LH} (rising)
´ = H (high)	^ = \widehat{HL} (falling)	`" = \widehat{LS} (rising)
" = S (superhigh)	"^ = \widehat{SL} (falling)	`^ = \widehat{LHL} (rising-falling)

The rules that derive these tones are sandhi rules -- i.e. they apply across word boundaries or in domains larger than the word. One consequence of this is that many Kivunjo words have a large number of contextual variants. Consider the following paradigm of twelve tonal allomorphs for the word mburu 'goat':

- (21) a. Naulrà mbúru ngí-tùtù^ . '(S)he (recently) bought a small
he-bought goat small goat'
b. Ne'ciúlra mbúru ngítùtù^ . '(S)he will buy a small goat'
he'll-buy goat small
c. Na'lelya mburu ukòù^ . '(S)he ate a goat yesterday'
he-ate goat yesterday
d. Na'leúlra mburu ukòù^ . '(S)he bought a goat yesterday'
he-bought goat yesterday
e. Naulrà mbúru . '(S)he bought a goat'
he-bought goat
f. Ne'ciúlra mbúru . '(S)he will buy a goat'
he'll-buy goat
g. Naulrà mbú'ru? 'Did (s)he (recently) buy a goat?'
he-bought goat
h. Ne'ciúlra mbú'ru? 'Will he buy a goat?'
he'll-buy goat
i. Ûlra mburu! 'Buy a goat!'
buy goat
j. Noamba "úlra mbu'ru!"? 'Did you say "Buy a goat!"?'
you-said buy goat
k. Kòlra mbúru! 'Cook a goat!'
beat goat
l. Kòlra mburu túpù 'Cook only a goat!'
beat goat only

The phonological rules responsible for paradigms such as these interact with each other and with syntactic structure extensively enough to provide evidence bearing on the organization of the postlexical phonology and its interpretation of syntactic structure. Thus phrasing-sensitive (p-level) tone rules constitute the focus of the argument for cyclicity in Chapter 3.

1.7. Organization of the dissertation

This thesis is organized into three chapters: (1) Introduction, (2) The P-level Rule System, (3) Phrasal Cyclicity; and three appendices: (A) The Prosody Shift Hypothesis, (B) U-level Rules, and (C) The Mapping of Syntax to Phrasing.

In Chapter 2 I introduce the p-level rule system of Kivunjo. The

centerpiece of this system is a pair of tone raising rules, each of which is triggered by (a) adjacency to a p-phrase boundary and (b) attachment to an accented syllable. In presenting these rules I show the essential role which lexically assigned stem-penultimate accent plays in deriving the p-phrase-final sandhi variants of a fifteen member tone-accent paradigm. Accent in effect brings order to what would otherwise be a grab-bag of ad hoc exception features. I then argue that tonal underspecification is necessary for a natural and constrained characterization of these raising rules. The rest of the chapter I devote to an exposition of the remaining p-level rules, as well as a few u-level rules, which are fed by the two central raising rules. Because of the complexity of p-level sandhi, there are several cases in which extrinsic non-cyclic orderings among p-level rules are motivated. These will serve as the basis for arguments for cyclicity in Chapter 3.

Taking the analysis of the p-level system in Chapter 2 as its point of departure, Chapter 3 motivates four crucial orderings in multiphrasal derivations that are diagnostic of cyclicity. One of the cyclic cases requires the introduction of an additional phrasing environment -- strong juncture -- which reflects the addition of an accent to the preceding phrase on a subsequent cycle. After presenting arguments for cyclicity, I show that the basic cyclic domain in Kivunjo is the word, not the p-phrase. I then demonstrate that the type of cycle found in Kivunjo is an affixation-style, left-to-right cycle. I conclude with a discussion of how the mechanics of phrasal cyclicity in Kivunjo may be handled with little revision by

Prosodic Hierarchy theory.

In Appendix A, I discuss the mechanism of Tone Shift and its ordering with respect to Default and other p-level rules. To allow for the orderings motivated in Chapter 3, I argue for a hierarchical representation of tone and accent in which both are dependent on a suprasegmental root tier parallel to the segmental root tier. Tone Shift may then be characterized as a "Prosody Shift" rule that shifts linkings between the suprasegmental root tier and the CV skeleton. This predicts shifting of accent as well as tone. Evidence in support of Prosody Shift comes from two late rules that refer to accent in its shifted location.

Appendix B presents a list of rules, including late rules that complete the derivation of u-final surface forms. Many u-level rules are triggered by the addition of intonational boundary tones, and modify the output of the p-level phonology. I show that tone becomes fully specified and discuss the implications this has for recent attempts to constrain underspecification theory.

In Appendix C I survey the basic syntactic structures of Kivunjo, exemplifying more extensively the mapping of syntactic structure to phrasing. I also consider syntactic solutions to certain unusual phrasings, and attempt to characterize the strong juncture discussed in Chapter 3.

CHAPTER 2: THE P-LEVEL RULE SYSTEM

In order to understand the significance of the cyclic cases to be considered in Chapter 3, we must first motivate the rules involved, their structural descriptions and their crucial orderings with respect to each other. This can best be done by considering the p-level rule system as a whole. In the present chapter, therefore, I present an analysis of the Kivunjo p-level component. I begin with a preliminary discussion of four facets of Kivunjo tonology which form the background against which p-level rules operate. Two of these facets, Tone Shift and p-phrasing, can be simply confirmed by looking at any sandhi alternations, as is done in section 2.1. The other two facets, accent and underspecification, require more subtle argumentation based on the two p-final raising rules H Attachment and Final Raising. These arguments are presented in sections 2.2 and 2.3. In sections 2.4-6, in order to complete the tone-accent-phrasing paradigm introduced in 2.2, I motivate additional rules that interact with H Attachment and Final Raising, as well as an ordering relationship between the two raising rules. I then summarize the p-level rule inventory and the crucial orderings among its members.

2.1. Tone in Kivunjo

2.1.1. Tone Shift

Chaga underlyingly preserves the lexical tones reconstructed for Proto-Bantu, namely high (H) and low (L), but on the surface these tones are modified with respect to both timing and pitch. The first, timing-related modification consists of a Tone Shift, whereby each

syllable's underlying tone surfaces one syllable late. This applies both within words, as in example (1), and across word boundaries, as in example (2). In (1a) we can see that the L-toned object prefix m- 'him/her' causes the verb stem's initial syllable to surface with L tone, while in (1b) the H-toned object prefix lu- 'us' causes the stem-initial syllable to surface with H tone:

(1) Tone Shift within a word:

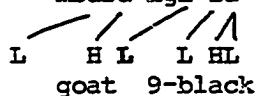
- a. $\begin{array}{c} \text{m}^{\text{L}}\text{-s\acute{e}t\text{se}^{\text{H}}} \\ \text{L} \quad \text{L} \quad \text{L} \quad \text{H} \end{array}$ 'make him/her laugh!'
 OP3s-laugh:caus
- b. $\begin{array}{c} \text{lu}^{\text{H}}\text{-s\acute{e}t\text{se}^{\text{H}}} \\ \text{L} \quad \text{H} \quad \text{L} \quad \text{H} \end{array}$ 'make us laugh!'
 OP1pl-laugh:caus

Thus while on the segmental tier it is the initial syllable that changes, on the tonal tier we see a corresponding change on the second syllable.

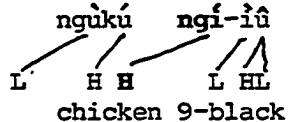
In (2) we see that after a L-final noun such as mburu 'goat' (2a) the adjective ngiiu 'black' surfaces with an initial L tone, but in after the H-final noun nguku 'chicken' (2b) the adjective begins with H tone:

(2) Tone Shift across a word boundary:

- a. After L-final noun: adjective's initial syllable surfaces L
 mburú ngi-iû 'a black goat'



- b. After H-final noun: adjective's initial syllable surfaces H
 ngukú ngi-iû 'a black chicken'



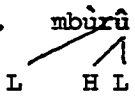
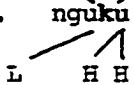
Again, what has changed on the segmental tier is the noun, yet the accompanying tonal change appears on the first syllable of the immediately following word.

As a result of Tone Shift, each word has two basic contextual variants, post-H and post-L, depending on the final underlying tone of the preceding word. Thus in (2) the initial syllable of the adjective bears L tone after mburu 'goat' and H tone after nguku 'chicken'.

When no other word precedes, a word's initial syllable must still bear either H or L tone. In citation context, the post-H variant is generally used with the meaning 'it's...'. For these I posit an initial floating H tone, which is a reduced form of the H-toned copula nyi. In neutral or non-focused contexts, such as sentence-initial subject or topic position, or vocative use, the post-L variant is found, suggesting that L is the default value for tone. Each of the examples in (1) and (2) is cited in its post-L form.

On utterance-final syllables, where the final tone has no subsequent syllable to shift to, the penultimate and final tones both end up linked to the final syllable, producing a contour tone if those

tones are distinct. Thus in (1), a final rising tone results from L plus H, and in (2) a final falling tone results from H plus L. Similarly, the words mburu and nguku from example (2) bear falling and high tone, respectively, in utterance-final position, as in (3):

- (3) a. mburú 'goat' (post-L)

 L H L
- b. ngukú 'chicken' (post-L)

 L H H

I will present a formal statement of Tone Shift in Appendix A.

It should be noted that the tone patterns cited in examples (1-3) above are in fact abstracted away from the effects of utterance-final intonational boundary tones. I have identified two such boundary tones, a declarative L and an interrogative H, which interact with certain utterance-final tone sequences to produce modifications of those sequences. In some cases, though, the boundary tones effect no change. Thus, for example, while the falling tone of (3a) is modified in interrogatives, it surfaces intact in declarative utterances. Similarly, the final high tone of (3b) surfaces as a falling tone in statements, yet emerges unscathed in questions. The final rising tone of example (1), on the other hand, never surfaces as such, appearing as either a rising-falling or a superlow tone in declaratives and as a superlow tone in interrogatives. The rules governing these tone interactions are discussed in detail in Appendix B. Here, except as noted, the surface forms given in examples will not reflect the addition of utterance-final intonational boundary tones.

Tone Shift, though an unusual linguistic phenomenon, is not unique to Chaga. A number of other Bantu languages, namely Kikuyu (Clements & Ford 1979, Clements 1984), Sukuma (Goldsmith 1985), Digo (Kisseberth 1984), Kiyaka (Kidima forthcoming), and Chizigula (Kenstowicz and Kisseberth forthcoming), exhibit some variety of tone shift or systematic tonal displacement. Nor is tone shift restricted in occurrence to the Bantu family: Rice (1987, 1989) describes such phenomena in Slave, an Athapaskan language.

In addition to shifting the timing of tones, Kivunjo Chaga has also expanded the canonical Bantu H-L tone system qualitatively, to produce a surface inventory consisting of three level tones, H, L, S; five contour tones, \widehat{HL} , \widehat{SL} , \widehat{LS} , \widehat{LH} , and \widehat{LHL} ; and a downstep that may appear before H (!H) and S (!S). In this thesis I will show that with few exceptions all of these tones derive synchronically from underlying H and L by a series of tone rules operating in the lexical, p-level, and u-level phonological components. The formulation of these rules in a simple and natural way depends crucially on Tone Shift and three other aspects of Kivunjo phonology: tonal underspecification, phonological phrasing, and stem-penultimate accent in major lexical classes. I discuss each of these in the ensuing three sections.

2.1.2. Underspecification

Despite the fully specified autosegmental representations of tone used for illustrative purposes in examples (1) and (2) above, there is reason to believe that tone is underspecified in Kivunjo underlying representations. What this means, following Kiparsky (1982) and Pul-

leyblank (1983), is that only H ([+high]), the marked feature for a binary tone system, may be specified in lexical entries. Under this analysis, then, "L-toned" syllables are in fact toneless underlyingly.

$$(4) \quad \begin{array}{c} \sigma \\ | \\ H \end{array} = \text{high-toned syllable} \qquad \textcircled{\sigma} = \text{"low-toned" syllable}$$

In rule schemata, I use a lower-case sigma (σ) to denote a syllable. I also adopt Pulleyblank's convention of circling a syllable that has no tone.

Throughout the lexicon and much of the p-level phonological component, tone rules continue to apply to underspecified forms, as I will show in section 2.3. Syllables which have remained toneless after the application of the first rule that refers to specified L are then supplied with the unmarked tone feature L ([−high]) by a default rule, given in (5).

$$(5) \text{ DEFAULT: } \textcircled{\sigma} \rightarrow \begin{array}{c} \sigma \\ | \\ L \end{array} \quad (\text{applies after various spreading rules})$$

Late in the p-level and throughout the entire u-level component, following the application of Default, rules treat L tone on a par with H tone. This, as I will show in 2.4.3 and Appendix B, is what we expect if L is specified. Tone Shift may be assumed to follow Default and therefore to apply to fully specified representations such as those shown in examples (1) and (2).

2.1.3. Phonological phrasing

All p-level tone rules are triggered directly or indirectly by proximity to phonological phrase boundaries. Phonological phrases, hereafter referred to as p-phrases, furnish part of the framework around which Kivunjo p-level tonology is organized. A detailed discussion of how p-phrases are formed appears in Appendix C, which is an expanded adaptation of McHugh (1987). I give a working definition of the p-phrase in (6) below:

(6) Kivunjo Chaga P-phrase formation

For each pair of consecutive words X and Y,

- (a) if X p-governs Y, then X and Y form part of a single p-phrase;
- (b) otherwise they are phrased separately.

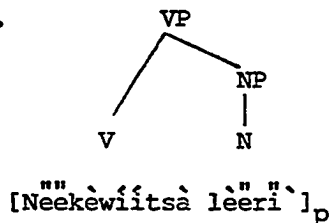
Definition of p-government

X p-governs Y if X is the head of a maximal projection that dominates Y

Thus, a p-phrase is always made up of at least one word. If a word heads a maximal projection (NP, VP, AP, PP, IP, CP) that dominates the immediately following word, it joins with that immediately following word to form part of the same p-phrase. Thus a verb forms a p-phrase with an immediately following object, as in (7a), or with an immediately following adverb, as in (7c). However, a verb's first object cannot be phrased with any additional material in the VP, such as an adverb or a second object, as seen in (7b) and (7d). In examples (7-9) all lexical items have the same underlying final tone pattern, which undergoes a raising rule (to be discussed in section 2.2) in p-phrase-final position. Consequently, the presence of super-

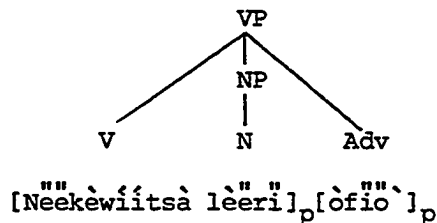
high (S) tone on a word's last two syllables marks a following p-phrase boundary, while the absence of S tone marks joint phrasing with the next word. The S tones on the initial verbs come from a different source, although they, too, are partly conditioned by p-phrase-initial position.

(7) a.



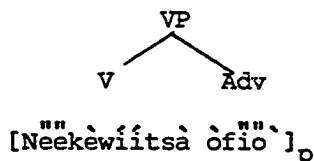
he-throws money
'He throws money'

b.



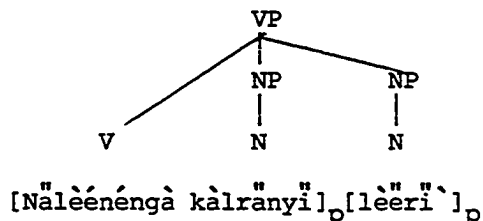
he-throws money carelessly
'He throws money away'

c.



he-throws carelessly
'He throws carelessly'

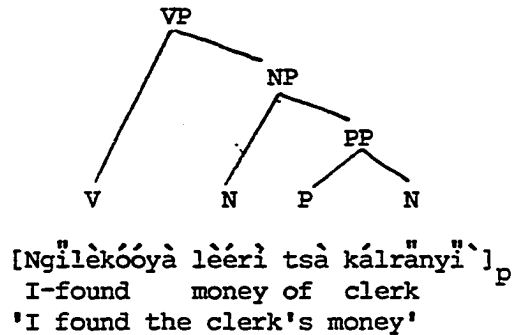
d.



he-gave clerk money
'He gave a clerk money'

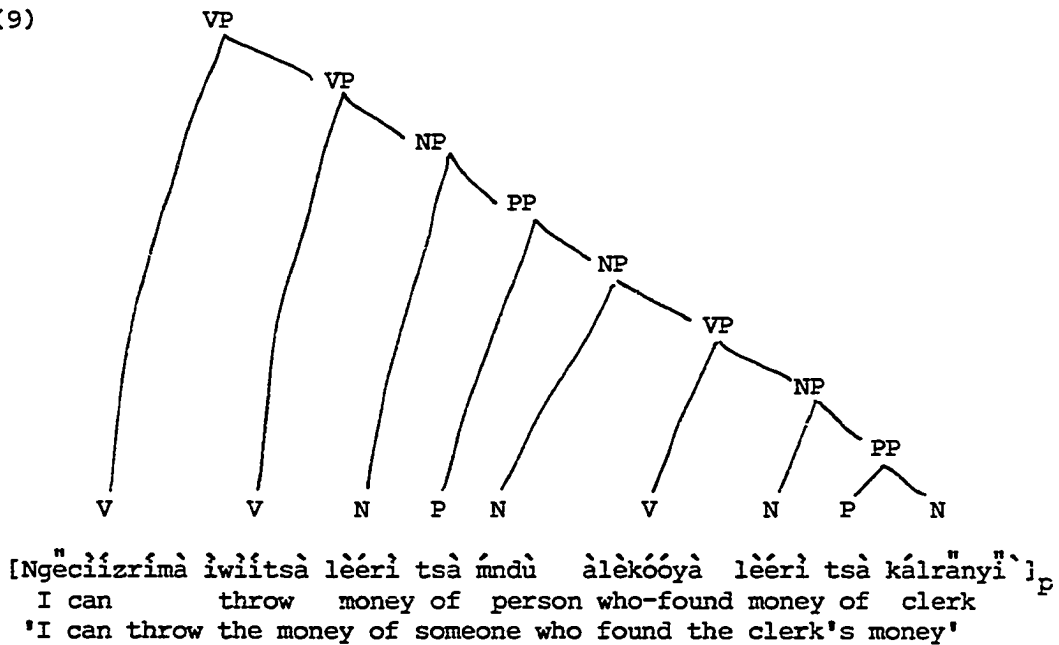
In (7b) and (7d) the word following the verb's direct object is a fellow constituent of the VP and is not p-governed by the direct object. If, however, the verb's object is followed by its own modifier or complement, that modifier or complement is included in the p-phrase, as in example (8):

(8)



P-phrase formation may proceed recursively to generate p-phrases of several words in length, provided the chain of p-government is unbroken, i.e. provided each word in the p-phrase heads a maximal projection that dominates the next:

(9)



The effect of phrasing on the p-level phonology, then, is a pattern of alternation between a word's p-phrase-internal form, in which its underlying tones show up unaltered (albeit one syllable

later); and its p-phrase-final form, in which the various phrasally triggered tone rules may apply. Combining this alternation with that between utterance-final and utterance-internal position, we derive a three-way paradigm. (The fourth possible combination, p-phrase-internal but utterance-final, is ruled out by the very definition of the p-phrase, a subdomain of the utterance.) This three-way phrasing paradigm in turn interacts with the post-H/post-L alternation produced by Tone Shift to form a basic six-way sandhi paradigm, illustrated in (10) for the word mburu 'goat'.

(10)	utterance-internal		utterance-final
	p-phrase-internal	p-phrase-final	
	"p-internal"	"junctural"	"u-final"
post-L	...mburú ō...] _p ...] _u	...mburú] _p [ō...] _p] _u	...mburú] _p] _u
post-H	...mburú ō...] _p ...] _u	...mburú] _p [ō...] _p] _u	...mburú] _p] _u

In further discussion, I will adopt the shorter terms "p-internal", "junctural", and "u-final" to refer to each of the three phrasing contexts.

2.1.4. Accent

Several facts of Kivunjo tonology point to the existence of accent in addition to tone. Although Kivunjo accent has no overt phonetic manifestation, it contributes, along with phonological phrasing, to the organization of Kivunjo sentence-level tonology. Virtually all p-level tone rules are directly or indirectly triggered by accent. In effect, they conspire to give phrase-peripheral accented syllables higher tones than their unaccented tonal counterparts.

This notion of accent is distinct from that proposed by Haraguchi (1976) for Japanese and by Goldsmith for Sukuma (1985), Tonga (1984), and other languages. Kivunjo accents are assigned by rule to underlying representations that are already lexically specified for tone, they obey the same distributional limitations observed in stress languages, and they serve as loci for feature-changing tone rules. Goldsmith's and Haraguchi's accents, on the other hand, are specified in underlying representations to the exclusion of tone, and they provide loci for accentual melody mapping rules, not feature-changing rules. Thus Pulleyblank's (1983) reanalysis of Goldsmith's accent, and Archangeli & Pulleyblank's (1984) and Poser's (1984) reanalysis of Haraguchi's accent as H tone in an underspecified context would not apply to the accent I attribute here to Kivunjo Chaga. Other proposals in which lexical tone coexists with accent or metrical structure include Kidima's (forthcoming) analysis of Kiyaka and Rice's (1989) analysis of the Hare dialect of Slave.

In section 2.2 I will show that by positing a variable accent whose position is predictably penultimate or final depending on

morphological structure, and by leaving L tone unspecified, it is possible to simplify the statement of tone rules that would otherwise seem unwieldy and ad hoc. Reference to accent also minimizes the need for arbitrary rule exception features in differentiating stem types of the same tone pattern which behave differently with respect to sentence-level tone rules.

The remainder of the present section is a brief analysis of the lexical rules responsible for assigning accent and deriving the penultimate/final accent distinction.

The Kivunjo accent rule is typologically ordinary: it accents the penultimate syllable of a lexical stem.

(11) STEM ACCENT RULE:

Construct a left-headed binary foot at a domain's right edge

DOMAIN: lexical stem

A lexical stem comprises a lexical root (see 3.4 and Appendix C for discussion of the "lexical"/"functional" distinction) plus any derivational suffixes, but usually not including any prefixes. Such stem-bounded accent or stress rules are not uncommon, and are attested in a number of languages unrelated to Chaga: Indonesian (Cohn 1989), Chimalpa Zoque (Knudson 1975), Mentawai (Morris 1900), Spanish (Harris 1987), German and English. Since the Stem Accent Rule refers to morphological structure, I assume it applies at the lexical level.

If a lexical stem consists of just one syllable, that syllable receives an accent, even though the stem technically has no penult.

In other languages with penultimate or second-syllable stress, such as English, Polish (Schenker 1973), Indonesian (Cohn 1989), and Lakhota (Shaw 1980), monosyllables likewise receive stress. As formulated in (11), the Kivunjo Stem Accent Rule does not require the presence of two syllables to create a foot. Thus in monosyllabic stems the rule will build a monosyllabic foot whose head is its only constituent.

With the addition of prefixes, the distinction between monosyllabic and polysyllabic stems gives rise to a distinction between word-final and penultimate accent, as seen in the underlying representations of the words in (12) below. Here, in p-internal position, the accentual distinction is not phonetically realized. Thus njama (12a) and kipfi (12b), both underlyingly toneless, surface with identical LL tones (shifted rightward and shown on the boldface syllables).

- | | |
|---|---|
| <p>(12) <u>Polysyllabic noun stem</u>
(penultimate accent)</p> <p style="text-align: center;">*</p> <p>a. [njama]_{Stem} 'rich man'</p> <p style="margin-left: 40px;">[njàma ngìnòrǔ]_p</p> <p style="margin-left: 40px;">'a fat rich man' (post-L)</p> | <p><u>Monosyllabic noun stem</u>
(final accent)</p> <p style="text-align: center;">*</p> <p>b. ki[pfi]_{Stem} 'wasp'</p> <p style="margin-left: 40px;">[kìpfi kìnòrǔ]_p</p> <p style="margin-left: 40px;">'a fat wasp' (post-L)</p> |
|---|---|

In p-final position, however, penultimate-accented njama surfaces with different tones from final-accented kipfi through the attachment of a p-final accentual boundary H tone:

- | | |
|--|---|
| (13) <u>Polysyllabic noun stem</u>
(penultimate accent) | <u>Monosyllabic noun stem</u>
(final accent) |
| a. [njáma] _p
'(a) rich man' (post-L) | b. [kípfi] _p
'(a) wasp' (post-L) |

As will be explained in detail in section 2.2.1, the falling tone on njama's last syllable represents a pre-Tone Shift sequence of HL, which in turn reflects placement of the p-final accentual H tone on the penult. The level H tone of kipfi's final syllable, however, reflects pre-Tone Shift placement of the accentual H on the final syllable in that word. (The H tone on both words' initial syllables results from a spreading rule that is also discussed in 2.2.1.)

The monosyllabic/polysyllabic stem distinction correctly predicts the placement of accent in underived nouns. However, the contrast between penultimate and final accent is also found in verbs and deverbal nouns, but cannot always be attributed to the difference between monosyllabic and polysyllabic stems, since some monosyllabic verb stems exceptionally "borrow" a syllable from their string of prefixes to create a polysyllabic stem for accentual purposes. Rather, the verbal accent distinction holds between active and passive verbs: While active verbs receive the expected penultimate accent, passive verbs receive final accent, as shown in (14). The verbs shown in (14) are low toned, as shown by their p-internal forms, and in p-final position undergo the same rules attaching and spreading the p-final accentual H boundary tone as do the nouns in (12-13) above.

(14) ActivePassive

- | | |
|---|---|
| <p style="text-align: center;">*</p> <p>a. i[sanj-a]_{Stem} 'wash (trans.)'</p> <p style="padding-left: 40px;">[ìsànjà mèembá]p</p> <p style="padding-left: 40px;">'to wash corn' (post-L)</p> <p style="padding-left: 40px;">[íásanjâ]_p</p> <p style="padding-left: 40px;">'to wash (something)' (post-L)</p> | <p style="text-align: center;">*</p> <p>b. i[sanj-o]_{Stem} 'be washed'</p> <p style="padding-left: 40px;">[ìsànjò nàwǒ]p</p> <p style="padding-left: 40px;">'to be washed by them'</p> <p style="padding-left: 80px;">(post-L)</p> <p style="padding-left: 40px;">[íásanjó]_p</p> <p style="padding-left: 40px;">'to be washed' (post-L)</p> |
| <p style="text-align: center;">*</p> <p>c. i[wazrim-a]_{Stem} 'forget'</p> <p style="padding-left: 40px;">[ìwàzrìmà mèembá]p</p> <p style="padding-left: 40px;">'to forget corn' (post-L)</p> <p style="padding-left: 40px;">[íwàzrímâ]_p</p> <p style="padding-left: 40px;">'to forget' (post-L)</p> | <p style="text-align: center;">*</p> <p>d. i[wazrim-o]_{Stem} 'be forgotten'</p> <p style="padding-left: 40px;">[ìwàzrìmò nàwǒ]p</p> <p style="padding-left: 40px;">'to be forgotten by them'</p> <p style="padding-left: 80px;">(post-L)</p> <p style="padding-left: 40px;">[íwàzrímó]_p</p> <p style="padding-left: 40px;">'to be forgotten' (post-L)</p> |

The reason for this accent distinction lies in the verbal derivational morphology. Passive verbs in Kivunjo are derived from their active counterparts by a process which superficially looks like the replacement of the normal final vowel -a with -o. Yet all other derivational suffixes, as can be seen in (15), do not replace the final vowel, but rather intervene between it and the verb root. All of the verbs in (15) also fit the normal pattern in that they have penultimate accent.

	*	
(15) Underived:	samb-a	'wash (intrans.)'
	*	
Applicative:	samb-i-a	'wash for/in/on'
	*	
Applicative + Causative:	samb-i-lr-a	'cause to wash for/in'
	*	
Causative:	sanj-a (b+y > j)	'wash (trans.)'
	*	
Reciprocal:	sanj-an-a	'wash one another'

In its underlying form, the passive suffix arguably also fits this pattern. Starting out with the underlying shape -u-, this suffix occupies the stem-penultimate syllable, as seen below in (16). It consequently receives accent, and then coalesces with the final vowel -a to form the surface vowel o, which inherits the accent. The result is a verb whose final syllable bears accent.

(16) Passive:	sanj-u-a	UNDERLYING REPRESENTATION
	*	
	sanjua	STEM ACCENT RULE
	*	
	sanjo	VOWEL COALESCENCE

(17) VOWEL COALESCENCE: u + a --> o

The same rule of Vowel Coalescence is needed in a number of other morphological contexts. Consider, for example, the paradigm of subject and tense markers in (18):

(18)	<u>Recent Past</u>		<u>Distant Past</u>
'I went'	ngi-a-enda --> ngaenda	cf.	ngi-le-enda
'we went'	lu-a-enda --> loenda	cf.	lu-le-enda
'they went'	wa-a-enda --> waenda	cf.	wa-le-enda

Thus, despite the variation between word-final and penultimate accent, it is possible to predict the location of a word's accent from

its structure, by assuming an independently motivated rule of Vowel Coalescence, and a simple penultimate accent rule whose domain is the stem, not the word.

A third accentual type also exists in KiVunjo: words that lack accent altogether. Certain lexical subclasses either escape the Stem Accent Rule in the first place or lose their accent later in the Lexical Phonology, with the result that they fail to undergo accent-triggered phrasal tone rules such as H Attachment. These are listed in (19).

(19) Unaccented lexical classes:

- (a) derived place names (formed with Class 14 prefix u-)
ethnonyms -- names of members of ethnic groups or nationalities
(formed with Class 1/2 prefixes m-/wa-)
language/culture names (formed with Class 7 prefix ki-)
- (b) subjunctive verbs (without object prefix)
- (c) some nicknames formed by truncation to the left of a full name's accented syllable (e.g. Ladi < Ladisilasi 'Ladislaus')
- (d) nonlexical classes such as prepositions and functional or ideophonic adverbs

The words in (19a) are often formed from non-derived place names that bear accent (e.g. m-kiwoso 'person from Kibosho' and ki-kiwoso 'Kibosho dialect' (both LLHL, unaccented), derived from Kiwoso (LHL, penultimate accent) 'Kibosho (region on Kilimanjaro)'), and so presumably undergo an accent deletion rule as part of their derivation. Similarly, subjunctive verbs (19b) are inflected forms of accented verbs with either H or L lexical tone. Yet subjunctive verbs not only lack accent, but they also lack lexical tone, bearing only the tone

pattern imposed by subjunctive morphology. Thus (19b) can also be considered a case of deletion of all suprasegmentals, not a true class of underlying lexical exceptions. Thirdly, the truncated nicknames in (19c) are derived by rule from accented words, but after the Stem Accent Rule has applied, so that they do not get a second chance to receive accent. Only the items in (19d) are truly exempted from the Stem Accent Rule by virtue of not falling under the classification of "lexical" stems mentioned in (11).

Example (20) below illustrates low-toned unaccented nouns and verbs in p-internal and p-final position for comparison with (12-14) above:

(20) <u>Subjunctive Verb</u>	<u>Ethnonym</u>
a. u-sanj-e 'may you wash | H (trans.)'	b. m-caka 'Chaga person'
[ùsánjè mèembá] _p	[m̀càkà m̀nòrǔ] _p
'you should wash corn'	'a fat Chaga person' (post-L)
[ùsánjè] _p	[m̀càkà] _p
'you should wash (trans.)'	'a Chaga person' (post-L)
c. u-wazrim-e 'may you forget' | H	d. m-ngeresà 'English person'
[ùwázrímè mèembá] _p	[m̀ngèrèsà m̀nòrǔ] _p
'you should forget the corn'	'a fat English person' (post-L)
[ùwázrímè] _p	[m̀ngèrèsà] _p
'you should forget'	'an English person' (post-L)

Observe that the examples in (20) retain their low tones in p-final position.

In summary, accent is word-final if (a) the stem is monosyllabic, or (b) the stem's last two syllables have coalesced, as in passive verbs and their derivatives. Accent is either underlyingly absent or removed by rule if a word belongs to one of the exceptional classes listed in (19). Otherwise, accent is word-penultimate. Since accent is assigned independently of tone, for each tone pattern there are potentially three accentual types to be distinguished by the p-level tonology: penultimate, final, and unaccented. A table illustrating this paradigm appears at the beginning of the next section, in which I examine closely the role of accent in the p-level tonal system.

2.2. P-level evidence for accent: basic facts and tonal paradigms

The purpose of this section is to adduce evidence from p-level tone sandhi for accent in Chaga. As mentioned in section 2.1.4, there is a three-way accentual contrast between penultimate-accented, final-accented, and unaccented words. This contrast is not realized in p-internal position, because no accent-triggered p-level rules apply there. P-finally, however, two accent-triggered tone raising rules apply, giving rise to tonal differences between the three accentual types. Those two raising rules will be presented in section 2.2.1.

The tone-accent paradigm given below in (21) demonstrates the irrelevance of accent distinctions in p-internal position, regardless of tone pattern. Thus, for each word-final tone pattern, the three accent types bear identical surface tones in this paradigm. Due to the nature of p-level accent-sensitive rules, it is only necessary to distinguish five tonal types among p-phrases, based on their final sequence of underlying tones. These tonal types are exemplified in the five rows of the chart in (21). Combined with the columns for the three accent types, they yield a 15-member paradigm.

To illustrate each member of the paradigm, I employ keywords which end in each of the relevant tone patterns and belong to each of the three accent types. These same p-final tone patterns may also be created by combinations of more than one word with no change in outcome, since word boundaries are irrelevant to most p-level rules. In keywords longer than the number of syllables typified by their p-final tonal type, I mark only the relevant final tones. Thus, for example, only the final two tones of the quadrisyllable mmriti (...HH, unac-

cented) appear in (21). Due to Tone Shift, a keyword's tone pattern will always surface one syllable to the right. In (21), the lower-case sigma [σ] following each keyword stands for the first syllable of a following word in the p-phrase, which on the surface bears the keyword's last underlying tone.

Hyphens indicate morpheme boundaries between stems and prefixes. This enables us to see that all the penultimate-accented words have polysyllabic stems, while the final-accented words are either common nouns formed from monosyllabic stems (mkipfi 'wasp' has two noun class prefixes), proper nouns derived from passive verbs with the prefix Nde- (in which the coalescence of the passive suffix with the final vowel produces final accent), or in the case of Ndelya-ngo 'One Who Takes (lit. 'eats') Heart', a proper noun derived from a verb and a monosyllabic noun object. The unaccented nouns all belong to the class of ethnonyms.

(21) P-internal tone-accent paradigm

	<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
...LLL	m-sùlri ǝ̃ 'nobleman'	m-ki-pfi ǝ̃ 'big (ugly) wasp'	m-càkà ǝ̃ 'Chaga person'
...HLL	leérì ǝ̃ 'money'	Nde-wiki-ò ǝ̃ 'Blessed One' (woman's name)	mu-olrómbò ǝ̃ 'person from Rombo'
...HL	mburú ǝ̃ 'goat'	Nde-min-ó ǝ̃ 'Despised One' (man's name)	m-kiwosó ǝ̃ 'person from Kibosho'
...LH	numbà ǝ̃ 'house'	u-kù ǝ̃ 'piece of firewood'	m-sià ǝ̃ 'person from Siha'
...HH	ngukú ǝ̃ 'chicken'	Nde-lya-ngó ǝ̃ 'One Who Takes Heart' (person's name)	m-mrití ǝ̃ 'person from Mriti'

Aside from a few contexts in which a rule spreads a tone from the p-final word to preceding words in the p-phrase, the interior of a p-phrase is immune from phrasal rule application, and the p-internal sandhi variant in the absence of leftward spreading is therefore a reliable diagnostic for a word's underlying tone pattern. Thus from the paradigm in (21) we can simply shift the tones one syllable backward to arrive at the keywords' underlying representations upon entry to the p-level. Example (22) schematizes these underlying representations. I have parenthesized the tones and syllables that are irrelevant to a word's tonal type. Since I assume that tone is underspecified at the p-level in Chaga, L tone simply appears as the absence of tone in (22).

(22) Tone-accent paradigm: representations on entry to p-level

<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
<p>...LLL * m-sulri</p>	<p> * m-ki-pfi</p>	<p>m-caka</p>
<p>...HLL * leeri | H</p>	<p> * (Nde)-wiki-o | H</p>	<p>(mu)-olrombo | H</p>
<p>...HL * mburu | H</p>	<p> * (Nde)-min-o | H</p>	<p>(m-ki)woso | H</p>
<p>...LH * numba | H</p>	<p> * u-ku | H</p>	<p>(m)-sia | H</p>
<p>...HH * nguku | | H H</p>	<p> * (Nde)-lya-ngo | | H H</p>	<p>(m-m)riti | | | (H) H H</p>

Whereas in p-internal position accent is irrelevant, in p-final position words of the three accent classes exhibit distinct behavior. As was explained in section 2.1.2, Kivunjo distinguishes two types of p-final environment: u-final and junctural. Consider first the u-final (utterance-final) context, which is of necessity also p-final. The paradigm in (23) shows the same fifteen-member tone-accent paradigm as in (21), only this time in u-final position. The tone patterns cited have been abstracted away from the effects of u-final intonational boundary tones and the rules they trigger, which are discussed in Appendix B. I indicate in boldface type those forms which undergo a feature changing rule (i.e. a rule other than Tone

Shift).

(23) U-final tone-accent paradigm

	<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
...LLL	m- ^l súl-rí	m- ^l kí-pfí	m-càkà
...HLL	leerí ["]	Nde-wíkí- ^l ó	mu-olrómbò
...HL	mburû	Nde-min-ô	m-kiwosô
...LH	numbã ^Y	u-kû ^Y	m-siã ^Y
...HH	ngukú	Nde-lya-ngó	m-mrití

Because there is no syllable following a u-final word, the word's last two tones both attach to the final syllable, and if distinct, form a contour tone. Thus in (23) the ...HL, ...LH and ...HH tonal types surface with final falling, rising and H tone, respectively. No accent distinctions appear u-finally in these three types. However, in the ...LLL and ...HLL types each of the three accent classes bears a different tone pattern.

We turn now to the other p-final environment, p-juncture. The junctural tone-accent paradigm in (24) below reveals a more extensive pattern of accentual distinctions, affecting all five tonal types. As in (21) and (23), only the relevant final tones of each keyword are given, shifted one syllable rightward. As in the p-internal paradigm, I indicate the surface tone of the immediately following syllable, to show the keyword's last shifted tone. To illustrate the extent of a rule of rightward S Spread that applies in certain tonal contexts, I also mark the surface tone of a second following syllable in some cases. A parenthesized S tone over a syllable indicates that S tone

appears only when the conditions for S Spread are met, otherwise the syllable bears the underlying lexical tone of the preceding syllable.

(24) Junctural tone-accent paradigm: verb + direct object + adverb
e.g. [Ngilewona _____]_p[ukou]_p 'I saw (a) _____ yesterday'

	<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
...LLL	m-'sulri] _p ['(σ)	m-'ki-pfi] _p ['(σ)	m-càkà] _p [ò
...HLL	leerij] _p [ò	Nde-wiki-ò] _p ['(σ)	mu-olrómbò] _p [ò
...HL	mburuj] _p ['(σ)	Nde-min-ò] _p ['(σ)	m-kiwosó] _p [ò
...LH	numbà] _p [ò	u-kù] _p ['(σ)	m-sià] _p [ò
...HH	ngukù] _p [ò	Nde-lya-ngó] _p ['(σ)	m-mrití] _p [ò

I devote the remainder of section 2.2 to motivating a set of rules which derive the two distinct u-final and junctural patterns of accentual contrast just presented, but which ignore accentual contrasts in p-internal position. Central to the analysis are two tone raising rules that are sensitive to both accent and the proximity of a p-phrase boundary. I discuss these rules in sections 2.2.1 and 2.2.2 below.

2.2.1. H Attachment

The first rule that furnishes evidence for accent is one which, together with a later spreading rule, has the surface effect of raising a p-final sequence of L-toned syllables to !H (downstepped H), up to and including the accented mora of the final word in the p-phrase. Thus in example (25) the accented toneless words msulri 'nobleman' and mkipfi 'big, ugly wasp', which bear L tone in p-internal position (25a-b), show up with !H in p-final position (25c-d).

- | | | |
|---|--|---|
| * | | * |
| (25) Penultimate Accent [msulri] | | Final Accent [mkipfi] |
| a. [Ngá'wóná m̥sùlri m̥nòrŭ] _p | | b. [Ngá'wóná m̥kipfi m̥nòrŭ] _p |
| 'I saw a fat nobleman' | | 'I saw a fat big-ugly-wasp' |
| c. [Ngá'wóná m̥!sùlri] _p | | d. [Ngá'wóná m̥!kipfi] _p |
| 'I saw a nobleman' | | 'I saw a big ugly wasp' |

Note that while the !H extends as far as the first mora of the p-final syllable in (25c) to yield a final falling tone, in (25d) the !H extends through to the p-final syllable's second mora, yielding a final H tone. This difference in location of the rightmost H-toned mora reflects the pre-Tone Shift difference between penultimate and final accent.

With underspecification, L tone is not present underlyingly, so the rule responsible for this alternation is actually not a feature-changing rule, but one which attaches a H to an underlyingly toneless accented syllable. I call this rule H Attachment and state it in example (26) below. The circled sigma designates a toneless syllable,

and the asterisk above it represents an accentual grid mark.

(26) H ATTACHMENT

$$\emptyset \rightarrow H^* / \text{---} l_p$$

*
⊙
|

This rule performs the same function as an intonational or accentual melody assignment rule, in that it establishes a linking between a designated tone and a designated prominent syllable. For that reason I mark the H with an asterisk, following Goldsmith's (1976) and Pierrehumbert's (1980) conventions for designating such tones. Although this diacritic feature is not needed to distinguish the accentual H from other intonational melody tones in Kivunjo, it will be needed to distinguish the accentual H from lexical H tones later in the derivation, when spreading takes place.

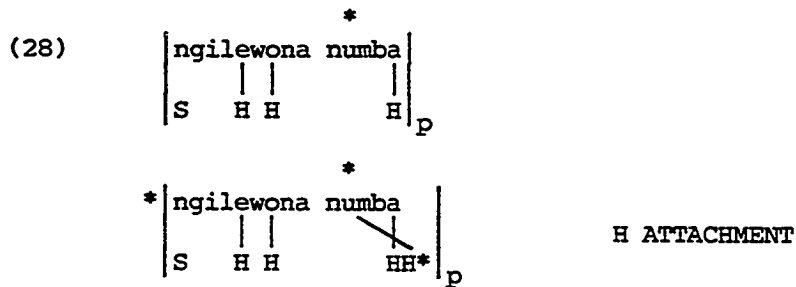
While the inserted H* must be p-final on the tonal tier, the toneless accented syllable shown in the rule formulation in (26) need not be p-final on the segmental tier. This is why I have indicated a p-phrase right-hand bracket only after the environment dash on the tonal tier. (In general, linear precedence in autosegmental phonology is defined only within tiers.) The sole requirement on H Attachment is that no H-toned syllables intervene between the accented syllable and the p-boundary. Thus H Attachment operates in accented LLL-final nouns to supply a tone for the underlyingly toneless accented syllable, whether final or penultimate. In the derivation in (27), a H* attaches to the penultimate syllable of the LLL penultimate-accented keyword msulri and to the final syllable of the LLL final-accented

keyword mkipfi.

(27)	m | sulri |	m-ki | pfi |	UNDERLYING REPRESENTATION
	| stem	| stem	
	* m | sulri |	* m-ki | pfi |	STEM ACCENT RULE (LEXICAL)
	| stem	| stem	
	* | naiolonga msulri |	* | naiolonga mkipfi |	LEXICAL INSERTION AND P-PHRASE CONSTRUCTION
	| S H |	| S H |	
	| p	| p	
	* | naiolonga msulri |	* | naiolonga mkipfi |	H ATTACHMENT
	| S H |	| S H |	
	| H* |	| H* |	
	| p	| p	
	'(S)he's pointing at a nobleman'	'(S)he's pointing at a big wasp'	

The verb-initial S(uperhigh) tones that appear in (27) are irrelevant to the current discussion, and their origin will be discussed in section 2.2.5.

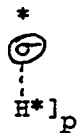
As formulated in (26), H Attachment not only attaches the H*, but also inserts it in p-final position on the tonal tier. However, the H* is inserted only if it can be linked to a toneless accented syllable without violating the standard prohibition on crossing association lines. Thus H Attachment will fail to apply to the accented syllable of a word such as numba 'house', in which a H-toned syllable intervenes between the accented syllable and the p-boundary.



Since it has no available landing site, the H* is never inserted, and the starred configuration in (28) never arises.

Another possible analysis of H Attachment would be to generate the H* tone along with the p-boundary, as a combination phrase accent and boundary tone. This would eliminate the need for H Attachment to insert the H*, leaving it merely to link the H* to an accented syllable:

(29) H ATTACHMENT (alternate version)



An automatic convention would then delete any H* tones which remain floating after the rule's application, since they would lack any phonetic effect on pitch register. It matters little to the ensuing analysis which version of H Attachment we use, and so I continue to use the original version in (26) for ease of exposition. However, in section 3.7 I will discuss the advantages of (29).

Returning to the derivation begun in (27), each noun is the direct object of the verb naiolonga '(s)he is pointing (at)'. Since the verb heads a VP which dominates the noun, it p-governs the noun,

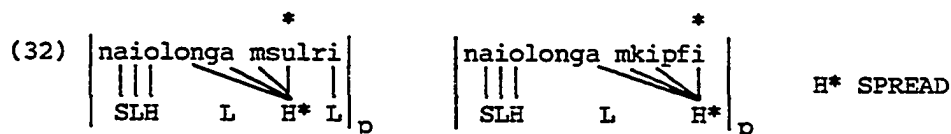
and the pair form a single p-phrase. After H Attachment, the Default rule is free to supply the remaining toneless syllables of both the verb and the noun with L tone. This will happen late in the p-level phonology:



Once Default has applied, a rule of H* Spread is triggered:



H* Spread iteratively propagates the H* leftward at the expense of the preceding L until all of the L tone's linkings to syllables have been eliminated, and the H* is blocked from further spreading by the right-most H-toned syllable of naiolonga. The resultant floating L is interpreted phonetically as a downstep, which lowers the upper limit of the pitch register. There is ample precedent for the identification of downstep with floating L tone, cf. Goldsmith (1979), Clements (1984).



With the application of Tone Shift, we derive the surface forms in (33), which show on their final syllables the contrast between penul-

timate and final accent in LLL words.

(33) $\text{nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngá}^{\text{H}} \text{m}^{\text{H}}\text{súl}^{\text{H}}\text{r}^{\text{H}}\text{i}$ $\text{nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngá}^{\text{H}} \text{m}^{\text{H}}\text{kípfi}$ TONE SHIFT

H* Spread only applies to the tone inserted by H Attachment, ignoring lexical H tones. Thus the H tones of mburu 'goat' and uku 'piece of firewood' fail to spread, even though they are attached to accented syllables. Examples (34a-b) show that these words have lexical H tones, and (34c-d) show that H* Spread fails to apply to them.

<p>(34) a. $\left| \begin{array}{ccc} \text{naiolonga} & \text{mburu} & \text{ngitutu} \\ | & | & | \\ \text{S H} & \text{H} & \text{H} \end{array} \right|_p$</p> <p>$\text{Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngà} \text{m}^{\text{H}}\text{bùrú} \text{ngitùtù}^{\text{H}}$</p> <p>'(S)he's pointing at a small goat'</p>	<p>b. $\left| \begin{array}{ccc} \text{naiolonga} & \text{uku} & \text{lututu} \\ | & | & | \\ \text{S H} & \text{H} & \text{H} \end{array} \right|_p$</p> <p>$\text{Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngà} \text{nùmbà} \text{ngitùtù}^{\text{H}}$</p> <p>'(S)he's pointing at a small piece of firewood'</p>
<p>c. $\left| \begin{array}{ccc} \text{naiolonga} & \text{mburu} & \\ | & | & | \\ \text{S H} & \text{H} & \end{array} \right|_p$</p> <p>$\left| \begin{array}{ccc} \text{naiolonga} & \text{mburu} & \\ ||| & | & | \\ \text{SLH} & \text{L} & \text{H L} \end{array} \right|_p$</p> <p>n/a</p> <p>$\text{Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngà} \text{m}^{\text{H}}\text{bùrù}$</p> <p>$\text{*Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngá}^{\text{H}} \text{m}^{\text{H}}\text{bùrù}$</p> <p>'(S)he's pointing at a goat'</p>	<p>d. $\left| \begin{array}{ccc} \text{naiolonga} & \text{uku} & \\ | & | & | \\ \text{S H} & \text{H} & \end{array} \right|_p$</p> <p>$\left| \begin{array}{ccc} \text{naiolonga} & \text{uku} & \\ ||| & | & | \\ \text{SLH} & \text{L} & \text{H} \end{array} \right|_p$</p> <p>n/a</p> <p>$\text{Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngà} \text{ùkù}$</p> <p>$\text{*Nai}^{\text{H}}\text{òl}^{\text{H}}\text{ó}^{\text{H}}\text{ngá}^{\text{H}} \text{ùkù}$</p> <p>'(S)he's pointing at a piece of firewood'</p>

DEFAULT

H* SPREAD

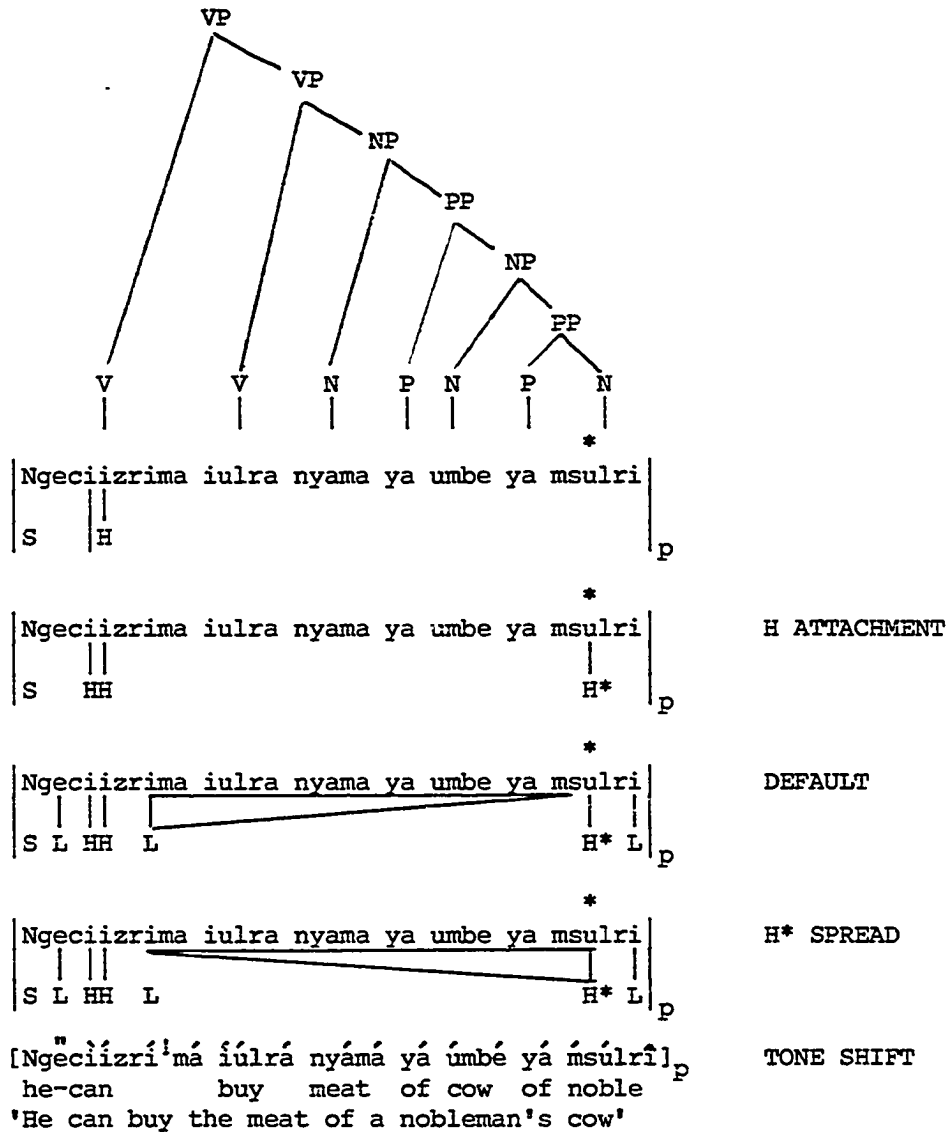
TONE SHIFT

It is for this reason that an intonational feature is needed to distinguish the inserted H* from lexical H. In Appendix B we will see

evidence for the same intonational feature on utterance-final intonational boundary tones as well.

Note that in (32) the H* spreads into the preceding word. This is because H* Spread is an unbounded rule with respect to word boundaries. It may therefore spread back indefinitely within the p-phrase until it reaches a H tone. This is shown in (35), where a string of seven words forms a single p-phrase because each word in the string p-governs the next.

(35)



This example may be compared with one in which the final LLL word, msulri, is replaced with the LLH word msolro 'man', which fails to undergo H Attachment because of its final H tone. Such an example, given in (36), shows L surface tone over the same stretch of underlyingly toneless syllables.

- (36) $\left| \begin{array}{ccccccc} \text{Ngeciizrima} & \text{iulra} & \text{nyama} & \text{ya} & \text{umbe} & \text{ya} & \text{msolro} \\ & | & & & & & | \\ & \text{S} & \text{HH} & & & & \text{H} \end{array} \right|_p$
- $\left[\text{Ngeciizrima} \text{ iulra nyama ya umbe ya msolro} \right]_p$ DEFAULT,
 he-can buy meat of cow of man TONE SHIFT
 'He can buy the meat of a man's cow'

Since H Attachment is accent-triggered, unaccented LLL words fail to undergo the rule. Consequently, they surface with low tones that are supplied by Default and then shifted rightward by Tone Shift. In (37) I derive the u-final variants of two types of unaccented nouns. The first, mcaka 'Chaga person', belongs to the class of ethnonyms, which are subject to a Deaccenting rule, while the second, Ladi (a man's name), is a truncated version of the name Ladisilasi, and lacks accent because the accented penult of Ladisilasi is part of the material which has been deleted. Although Ladi has only two syllables, yielding a LL final tone pattern, the final L-toned syllable of the verb naiolonga combines with its LL to form the sequence LLL.

(37)	$\begin{array}{|c|} \hline \text{caka} \\ \hline \end{array} \text{stem}$	$\begin{array}{|c|} \hline \text{ladisilasi} \\ \hline \text{H} \\ \hline \end{array} \text{stem}$	UNDERLYING REPRESENTATION
	$\begin{array}{|c|} \hline * \\ \hline \text{caka} \\ \hline \end{array} \text{stem}$	$\begin{array}{|c|} \hline * \\ \hline \text{ladisilasi} \\ \hline \text{H} \\ \hline \end{array} \text{stem}$	STEM ACCENT RULE
	$\text{m} \begin{array}{|c|} \hline \text{caka} \\ \hline \end{array} \text{stem}$	n/a	ETHNONYM FORMATION, DEACCENTING
	n/a	$\begin{array}{|c|} \hline \text{ladi} \\ \hline \end{array}$	NICKNAME TRUNCATION
	$\begin{array}{|c|} \hline \text{naiolonga mcaka} \\ \hline \text{S H} \\ \hline \end{array} \text{p}$	$\begin{array}{|c|} \hline \text{naiolonga ladi} \\ \hline \text{S H} \\ \hline \end{array} \text{p}$	LEXICAL INSERTION AND P-PHRASE CONSTRUCTION
	n/a	n/a	H ATTACHMENT
	n/a	n/a	H* SPREAD
	naìòlóngà mcàkà	naìòlóngà Ladi	DEFAULT, TONE SHIFT
	'(S)he's pointing at a Chaga person'	'(S)he's pointing at Ladi'	

To sum up, among p-phrases ending in three toneless syllables we have observed three distinct patterns of sandhi: if the final syllable bears accent, LLL becomes !HHH by the action of H Attachment and H* Spread; if the penult bears accent, LLL becomes !HHL; and if neither syllable is accented, LLL remains unchanged.

2.2.2. Final Raising

The second argument for accent comes from a true raising rule, which I will call Final Raising. Instead of inserting a tone and attaching it to a toneless syllable, this rule raises the pitch of an already existing H tone to superhigh (S). However, Final Raising only targets the rightmost H in a p-phrase. With L tone unspecified at this stage of the derivation, it is simple to express this restriction, since the last H is in fact adjacent to the p-boundary on the tonal tier, regardless of the number of intervening toneless syllables. Thus the statement of the rule in (38) refers to the H tone's adjacency to the p-boundary without specifying the position of the syllable to which it is attached.

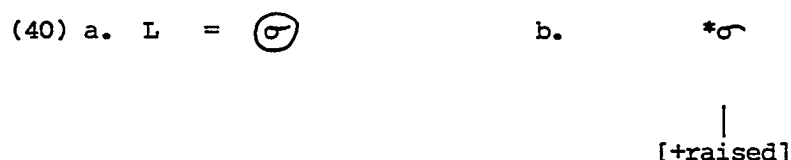
(38) FINAL RAISING (first approximation): $H \rightarrow S / _]_p$

The symbol S is shorthand for the feature matrix [+high,+raised]. This use of the feature [raised] differs from that of Pulleyblank (1983). We may presume for now that H tone is underlyingly unspecified for the feature [raised], and where it does not undergo Final Raising it is eventually supplied with the default value [-raised] by the end of the derivation. Thus in the present chapter I use the symbol H to indicate the feature complex in (39a) and the symbol S to indicate the feature complex in (39b).

(39) a. $H = \begin{array}{c} \sigma \\ | \\ [+high] \end{array}$

b. $S = \begin{array}{c} \sigma \\ | \\ [+high] \\ | \\ [+raised] \end{array}$

The feature geometry in (39) implies that [raised] is hierarchically dependent on [high]. This accurately reflects the fact that the feature combination [-high,+raised] is impossible. Assuming underspecification and a feature hierarchy, such a matrix would appear as in (40b), where the [+raised] autosegment has no specified [high] feature to attach to and so cannot be realized on a syllable.



Another consequence of the feature representation in (39) is that since S and H share the feature [+high], they undergo many rules as a natural class: S may always function as a H in the structural description of a rule, since it contains the feature [+high], but H cannot function as a S since it is unspecified for the feature [+raised]. Thus every rule that refers to H applies to both H and S, but there are also rules refer only to S.

I will first show Final Raising applying to the penultimate H of mburu 'goat', a penultimate-accented word of the HL tone class. In (41) we can tell from its noun class and identical plural form that mburu has a polysyllabic stem and a non-syllabic nasal consonant prefix. It therefore receives penultimate accent.

- (41) m | buru | 'goat' (Class 9) cf. m | buru | 'goats' (Class 10)
 | |
 H | stem H | stem

P-internally, the HL tones of mburu emerge unscathed, shifted one syllable rightward by Tone Shift, as in (42).

If we replace the adjective ngitutu 'small' with the adverb inu 'today', however, mburu ends up in junctural position: Since inu is not part of the NP headed by mburu, it is not p-governed by mburu and so must form a separate p-phrase. In this context H raises to S:

Note also that the H of mburu is accented. Just as H Attachment applies only to toneless syllables which are accented, Final Raising

applies only to H-toned syllables which are accented. Thus the H of the unaccented HL keyword mkiwoso fails to raise in junctural position:

(44)	$\begin{array}{|c|} \hline \text{kiwoso} \\ \hline | \\ \text{H} \\ \hline \end{array} \text{stem}$	'Kibosho'
	*	
	$\begin{array}{|c|} \hline \text{kiwoso} \\ \hline | \\ \text{H} \\ \hline \end{array} \text{stem}$	STEM ACCENT RULE
	m	ETHNONYM DERIVATION, DEACCENTING
	$\begin{array}{|c|} \hline \text{kiwoso} \\ \hline | \\ \text{H} \\ \hline \end{array} \text{stem}$	
	$\begin{array}{|c|c|c|c|c|} \hline \text{Ngawona} & \text{mkiwoso} & \text{mnoru} & & \\ \hline | & | & | & & \\ \text{HLH} & \text{H} & \text{H} & & \\ \hline \end{array} \text{p}$	$\begin{array}{|c|c|c|c|c|} \hline \text{Ngawona} & \text{mkiwoso} & & \text{inu} & \\ \hline | & | & | & | & \\ \text{HLH} & \text{H} & \text{H} & \text{H} & \\ \hline \end{array} \text{p}$
	n/a - not p-final	FINAL RAISING
	Ngá'wóná mkiwòsò mnòrù	TONE SHIFT, DEFAULT
	'I saw a fat person from Kibosho'	'I saw a person from Kibosho today'

This indicates an additional condition on Final Raising: The H, in order to raise, must be attached to an accented syllable. The revised version of Final Raising appears in (45):

(45) FINAL RAISING (final statement)	*
	$\begin{array}{c} \sigma \\ | \\ \text{H} \rightarrow \text{S} / \text{ } \text{p} \end{array}$

Final Raising may also apply to an accented H attached to the p-final syllable. A comparison of the three accentual variants of the LH tonal type produces a similar contrast to that just seen between

mburu and mkiwoso, only in this case it is the final-accented item which undergoes Final Raising, while the penultimate-accented and unaccented LH words fail to do so.

Noun class membership and morphological alternations between the singular and plural forms of the nouns in (46a-b) show that numba 'house' has a disyllabic stem and consequently gets penultimate accent, while uku 'piece of firewood' has a monosyllabic stem and so receives final accent. In (46c), msia 'person from Siha' loses its accent because it is an ethnonym.

<p>(46) a. $\begin{array}{c} * \\ | \text{numba} | \\ | \quad | \\ \quad | \text{H} | \\ | \text{stem} \end{array}$</p> <p>'house' (Class 9)</p>	<p>b. $\begin{array}{c} * \\ | \text{u} | \text{ku} | \\ | \quad | \\ \quad | \text{H} | \\ | \text{stem} \end{array}$</p> <p>'piece of firewood' (Class 11)</p>	<p>c. $\begin{array}{c} * \\ | \text{m} | \text{sia} | \\ | \quad | \\ \quad | \text{H} | \\ | \text{stem} \end{array}$</p> <p>'person from Siha' (Class 1)</p>
<p>$\begin{array}{c} * \\ | \text{numba} | \\ | \quad | \\ \quad | \text{H} | \\ | \text{stem} \end{array}$</p> <p>'houses' (Class 10)</p>	<p>$\begin{array}{c} * \qquad \qquad * \\ | \text{n} | \text{ku} | \quad \text{-->} \quad \text{ngu} \\ | \quad | \qquad \qquad | \\ \quad | \text{H} | \qquad \qquad | \text{H} \\ | \text{stem} \end{array}$</p> <p>'firewood' (collective plural) (Class 10)</p>	

That these three words end in a LH tone pattern is confirmed by their p-internal variants: each word's final syllable bears L tone, and the first syllable of the following word bears H tone, as seen in (47).

(47) Sentence frame: **Nyi** ____ **AGR-tutu** 'It's a small ____'

<p>a. ...<u>numba</u> ngitutu</p> <p style="text-align: center;">H H_p</p>	<p>b. ...<u>uku</u> lututu</p> <p style="text-align: center;">H H_p</p>	<p>c. ...<u>msia</u> mtutu</p> <p style="text-align: center;">H H_p</p>
<p>Nyì nùmbà ngítùtùY</p> <p>'It's a small house'</p>	<p>Nyì ùkù lútùtùY</p> <p>'It's a small piece of firewood'</p>	<p>Nyì msià mtùtùY DEFAULT, TONE SHIFT</p> <p>'(S)he's a small person from Siha'</p>

The fact that the adjective -tutu 'small' bears a different agreement prefix after each word is a consequence of the fact that each belongs to a different noun class. This has no effect on the tone, as all adjective prefixes are underlyingly toneless.

Since Final Raising requires the target H to be accented, we predict that in p-final position the accented H of uku will raise to S, while the unaccented H of numba will not. The data in (48) show that this is indeed the case. The two keywords appear in a construction like that of (43), but with a different adverb, ngama 'tomorrow'.

(48) Sentence frame: **Ngeciulra** ____ **ngama** 'I'll buy a ____ tomorrow'

<p>a. ...<u>numba</u> | ngama</p> <p style="text-align: center;">H_p H_p</p>	<p>b. ...<u>uku</u> | ngama</p> <p style="text-align: center;">H_p H_p</p>	<p>LEXICAL INSERTION AND P-PHASE CONSTRUCTION</p>
<p>n/a -- final H not accented</p>	<p>...<u>uku</u> | ngama</p> <p style="text-align: center;">S_p H_p</p>	<p>FINAL RAISING</p>
<p>Ngeciùlrà nùmbà ngámáY</p> <p>'I'll buy a house tomorrow'</p>	<p>Ngeciùlrà ùkù ngámáY</p> <p>'I'll buy a piece of firewood tomorrow'</p>	<p>DEFAULT, TONE SHIFT</p>

Like numba, the unaccented LH-final keyword msia also fails to undergo

Final Raising:

(49)	$\left| \begin{array}{c} \text{ngeciwona} \\ \text{S} \end{array} \right| \left| \begin{array}{c} \text{msia} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{ngama} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \\ \text{p} \end{array} \right|$	LEXICAL INSERTION, P-PHASE CONSTRUCTION
	n/a -- no accent	FINAL RAISING
	Ngēcìwóná m̀sià ngámá	TONE SHIFT, DEFAULT
	'I'll see a person from Siha tomorrow'	

In both tonal types for which Final Raising has been exemplified so far, the accented H has also been the rightmost H tone in the phrase. If an accented H is not p-phrase-final on the tonal tier, the rule will pass it over. This circumstance arises in penultimate-accented HH words.

Example (50) illustrates the placement of accent and the p-internal surface tones of the two accented HH keywords nguku 'chicken' and Ndelya-ngo (a man's name). Nguku receives penultimate accent because of its disyllabic stem. Ndelya-ngo is a compound derived from the verb-object phrase ilya ngo 'take heart, courage' (lit. 'eat heart'). Since ngo is a monosyllabic content word, it takes accent on its only syllable, lending final accent to the entire compound.

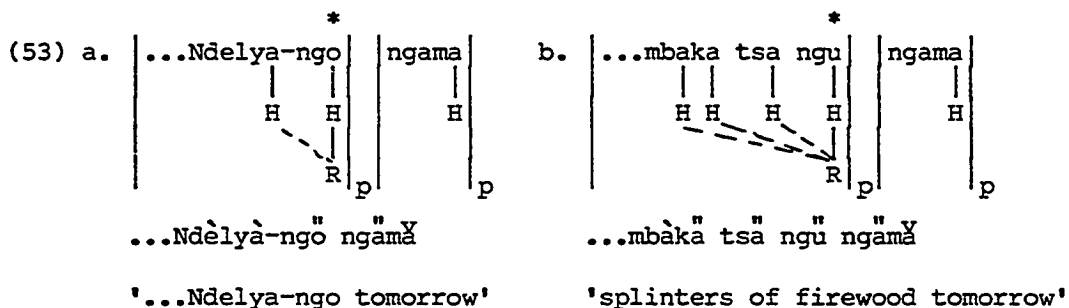
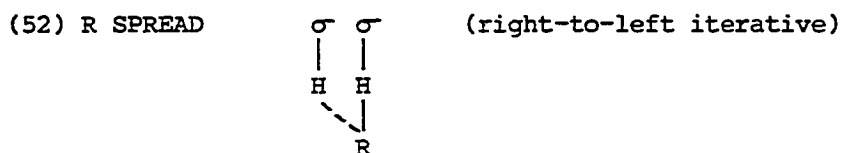
(50) a. $\begin{array}{|c|} \hline \text{nguku} \\ \hline \text{H} \quad \text{H} \\ \hline \text{stem} \\ \hline \end{array}$	b. $\begin{array}{|c|} \hline \text{nde} \quad \text{lya} \\ \hline \text{H} \\ \hline \text{stem} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{ngo} \\ \hline \text{H} \\ \hline \text{stem} \\ \hline \end{array}$	UNDERLYING REPRESENTATION
$\begin{array}{|c|} \hline \text{nguku} \\ \hline \text{H} \quad \text{H} \\ \hline \text{stem} \\ \hline \end{array}$	$\begin{array}{|c|} \hline \text{nde} \quad \text{lya} \\ \hline \text{H} \\ \hline \text{stem} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{ngo} \\ \hline \text{H} \\ \hline \text{stem} \\ \hline \end{array}$	STEM ACCENT RULE
$\begin{array}{|c|} \hline \text{nyi} \quad \text{nguku} \quad \text{ngitutu} \\ \hline \text{H} \quad \text{H} \quad \text{H} \\ \hline \text{p} \\ \hline \end{array}$	$\begin{array}{|c|} \hline \text{nyi} \quad \text{ndelya-ngo} \quad \text{mtutu} \\ \hline \text{H} \quad \text{H} \quad \text{H} \\ \hline \text{p} \\ \hline \end{array}$	LEXICAL INSERTION AND P-PHRASE CONSTRUCTION
Nyi ngúkú ngítùtù 'I saw a little chicken'	Nyi Ndélyà-ngo' mtùtù 'I saw little Ndelya-ngo'	DEFAULT, TONE SHIFT

In p-internal position both keywords show HH as their last two underlying tones, as seen in (50). In junctural position, however, a final-accented HH word will undergo Final Raising, as in (51b), while a penultimate-accented HH word will not, as in (51a). This is because in (51a) a final, unaccented H tone intervenes between the accented H and the p-phrase juncture, blocking their adjacency on the tonal tier.

(51) Sentence frame: Ngeciwona ____ ngama 'I'll see (a) ____ tomorrow'

a. $\begin{array}{|c|} \hline \text{...nguku} \\ \hline \text{H} \quad \text{H} \\ \hline \text{p} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{ngama} \\ \hline \text{H} \\ \hline \text{p} \\ \hline \end{array}$	b. $\begin{array}{|c|} \hline \text{...Ndelya-ngo} \\ \hline \text{H} \quad \text{H} \\ \hline \text{p} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{ngama} \\ \hline \text{H} \\ \hline \text{p} \\ \hline \end{array}$	LEXICAL INSERTION AND P-PHRASE CONSTRUCTION
(inapplicable -- accented H not phrase-final)	$\begin{array}{|c|} \hline \text{...Ndelya-ngo} \\ \hline \text{H} \quad \text{S} \\ \hline \text{p} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{ngama} \\ \hline \text{H} \\ \hline \text{p} \\ \hline \end{array}$	FINAL RAISING
Ngècìwóná ngúkú ngámá 'I'll see a chicken tomorrow'	Ngècìwóná Ndèlyà-ngo' ngámá 'I'll see Ndelya-ngo tomorrow'	OTHER RULES

Note that in (51b) the surface form shows two S tones, corresponding to Ndelya-ngo's two underlying H tones, rather than just one final S tone. This reflects a rule of R Spread, which spreads the feature [+raised] leftward onto an uninterrupted sequence of H tones, in a manner analogous to H* Spread. I use the symbol R as a shorthand for the feature [+raised] in what follows:



Not surprisingly, the unaccented HH keyword mmriti 'person from Mriti' fails to undergo Final Raising, just as unaccented LL-final keywords fail to undergo H Attachment:

(54)	$\begin{array}{|c|} \hline \text{mriti} \\ \hline | \quad | \quad | \\ \hline \text{H} \text{ H} \text{ H} \\ \hline \end{array} \text{stem}$	'Mriti'	
	*		
	$\begin{array}{|c|} \hline \text{mriti} \\ \hline | \quad | \quad | \\ \hline \text{H} \text{ H} \text{ H} \\ \hline \end{array} \text{stem}$	STEM ACCENT RULE	
	m	ETHNONYM DERIVATION, DEACCENTING	
	$\begin{array}{|c|} \hline \text{mriti} \\ \hline | \quad | \quad | \\ \hline \text{H} \text{ H} \text{ H} \\ \hline \end{array} \text{stem}$		
	$\begin{array}{|c|c|c|} \hline \text{nyi} & \text{mmriti} & \text{mtutu} \\ \hline | & | & | \\ \hline \text{H} & \text{H} \text{ H} \text{ H} & \text{H} \\ \hline & & \text{p} \end{array}$	$\begin{array}{|c|c|c|c|} \hline \text{Necialyika} & \text{mmriti} & & \text{ngama} \\ \hline | & | & | & | \\ \hline \text{S} & \text{H} & \text{H} \text{ H} \text{ H} & \text{H} \\ \hline & & \text{p} & \text{p} \end{array}$	
	n/a -- p-internal	n/a -- no accent	FINAL RAISING
	Nyì mmrítí mtútŷ	Ngeciályikà mmrítí ngámŷ	DEFAULT, TONE SHIFT
	'It's a little person from Mriti'	'He'll marry a person from Mriti tomorrow'	

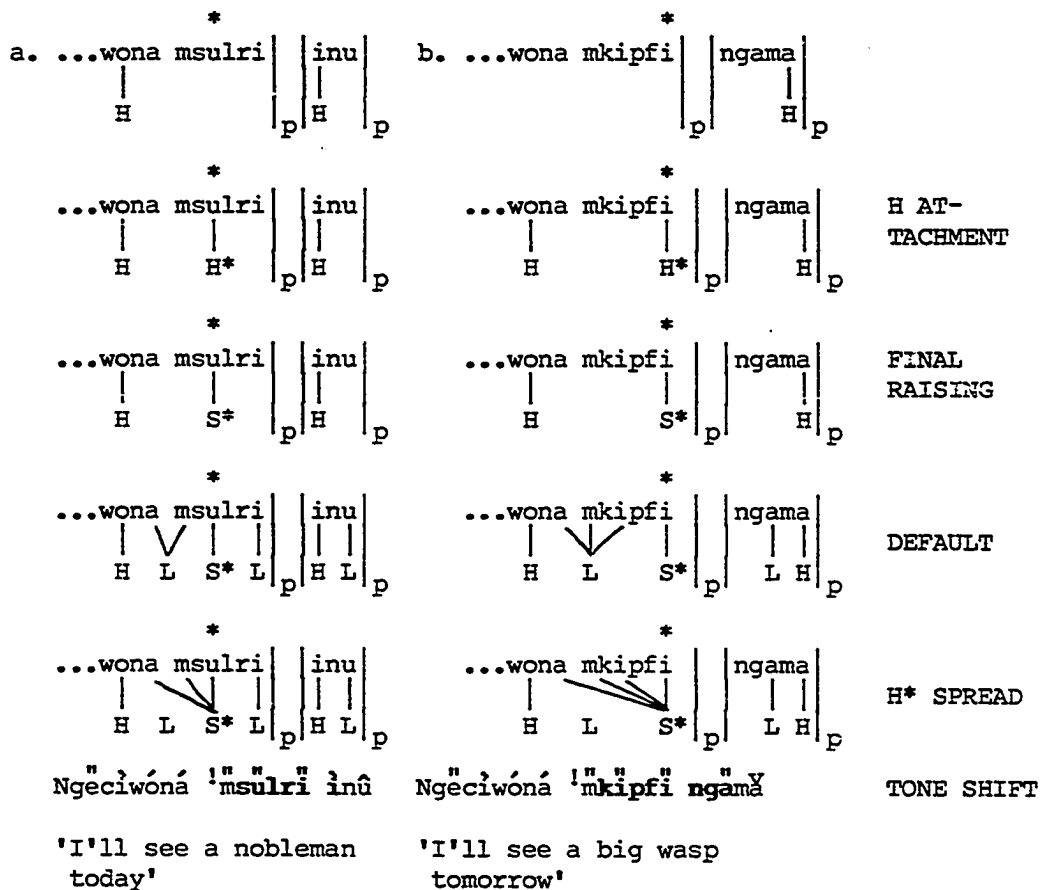
In summary, then, with Final Raising the three-way accent distinction is mapped onto a two-way contrast between words which undergo the rule and words which do not. Those which undergo Final Raising are penultimate-accented HL and final-accented LH/HH words. Those which do not are penultimate-accented LH/HH words and all unaccented words. The tone created by Final Raising is S(uperhigh), a complex of the features [+H(igh),+R(aised)]. An additional rule of R Spread assimilates a continuous sequence of preceding H tones to the S created by Final Raising, paralleling the application of H* Spread to sequences of toneless syllables.

2.2.3. H Attachment feeds Final Raising.

Since Final Raising targets a H that is linked to an accented syllable, while H Attachment links a H to an accented syllable, these two rules stand in a potential feeding relationship. The question therefore arises: Does H Attachment feed Final Raising? The presence of S tone in the junctural variants of toneless accented keywords indicates that it does. However, the absence of S tone in the u-final variants of these same keywords (the examples used to motivate H Attachment in 2.2.1) superficially suggests that it does not. In the next section, however, I will show that the surface absence of u-final raising reflects the later action of a u-final lowering rule. Thus we will assume in the present section that H Attachment feeds Final Raising in all environments.

Below, I derive the junctural variants of the two toneless accented keywords msulri and mkipfi:

(55) Sentence frame: Ngeciwona — inu 'I'll see a — today
ngama tomorrow'



The phonetic interpretation of the sequence H!S is discussed in Appendix B.

Note that H* Spread applies after Final Raising. This is because Final Raising crucially refers to the adjacency of its target to the p-boundary before L tone is supplied by Default. Yet H* Spread crucially applies after Default L tones are specified in order to derive the downstep that results from this process. Thus in junctural position H* Spread actually must apply to a S*. This, however, is not a problem since, as I mentioned in section 2.2.2, the feature composi-

tion of S ensures that S will undergo any rule that a H will undergo, since S is a H tone with the added feature R ([+raised]).

Unaccented LLL words fail to receive an inserted H*, and consequently also fail to undergo Final Raising. Thus they surface with unaltered LLL tone in junctural position:

(56) Sentence frame: Ngilewóna ____ ukou 'I saw (a) ____ yesterday'

a. ...mcaka | ukou |
 |_p | H |_p

b. ...Ladi | ukou |
 |_p | H |_p

n/a -- no accent

H ATTACHMENT

n/a -- no H*

H* SPREAD

n/a -- no accent, no H

FINAL RAISING

n/a -- no S

S SPREAD

n/a -- no S

S LOWERING

Ngilèwóná mcàkà ùkòŸ

Ngilèwóná Làdì ùkòŸ

DEFAULT, TONE SHIFT

'I saw a Chaga person
yesterday'

'I saw Ladi
yesterday'

The fact that H Attachment feeds Final Raising indicates that the same accent that targets a syllable for H Attachment also targets a syllable for Final Raising. Further, the diacritic feature marking an inserted H* as distinct from lexical H persists even after that H* has been raised to S* by Final Raising.

I noted above that in u-final position it appears as if H Attachment does not feed Final Raising. I now turn to those cases, which in fact do not counterexemplify H Attachment's feeding of Final Raising, but rather reflect the application of an additional, u-final demotion

rule.

2.2.4. U-final Demotion

In the discussion of Final Raising in 2.2.2 we have only looked at examples of raising in junctural position. Since Final Raising has been formulated as a p-final rule, it should also be expected to apply in the other p-final context: u-final position. Yet none of the examples we have seen to undergo Final Raising juncturally in 2.2.2 show S tone in their u-final variants:

- (57) a. $\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{mburu} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right|_p \end{array}$ b. $\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{uku} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right|_p \end{array}$ c. $\begin{array}{c} * \\ \left| \begin{array}{ccc} \text{nyi} & \text{Ndelya-} & \text{ngo} \end{array} \right| \\ \left| \begin{array}{ccc} \text{H} & \text{H} & \text{H} \end{array} \right|_p \end{array}$
- Nyì mbúrû Nyì úkŭ Nyì Ndélyà-ngó
- *Nyì mbúrû` *Nyì úkù" *Nyì Ndélyà-ngó"
- 'It's a goat' 'It's a piece of firewood' 'It's Ndelya-ngo'

Similarly, as noted in 2.2.3, the p-final tone inserted by H Attachment in toneless accented words fails to surface as S in u-final position:

- (58) d. $\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{msulri} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H}^* \end{array} \right|_p \end{array}$ b. $\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{mkipfi} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H}^* \end{array} \right|_p \end{array}$
- Nyì m'súlri Nyì m'kípfi
- *Nyì m'sulri` *Nyì m'kipfi"
- 'It's a nobleman' 'It's a big ugly wasp'

One possible reason for the absence of S might be that Final

Raising does not apply in u-final position. This effect could be accomplished by revising Final Raising so that it only applies in junctural position:

(59) FINAL RAISING (revised to apply only in junctural position)

$$\begin{array}{c}
 * \\
 \sigma \\
 | \\
 H \rightarrow S / \text{---}]_p[
 \end{array}$$

However, in 2.4.2 we will encounter a case -- HLL, penultimate-accented -- where Final Raising in fact does apply u-finally. The revised rule in (59) would be unable to apply to that case, and an additional, ad hoc raising rule would have to be added to the grammar for that one example.

I therefore propose a different sort of analysis, in which Final Raising applies to the forms in (57-58) in both types of p-final context, but its effects are undone by a u-limit rule that demotes a S to H if, after Tone Shift has applied, it is attached to the final syllable of an utterance.

(60) DEMOTION (first approximation)

$$\begin{array}{c}
 \sigma \quad]_u \\
 | \\
 S \rightarrow H / \text{---}
 \end{array}$$

As stated in (60) Demotion will account for the data in (57-58), lowering S tones which, before Tone Shift, were attached to either the penultimate or final syllable of the utterance. Since there is independent evidence that accent shifts rightward along with Tone

Shift as part of a more general process of Prosodic Shift (see the next section and Appendix A), I show both accents and tones shifted rightward when Tone Shift applies in the examples below.

(61) a.	$\begin{array}{c} * \\ \text{nyi mburu} \\ \text{H} \quad \text{H} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi uku} \\ \text{H} \quad \text{H} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndelya-ngo} \\ \text{H} \quad \text{H} \quad \text{H} \\ \hline p \end{array}$	
	$\begin{array}{c} * \\ \text{nyi mburu} \\ \text{H} \quad \text{S} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi uku} \\ \text{H} \quad \text{S} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndelya-ngo} \\ \text{H} \quad \text{H} \quad \text{S} \\ \hline p \end{array}$	FINAL RAISING
	$\begin{array}{c} * \\ \text{nyi mburu} \\ \text{H} \quad \text{S} \quad \text{L} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi uku} \\ \text{H} \quad \text{L} \quad \text{S} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndelya-ngo} \\ \text{H} \quad \text{L} \quad \text{H} \quad \text{S} \\ \hline p \end{array}$	DEFAULT
	$\begin{array}{c} * \\ \text{nyi mburu} \\ \text{H} \quad \text{S} \quad \text{L} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi uku} \\ \text{H} \quad \text{L} \quad \text{S} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndelya-ngo} \\ \text{H} \quad \text{L} \quad \text{H} \quad \text{S} \\ \hline p \end{array}$	TONE (AND ACCENT) SHIFT
	$\begin{array}{c} * \\ \text{nyi mburu} \\ \text{H} \quad \text{H} \quad \text{L} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi uku} \\ \text{H} \quad \text{L} \quad \text{H} \\ \hline p \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndelya-ngo} \\ \text{H} \quad \text{L} \quad \text{H} \quad \text{H} \\ \hline p \end{array}$	DEMOTION
	Nyì mbúrû	Nyì úkû	Nyì Ndélyà-ngo	
	'It's a goat'	'It's a piece of firewood'	'It's Ndelya-ngo'	

d.	$\begin{array}{c} * \\ \text{nyi msulri} \\ | \\ \text{H} \end{array} \Big|_p$	e.	$\begin{array}{c} * \\ \text{nyi mkipfi} \\ | \\ \text{H} \end{array} \Big|_p$	
	$\begin{array}{c} * \\ \text{nyi msulri} \\ | \quad | \\ \text{H} \quad \text{H}^* \end{array} \Big|_p$		$\begin{array}{c} * \\ \text{nyi mkipfi} \\ | \quad | \\ \text{H} \quad \text{H}^* \end{array} \Big|_p$	H ATTACHMENT
	$\begin{array}{c} * \\ \text{nyi msulri} \\ | \quad | \\ \text{H} \quad \text{S}^* \end{array} \Big|_p$		$\begin{array}{c} * \\ \text{nyi mkipfi} \\ | \quad | \\ \text{H} \quad \text{S}^* \end{array} \Big|_p$	FINAL RAISING
	$\begin{array}{c} * \\ \text{nyi msulri} \\ | \quad \diagdown \quad | \\ \text{L H L S}^* \text{L} \end{array} \Big|_p$		$\begin{array}{c} * \\ \text{nyi mkipfi} \\ | \quad \diagdown \quad | \\ \text{L H L S}^* \end{array} \Big|_p$	DEFAULT, H* SPREAD
	$\begin{array}{c} * \\ \text{nyi msulri} \\ / \quad / \quad \diagup \\ \text{L H L S}^* \text{L} \end{array} \Big|_p$		$\begin{array}{c} * \\ \text{nyi mkipfi} \\ / \quad / \quad \diagdown \\ \text{L H L S}^* \end{array} \Big|_p$	TONE (AND ACCENT) SHIFT
	$\begin{array}{c} * \\ \text{nyi msulri} \\ / \quad / \quad \diagup \\ \text{L H L H}^* \text{L} \end{array} \Big|_p$		$\begin{array}{c} * \\ \text{nyi mkipfi} \\ / \quad / \quad \diagdown \\ \text{L H L H}^* \end{array} \Big|_p$	DEMOTION
	Nyì m ¹ súlri		Nyì m ¹ kipfi	
	'It's a nobleman'		'It's a wasp'	

As I will show in Appendix B, Demotion is one of several processes in Kivunjo that contribute to an overall lowering of tones on u-final syllables. Like a number of other tone languages, Kivunjo lacks generalized phonetic downdrift or declination applying to the utterance as a whole. Instead, in Kivunjo a last-minute lowering effect is achieved on u-final syllables through the application of specific phonological rules such as Demotion.

2.2.5. Verb-initial accent: A lexical source of S tone

P-final raising is not the only source of S tone in Kivunjo Chaga. The initial syllables of verbs often bear S tone, yet verb-initial S cannot be the result of Final Raising applying to a stem-penultimate accent for several reasons. First, in verbs of more than two syllables the S is not attached to the verb's penultimate or final syllable, and so could not have arisen from an accent assigned by the Stem Accent Rule (see (62c) below). In fact, as can be seen in (62a-b), verb-initial accent regularly occurs alongside stem-penultimate accent in the same verb. In (62a-b) each verb is in p-final position since the following negative adverb pfo, for reasons discussed in Appendix C, fails to phrase with the verb. (In glosses, numerals refer to noun classes, not persons.)

(62) a. $\begin{array}{c} * \\ \left| \begin{array}{c} \text{aisamba} \\ | \\ \text{S} \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ \text{H} \end{array} \right| \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	b. $\begin{array}{c} * \\ \left| \begin{array}{c} \text{aizrezra} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ \text{H} \end{array} \right| \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	
$\begin{array}{c} * \\ \left| \begin{array}{c} \text{aisamba} \\ | \quad | \\ \text{S} \quad \text{S}^* \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ \text{H} \end{array} \right| \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	$\begin{array}{c} * \\ \left| \begin{array}{c} \text{aizrezra} \\ | \quad | \\ \text{S} \quad \text{S} \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ \text{H} \end{array} \right| \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	H ATTACHMENT, FINAL RAISING
Ài"samba pfŎ 1-PRES-wash NEG	Àizrèzra pfŎ 1-PRES-speak NEG	OTHER RULES
'(S)he is not washing'	'(S)he is not speaking'	

c. $\begin{array}{c} * \quad * \\ \left| \begin{array}{c} \text{aiazranyia} \end{array} \right| \left| \begin{array}{c} \text{moondu} \end{array} \right| \left| \begin{array}{c} \text{pfo} \end{array} \right| \\ \left| \begin{array}{c} \text{S} \end{array} \right| \left| \begin{array}{c} \text{H} \end{array} \right| \quad \left| \begin{array}{c} \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \quad \left| \begin{array}{c} \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$

n/a

H ATTACHMENT,
FINAL RAISING

Àiàzrányìà mòòndù pfó
1-PRES-listen case NEG

DEFAULT,
TONE SHIFT

'(S)he (Class 1) is not listening to a case'

In shorter verbs, where the initial syllable is the same as the penult or ultima, verb-initial S appears regardless of whether or not the verb is p-final:

(63) a. $\begin{array}{c} * \\ \left| \begin{array}{c} \text{waca} \end{array} \right| \left| \begin{array}{c} \text{kanyi} \end{array} \right| \left| \begin{array}{c} \text{pfo} \end{array} \right| \\ \left| \begin{array}{c} \text{S} \end{array} \right| \left| \begin{array}{c} \text{H} \end{array} \right| \quad \left| \begin{array}{c} \text{p} \end{array} \right| \left| \begin{array}{c} \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$

wàcà kànyí pfŏ
2-RECPAST home NEG

'They (Class 2) didn't come from home'

b. $\begin{array}{c} * \\ \left| \begin{array}{c} \text{waca} \end{array} \right| \left| \begin{array}{c} \text{pfo} \end{array} \right| \\ \left| \begin{array}{c} \text{S} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \left| \begin{array}{c} \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$

wàcà pfŏ
2-RECPAST NEG

'They didn't come'

Thus Final Raising cannot be responsible for verb-initial S even when it occurs within the stem-final accent foot.

Where a verb-initial S does alternate with H, the alternation is determined by morphological category, not phonological phrasing. Thus in (64) we see that the main clause form of the present progressive tense begins with S tone, while its relative form begins with H tone instead:

(64) a. $\begin{array}{c} * \quad * \quad * \\ \left| \text{Lyìopa} \right| \left| \text{aizrezra} \text{ kianjo} \right| \left| \text{pfo} \right| \\ \left| \text{H} \right| \left| \text{p} \right| \left| \text{S} \right| \left| \text{H} \right| \left| \text{H} \right| \left| \text{p} \right| \left| \text{H} \right| \left| \text{p} \right| \end{array}$

Lyìòpà àìzrèzrà kìańjò pfó
Lioba 1-PRES-speak Kivunjo NEG

'Lioba is not speaking Kivunjo'

b. $\begin{array}{c} * \quad * \quad * \\ \left| \text{nyi} \text{ kiki} \right| \left| \text{Lyìopa} \right| \left| \text{aizrezra} \right| \\ \left| \text{H} \right| \left| \text{H} \right| \left| \text{p} \right| \left| \text{H} \right| \left| \text{p} \right| \left| \text{H} \right| \left| \text{H} \right| \left| \text{p} \right| \end{array}$

Nyì kiki Lyìòpà àìzrèzrà?
COP what Lioba 1-PRES/REL-speak

'What is Lioba speaking?'

In both (64a) and (64b) the phrasing environment of the verb is identical, yet the two forms differ. Depending on the verb tense, differences in underlying tones can also be found between main and relative forms. This would tend to suggest that the alternation is not produced by the syntax or phrasal phonology, but instead by the morphology.

Other instances of verbal H - S alternation appear to mark subtle, pragmatically based differences in meaning between verb forms. Once again, this appears to be lexically or morphologically conditioned: In the subjunctive the alternation exists in the second person singular but only the S variant is well-formed in the third person singular. Thus this morphologically determined tonal alternation points to the existence of a lexical raising rule that applies only in verb-initial position:

(65) VERB-INITIAL RAISING

H → S / [____ DOMAIN: non-relative finite verb

Finally, there are some verbs and verbal morphemes whose S never alternates with H. These may be presumed to bear an underlying S in their lexical entries. Two such items are the negative/emphatic copula ci and the preverbal focus marker, which is typically prefixed to the verb in affirmative assertions:

- (66) a.
$$\begin{array}{c} * \\ \left| \begin{array}{cc} \text{ci} & \text{numba} \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ \text{H} \end{array} \right| \\ \left| \begin{array}{cc} \text{S} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \\ \text{H} \end{array} \right| \end{array}$$

Cì nùmbà pfo
COP house NEG
'It's not a house'
- b.
$$\begin{array}{c} * \\ \left| \begin{array}{cc} \text{naleenda} & \text{kanyi} \end{array} \right| \\ \left| \begin{array}{cc} \text{S} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{H} \\ \text{p} \end{array} \right| \end{array}$$

Nàlèèndà kànyî
FOC-1-FARFAR-1-go home
'(S)he went home'

The preverbal focus marker's segmental shape is either n- or zero depending on the noun class of the subject agreement marker it precedes. It should be noted that in neither of its segmental forms does the preverbal focus marker have a syllable of its own to bear its tone before Tone Shift. After Tone Shift, its tone surfaces on the verb's initial syllable in place of the usual default L. I will argue in Appendix A that the focus morpheme is in fact not a floating tone, but rather a floating tone-bearing unit that lacks segmental material. The S tone will attach to this tone-bearing unit, as will the accent I will claim must be attached to it. However, for ease of exposition, since this does not bear critically on any of the rule orderings discussed in Chapters 2 and 3, I will simply represent the focus marker's tone as a floating S at the verb's left edge wherever it

appears in examples.

Verbal S is phonetically identical to phrasal S, and the two pattern alike when targeted by certain rules -- S Spread and S Lowering -- to be introduced in 2.4. As I will show in 3.5.5, this indicates that both types of S must be attached to accented syllables, in contrast to syllables that come to bear S tone through spreading of already existing S tones. Yet in certain other contexts, verbal and phrasal S are treated unequally, in each case verbal S behaving as if it is "stronger" than phrasal S. One of these contexts is in second position of the Rival S Configuration, to be discussed in Chapter 3. The other context is one we have already seen: u-final position. There, the u-limit rule of Demotion lowers phrasal S, but not verbal S, as attested by the SL contour on the final syllable of (67d):

- (67) a. [[Ngilèénéngà mǎnǎ]_p[kèlyá]_p]_u b. [[Ngilèwóná mǎnǎ]_p]_u
 1sg-RECPAST-give child food 1sg-RECPAST-see child
- c. [[Ngilém!lèkǎ nǎlyè kèlyá]_p]_u d. [[Ngilém!lèkǎ nǎlyè]_p]_u
 1sg-RECPAST-let eat food 1sg-RECPAST-let eat

The resistance of verbal S to Demotion, taken together with its dominant behavior in other contexts, suggests that verbal S should be lexically associated with an accent that is stronger than stem-penultimate accent. In a grid-based theory of accent, this entails a column containing two grid marks above the bottom line, in contrast to the single grid mark that has so far sufficed to represent stem-penultimate accent.

(68) a. Stem-Penultimate Accent

*
σ

b. Verb-Initial Accent

*
*
σ

We may derive the double accent needed for verbal S by following Verb-Initial Raising with a rule that assigns a grid column of two asterisks to any S-toned syllable:

(69) LEXICAL S ACCENT RULE

Assign a grid mark on line 2 to a syllable that bears S tone

This will result in a grid column with a gap, as in (70):

(70)	*..	.	..	line 2
	...	.	*	line 1
	aiazranyia			
	S	H		

Following Halle and Vergnaud (1987, p. 52), I assume a line 1 grid mark will automatically be inserted to create a continuous grid column identical to the one in (68b). The Lexical S Accent Rule may apply either in the lexicon or early in the p-level derivation, before the application of rules that make reference to both kinds of accent.

The Lexical S Accent Rule parallels rules found in quantity-sensitive stress languages whereby a lexically heavy syllable attracts stress. In Kivunjo Chaga, where tonal prominence is instead the sole reflex of accent, it is not surprising to find a rule such as this. Languages in which stress is reported to be attracted to H-toned syllables include two Pacific languages, Fore (Nicholson and Nicholson

1962) and Golin (Bunn and Bunn 1977).

With verbal S attached to a stronger degree of accent than phrasal S, we can then rewrite Demotion so that it will reduce only phrasal S to H in u-final position. This can be accomplished by transforming Demotion into a purely accentual rule:

(71) DEMOTION (final statement)

Reduce the grid column of the u-final syllable by one.

OR: Conflate tiers 1 and 2 on the u-final syllable.
(in the sense of Halle & Vergnaud 1987)

Since, as I will argue in Appendix A, tone and accent shift simultaneously, penultimate- and final-syllable accents alike will end up on the final syllable after Tone Shift, along with penultimate- and final-syllable H tones. Demotion will have the effect of reducing the double accent associated with a verbal S to a single accent, and the single accent associated with a phrasal S to nothing. Then I assume a well-formedness convention requiring accent and the feature [+raised] to be associated with one another automatically comes into effect:

(72) MATCHING CONVENTION

- a. Every accent must be attached to a [+raised] autosegment, and
- b. Every [+raised] autosegment must be attached to an accent.

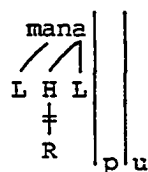
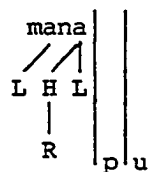
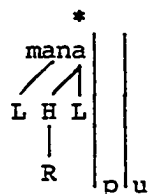
Halle & Vergnaud's (1982) convention (12d) (hereafter the "Delinking Convention") ensures that violations of this constraint be resolved by deleting an already existing feature.

(73) DELINKING CONVENTION (Halle & Vergnaud 1982, ex. 12d)

If the application of a rule results in a violation of the conditions -- either universal or language-specific -- which must be met by well-formed representations in the language in question, the violation is removed by deleting links between autosegments and core phonemes established by earlier rules or conventions.

In this case, the offending feature is the [+raised] of phrasal S, which after Demotion is no longer attached to an accented syllable. The phrasal S therefore loses its [+raised] specification, receives a [-raised] by default, and surfaces as H, while the verbal S remains S.

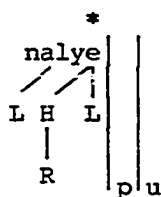
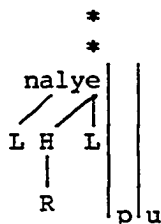
(73') a.



màná

'child'

b.



n/a

nàlye"

'he should eat'

RAISING RULES, DEFAULT,
TONE SHIFT

DEMOTION

MATCHING CONVENTION,
DELINKING CONVENTION

In 2.5.3 we will see that this accentual analysis of Demotion accounts for the lack of Demotion in the HLL penultimate-accented keyword's u-final variant. The double-accent analysis of verbal S and

the Matching Convention will also be seen to play an important role in 3.5 and 3.6.

The double-accent analysis of verbal S will, in shorter verbs, result in words whose only accent consists of two grid marks. This is an uncommon phenomenon in rhythmic stress languages, where stronger degrees of stress are normally only created by the subordination of other stresses, and would be uninterpretable as having a particular degree of strength except in the context of a weaker stress. However, the exclusively tonal realization of accent in Kivunjo may be responsible for the possibility of absolute differences in degree of accent. With a binary tone feature as accent's only reflex, there is no phonetic distinction between relative degrees of accent, only abstract differences in phonological behavior. This may make it possible to have accent of a particular degree in the absence of weaker accents in the same item. Bickmore (1989) argues for a three-way absolute distinction in degree of stress in Kinyambo, another Tanzanian Bantu language in which stress is exclusively realized as H tone. Differences in degree of stress in Kinyambo are reflected not in phonetic gradations of pitch, but in the degree of variability with which they undergo various phonological rules. Thus the present analysis of accent strength in Kivunjo, though novel and presumably uncommon, is not necessarily one which should be excluded from a theory of suprasegmental phenomena.

2.2.6. Summary of arguments for accent

In the preceding sections, I have motivated two tone raising rules, H Attachment and Final Raising, which are triggered by (a) adjacency to a p-final boundary on the tonal tier and (b) attachment to an accented syllable. H Attachment has the surface effect of raising L to H, while Final Raising raises H to S. In effect, these rules conspire to increase the tonal prominence of accented syllables near the right edge of a p-phrase.

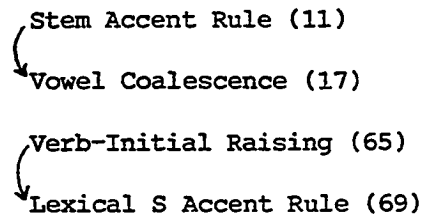
Because of underspecification, H Attachment is actually an accentual melody assignment rule. The accentual H* that it supplies must be marked as distinct from lexical H tone because H* alone undergoes a later, u-level rule of leftward H* Spread. However, before spreading, H* -- like lexical H tone -- undergoes Final Raising. This is because it, too, is attached to an accented syllable and is p-final on the tonal tier. The output of Final Raising in u-final position feeds a u-level rule of Demotion, which eliminates S tone from u-final syllables as part of a downdrift-like rule conspiracy.

In addition to S tones generated by Final Raising, S tones of lexical origin are found on the initial syllables of many verb forms. The immunity of lexical S to Demotion leads to an accentual reanalysis of Demotion, along with the assignment of a line 2 accent grid mark to lexical S syllables by the Lexical S Accent Rule. Lexical S survives because Demotion only reduces the grid column by one, "demoting" the lexical S's accent to a single grid mark, while completely eliminating the single grid mark of a phrasal S's accent. A Matching Convention requires accent to be attached to the feature [+raised] and vice

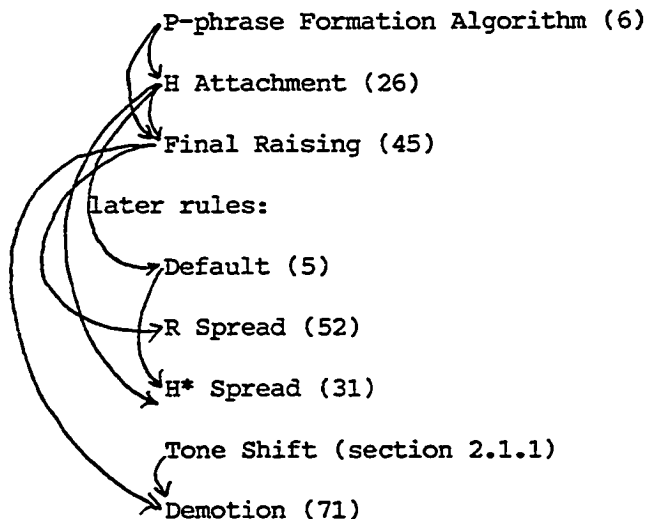
versa. Violations of the convention are resolved as per the Delinking Convention by deleting either accent or [+raised].

(74) Rule Inventory

lexical:



p-level:



Conventions:

Matching Convention (72)

Delinking Convention (73)

Both H Attachment and Final Raising make distinctions between p-final words of the same tone class but different accent type. To start with, neither rule applies to unaccented words of any tone

class. H Attachment applies to both penultimate-accented and final-accented LLL words, but with distinct results because of the different location of the accented syllable. Thus penultimate-accented LLL surfaces as !HHL, while final-accented LLL surfaces as !HHH. Final Raising applies to penultimate-accented HL words and final-accented LH and HH words, but not to penultimate-accented LH and HH words, since their final H tones are not accented. Final Raising also applies to the output of H Attachment in both penultimate- and final-accented LLL words.

This pattern could not be coherently accounted for without reference to accent. If a certain morphologically defined class of words consistently underwent the two raising rules, while another class consistently failed to undergo them, then a rule exception feature might be a simpler option than to propose the existence of both accent and tone in the same language. But the pattern observed is more complex, and defies a natural explanation with diacritic rule features.

First of all, with H Attachment it is not enough to say **whether** a word will undergo the rule; to distinguish between the penultimate-accented and final-accented types we must somehow specify **where** a word is to undergo the rule. Thus in order to predict the full three-way paradigm for H Attachment we would need to use a positive rule application feature, rather than a rule exception feature. Further, this rule application feature could not simply be attributed to an entire word or morpheme, but would have to be specified for individual syllables. Thus unaccented LLL words would have no [+H Attachment] fea-

ture, while penultimate-accented LLL words would be marked [+H Attachment] on their penults. Final-accented words would bear a [+H Attachment] specification on their final syllables. All syllables not specified positively for the feature [H Attachment] would be redundantly [-H Attachment]. A rule feature analysis of these facts would therefore have to place rule features in exactly the same locations where the analysis presented in 2.2.1 places accent.

Both rule features and accent (or stress) are diacritic features, lacking a direct phonetic correlate or realization. Yet they are not interchangeable. The various typologically motivated constraints that exist on accent and stress (cf. Hayes 1981) are not automatically available for rule features. Thus an arbitrary constraint would have to be imposed on the rule feature [H Attachment] so as to allow the positive value for that feature only on word-final and word-penultimate syllables. Furthermore, the connection between a word's morphological structure (stem length, eligibility for Vowel Coalescence) and placement of [+H Attachment] within the word would be arbitrary. A rule feature analysis would have to mimic the Stem Accent Rule given in (11), but there would be no clear reason why stem-penultimate position should be the ideal locus for a rule feature. There is no cross-linguistic basis for assuming that rule features should be restricted to domain-penultimate or final position.

In contrast, languages in which accent or stress is assigned by rule characteristically assign that feature to syllables that are a specific, limited distance from a domain's edge. If the diacritic

feature responsible for attracting H Attachment is identified as accent, we need not add to the phonology an ad hoc constraint restricting its occurrence to stem-penultimate syllables, since such a (parametrized) constraint is already available in the theory of rule-assigned accent or stress. In an accentual analysis, therefore, both the distribution of accent within words and the correlation of accent placement with morphological structure are not ad hoc, but follow from the typology of stress systems.

In addition to resembling accent in regard to its location in the word, the feature that marks syllables as targets for H Attachment also behaves like accent in that only one such feature is assigned per word, and nonlexical categories fail to receive the feature. In stress systems a word has only one primary stress, and nonlexical categories are often unstressed, or at least fail to receive primary sentence stress.

Let us now consider the patterning of tone-accent types with respect to Final Raising. For any given tone class, there are only two options: to undergo Final Raising or not to undergo the rule. Thus a simple rule exception feature attached to entire morphemes would be able to generate the correct forms. However, in such an analysis the class of forms undergoing the rule would not be a natural class: it would consist of HL words with disyllabic, non-passive stems and LH and HH words with monosyllabic or passive stems. The class of exceptions would encompass LH and HH words with disyllabic, non-passive stems, as well as non-"lexical" words, truncated nicknames, ethnonyms, etc. In order to make sense of this pattern it would be

necessary to recognize what it is that HL words with disyllabic, non-passive stems have in common with LH and HH words with monosyllabic stems. But this could only be done if the diacritic feature that triggers Final Raising is assigned to individual syllables. Allowing that, then, the class of forms undergoing the rule could be characterized as those in which the trigger feature is attached to a syllable that bears the last H tone in the p-phrase. Yet this is only a notational variant of the accentual analysis. We are therefore in the same position in regard to choosing between accent and a rule feature as we are with H Attachment, and all the arguments cited above apply equally to the Final Raising data.

Additional support for accent comes from the fact that the same feature that targets syllables for H Attachment also targets those syllables for Final Raising. Also, the constraints on the distribution of the rule feature [+H Attachment] are identical with those on the distribution of [+Final Raising]. With a rule feature analysis a redundancy rule would have to be stated to the effect that [+H Attachment] implies [+Final Raising]. Such a redundancy rule is unnecessary if both rules are triggered by the same feature, accent. In fact, across languages accent and stress are typically realized in terms of more than one phonological or phonetic phenomenon. Thus, for example, English stress correlates not only with tonal prominence, but also with syllable duration and negatively with a phonological rule of vowel reduction. The fact that the same diacritic feature in Kivunjo triggers both H Attachment and Final Raising is yet another telltale

sign that this feature is in fact accent.

The final argument for accent as the feature that triggers H Attachment and Final Raising comes from the nature of these two rules. Both have the effect of increasing the pitch prominence of the accented syllable to which they apply: H Attachment raises a L-toned or toneless accented syllable to H, and Final Raising raises a H-toned accented syllable to S. Rules such as these are precisely the kind of rule we expect an accentual language to have. Also, as was noted in section 2.2.1, because of underspecification H Attachment actually has the same form as a rule that matches intonational melody tones to accented syllables in non-tone languages.

Since stress is a relational feature, in stress systems we often encounter prominences of different relative strengths. If Kivunjo is an accentual language, then we might expect to see rules differentiating between relative degrees of accent. This is exactly what we find in the behavior of verbal and phrasal S with respect to Demotion, and will find in several other examples from Chapter 3.

The evidence for accent in Kivunjo Chaga has important implications for any theory of suprasegmental phenomena. It has generally been assumed that accent and lexical tone are, at least at any given stage in a derivation, mutually exclusive phenomena. Yet in Kivunjo accent and tone coexist and interact throughout the derivation.

The Kivunjo stem accent is assigned by a garden-variety penultimate stress rule, yet its surface realization is quite different from that of similar stress rules in stress/intonation languages such

as English. This highlights the fact that underlyingly stress is no more than an abstract property that attracts a cross-linguistic variety of rules whose unifying feature is to enhance a syllable's perceptual salience. In English, which lacks lexical tone but has intonational sentence melodies and underlying syllable weight distinctions, it is not surprising that stress should be realized by assignment of intonationally prominent tones and by syllable duration. In Chaga, however, syllable weight is not underlyingly distinctive, while intonation is handled by phrase- and utterance-final boundary tones that are represented on the same tier as lexical tones. In a limited number of lexical items we find an underlying [+raised] feature that transforms a H tone into a S. It is therefore not surprising that Kivunjo accentual phenomena revolve around the attachment of phrase-final tone features rather than intonational melodies, that lexical tones have a potential blocking effect on adjacency, and that [+raised] should be exploited as a marker of accentual prominence.

2.3. P-level evidence for underspecification

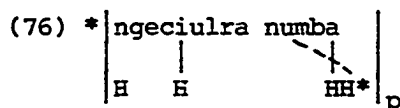
The p-level rules discussed in section 2.2 provide evidence not only for accent, but also for underspecification. Throughout the presentation of these rules in 2.2 I assumed without argument that tone is underspecified at the p-level in Kivunjo. In the present section I will show why this is so, basing my claim on the fact that L tone is essentially invisible to the two p-level raising rules H Attachment and Final Raising.

2.3.1. H Attachment

The first argument in favor of underspecification comes from the fact that H Attachment applies to a penultimate toneless accented syllable if the final syllable is also toneless, as in (75a), but fails to apply if the final syllable bears H tone, as in (75b).

(75) a. $\left| \begin{array}{c} \text{ngeciulra nyama} \\ | \\ \text{H H} \end{array} \right|_p$	b. $\left| \begin{array}{c} \text{ngeciulra numba} \\ | \\ \text{H H H} \end{array} \right|_p$	
$\left| \begin{array}{c} \text{ngeciulra nyama} \\ | \\ \text{H H H}^* \end{array} \right|_p$	(inapplicable -- H intervenes between accent and boundary)	H ATTACHMENT
ngěciú ⁱ lrá nyámâ	ngěciúl ^{rà} nùmbă	FINAL RAISING, DEFAULT, TONE SHIFT, DEMOTION
'I'll buy meat'	'I'll buy a house'	

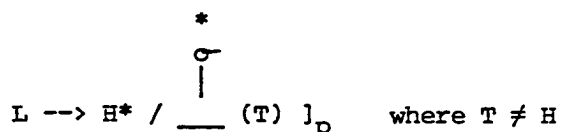
This is because the inserted tone must be adjacent to the p-phrase boundary on the tonal tier, in which case it would lie to the right of the linked H of numba (as illustrated in (76)), and would be unable to link to the accented penult without crossing an association line.



In (75a) the final L-toned syllable intervening between the accent and the phrase boundary in nyama fails to block attachment of the H⁺, which is precisely what we expect if L tones are not present at the time H Attachment applies.

If L tones were specified at this stage of the derivation, the statement of the environment for H Attachment would have to be more complex, and in fact would represent a negative environment:

(77) H ATTACHMENT (without underspecification)



Although (77) could be stated with an optional L tone between the target and the p-phrase boundary instead of the variable T plus a negative condition, I use this formalism to highlight the fact that the reason for including a reference to any tone in that position at all is to exclude the case in which a H intervenes. Such reference is unnecessary in an underspecified context.

In addition to placing what is in effect a negative constraint on a following tone, the rule in (77) also must place the following tone in parentheses to indicate that its presence is optional and does not serve to trigger the rule. In effect, what parenthesis notation indicates here is that the presence of a L tone between the target and the

trigger (the p-boundary) is irrelevant to the rule -- that the L tone is functionally equivalent to the absence of any tone. It is precisely this fact that underspecification captures notationally.

In general, though, it is no longer clear that parentheses are a desirable part of the inventory of devices phonology should have recourse to in rule formulation. The use of parentheses to indicate disjunctive ordering of subcases of stress rules has been eliminated by metrical theory. Moreover, the use of parentheses to indicate irrelevant material that may intervene between rule targets and their triggers is now being replaced by underspecification. This makes possible stronger claims about locality of rule application, such as Archangeli & Pulleyblank's (1986) Locality Condition and Cole's (1987) Adjacency Constraint, both of which require that target and trigger be adjacent on some tier for a phonological rule to be well-formed. Thus in the present analysis underspecification allows us (1) to reject the unwieldy statement of H Attachment in (77) above and (2) to avoid violating locality constraints on rule application with this rule.

2.3.2. Final Raising

The argument for underspecification from Final Raising resembles that based on H Attachment. Just as underspecification allows H Attachment to be stated such that target and trigger are adjacent on the tonal tier, it likewise allows Final Raising to be stated in this manner. Recall that in 2.2.2 we saw that Final Raising raises a H attached to an accented p-phrase-penultimate syllable only if the p-final syllable separating it from the p-boundary is toneless. Thus

the penultimate, accented H of mburu raises while that of nguku does not, as shown again in (78):

(78) Sentence frame: Ngawona ____ inu 'I saw a ____ today'

a. ...mburu | inu | | | | H p | H p	b. ...nguku | inu | | | | H H | H p	
* ...mburu | inu | | | | S p | H p	n/a -- H tone intervenes	FINAL RAISING
Ngá'wóná mbúru ínû 'I saw a goat today'	Ngá'wóná ngúkú ínû 'I saw a chicken today'	DEFAULT, TONE SHIFT

The difference between these two cases, assuming underspecification, is that the penultimate H of mburu is p-final on the tonal tier, while that of nguku is not. In this way, Final Raising treats L tone differently from H tone. For purposes of adjacency between its target (the H tone) and its trigger (the p-boundary), Final Raising treats L tone as if it is absent, but treats H tone as a barrier to adjacency.

If tone were fully specified at the p-level, Final Raising would have to be written with a parenthesized L tone, as in (79):

(79) FINAL RAISING (without underspecification)

$$\begin{array}{c}
 * \\
 \sigma \\
 | \\
 H \rightarrow S / \text{---} (L)]_p
 \end{array}$$

As with the fully specified version of H Attachment, this rule formulation is less desirable than that needed for underspecified represen-

tations in that it entails an effectively negative condition, and uses parentheses needlessly, rendering target and trigger non-adjacent on both the segmental and tonal tiers.

2.3.3. Summary of arguments for underspecification

In summary, I have presented evidence which strongly suggests that L tone is absent at the p-level: The two raising rules H Attachment and Final Raising show that L is transparent between a rule's target and its trigger, while H is not, preventing needed adjacency between target and trigger. The alternative to underspecification would be less constrained rule formulations which use parentheses to allow optional, transparent segments to intervene between target and trigger. These rule formulations would violate the commonly accepted notion that phonological rules are local, requiring adjacency between target and trigger.

2.4. P-level rules fed by Final Raising: S Spread, S Lowering, Flop

In sections 2.2 and 2.3 I focused on rules and data that are crucial to motivating accent and underspecification. In the present section I introduce the other p-level rules that are needed to derive the full paradigm of sandhi variants given in examples (21-24). Several of these rules will play a crucial role in the arguments for cyclicity to be presented in Chapter 3.

2.4.1. S Spread

In each of the examples given in sections 2.2.2-3 for Final Raising, the H that raises to S is followed by a H tone exactly two syllables away. If instead there is no H tone on the second syllable following, the S spreads one syllable rightward. This is the case in (80a-e), where the adverb following each keyword in the next p-phrase begins with two toneless syllables (recall that Kivunjo lacks heavy syllables, hence the adverb ukou in (80) is trisyllabic). For comparison, I repeat the corresponding non-spreading examples in (80f-j) alongside (80a-e) in the right-hand column.

(80) Sentence frame: Ngeciwona ____ inu 'I'll see (a) ____ today'
 ngama 'tomorrow'
 Nqilewona ukou 'I saw yesterday'

Spreading

No Spreading

a. ...mburu | ngama |
 H H
 p p

*

f. ...mburu	inu
H	H
p	p

*
...mburu | ngama |
| S | H |
p p

*

...mburu	inu
S	H
p	p

FINAL
RAISING

*
...mburu | ngama |
S | H |
p p

n/a

S SPREAD

Ngēcìwóná mbùru ngamá

Ngēcìwóná mbùrú ìnú

DEFAULT,
TONE SHIFT

'I saw a goat yesterday'

'I'll see a goat today'

b. ...uku^{*} | ukou |
 | | |
 H p H p

*

g. ...uku | ngama |

H | H |

p | p |

$$\begin{array}{cc} & * \\ \dots & \text{uku} \left| \begin{array}{c} \text{S} \\ \text{p} \end{array} \right| \quad \left| \begin{array}{c} \text{ukou} \\ \text{H} \\ \text{p} \end{array} \right| \end{array}$$
$$\begin{array}{ccccc} & & * & & \\ \dots & \text{uku} & | & | & \text{ngama} & | \\ & | & & & | & \\ & S & | & p & H & | \\ & & & & & p \end{array}$$

FINAL
RAISING

*
...uku | ukou |
| |
S | H |
p | p |

n/a

S SPREAD

Ngilèwóná ùkù ["]ukou["]

Ngècìwóná ùkù ngámá

DEFAULT,
TONE SHIFT

'I saw firewood
yesterday'

'I'll see firewood tomorrow'

SpreadingNo Spreading

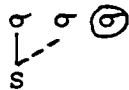
<p>c. ...Ndelya-ngo</p> <p style="text-align: center;">* H H p</p> <p style="text-align: center;">ukou</p> <p style="text-align: center;">H p</p>	<p>h. ...Ndelya-ngo</p> <p style="text-align: center;">* H H p</p> <p style="text-align: center;">ngama</p> <p style="text-align: center;">H p</p>	
<p>...Ndelya-ngo</p> <p style="text-align: center;">* H S p</p> <p style="text-align: center;">ukou</p> <p style="text-align: center;">H p</p>	<p>...Ndelya-ngo</p> <p style="text-align: center;">* H S p</p> <p style="text-align: center;">ngama</p> <p style="text-align: center;">H p</p>	FINAL RAISING
<p>...Ndelya-ngo</p> <p style="text-align: center;">* H S p</p> <p style="text-align: center;">ukou</p> <p style="text-align: center;">H p</p>	n/a	S SPREAD
<p>Ngilèwóná Ndèlyà-ngo "ukou"</p> <p>'I saw Ndelya-ngo yesterday'</p>	<p>Ngeciwóná Ndèlyà-ngo ngamã</p> <p>'I'll see Ndelya-ngo tomorrow'</p>	OTHER RULES
<p>d. ...wona msulri</p> <p style="text-align: center;">* H p</p> <p style="text-align: center;">ngama</p> <p style="text-align: center;">H p</p>	<p>i. ...wona msulri</p> <p style="text-align: center;">* H p</p> <p style="text-align: center;">inu</p> <p style="text-align: center;">H p</p>	
<p>...wona msulri</p> <p style="text-align: center;">* H S* p</p> <p style="text-align: center;">ngama</p> <p style="text-align: center;">H p</p>	<p>...wona msulri</p> <p style="text-align: center;">* H S* p</p> <p style="text-align: center;">inu</p> <p style="text-align: center;">H p</p>	H ATTACHMENT, FINAL RAISING
<p>...wona msulri</p> <p style="text-align: center;">* H S* p</p> <p style="text-align: center;">ngama</p> <p style="text-align: center;">H p</p>	n/a	S SPREAD
<p>Ngilèwóná "msulri" ngamã</p> <p>'I saw a nobleman yesterday'</p>	<p>Ngeciwóná "msulri" inû</p> <p>'I'll see a nobleman today'</p>	OTHER RULES

SpreadingNo Spreading

e. ...wona mkipfi | ukou |	j. ...wona mkipfi | ngama |	
H | p | H | p	H | p | H | p	
...	...	
...wona mkipfi | ukou |	...wona mkipfi | ngama |	H ATTACH. & FINAL RAISING
H | S* | p | H | p	H | S* | p | H | p	
...	...	
...wona mkipfi | ukou |	n/a	S SPREAD
H | S* | p | H | p		
Ngilèwóná 'mkipfi ukou	Ngèciwóná 'mkipfi ngamã	OTHER RULES
'I saw a big wasp yesterday'	'I'll see a big wasp tomorrow'	

We can account for this spreading with a rule of S Spread, which is blocked by the presence of a H two syllables away:

(81) S SPREAD



As written, the rule requires the second syllable following the S to be toneless. However, it places no such requirements on the immediately following syllable. In each example in (80), the syllable right after the S is toneless, but need not be. If a H syllable follows immediately, as in (82), the S still spreads, delinking the H by a convention prohibiting contour tones on non-final syllables (cf. Clark's (1983) discussion of the distribution of contour tones in Kikuyu and Igbo). Since floating H lacks a phonetic interpretation in

Kivunjo, we may assume it deletes automatically after being delinked.

(82) Sentence frame: **Ngiwonyi** ___ **inu** 'I see ___ now'

a. ...uku		ulalu		
b. ...Ndelya-ngo		ulalu		
...uku		ulalu		FINAL RAISING
...Ndelya-ngo		ulalu		
...uku		ulalu		S SPREAD
...Ndelya-ngo		ulalu		
Ngi'wónyí úkù "ulalŭ	Ngi'wónyí Ndélyà-ngo "ulalŭ			OTHER RULES
'I see a piece of firewood now'	'I see Ndelya-ngo now'			
c. |ngiwonyi mkipfi|		ulalu		
|ngiwonyi mkipfi|		ulalu		H ATTACHMENT, FINAL RAISING
|ngiwonyi mkipfi|		ulalu		S SPREAD
Ngi'wónyí m'kipfi "ulalŭ				OTHER RULES
'I see a big, ugly wasp now'				

Since S Spread places a condition on the second syllable following the S, a configuration in which there is no second syllable -- toneless or otherwise -- fails to undergo S Spread. Thus when the penultimate H

of mburu raises in u-final position, the resultant S does not spread to the u-final toneless syllable, since no syllable follows the u-final syllable to satisfy the structural description of S Spread.

The requirement that S Spread imposes on the second syllable following the S might seem to violate the locality condition invoked in the discussion of underspecification in section 2.3. However, on the segmental tier the rule's target is not the S's original syllable, but rather the syllable to which it spreads: the one that immediately follows the S. The required toneless syllable is therefore adjacent to the target of S Spread on the segmental tier. Similar spreading rules that require the second syllable following the source of spreading to be toneless may be found in Kenyang, a Cameroonian Bantu language (Odden 1988), and in the Sanskrit enclitic or dependent circumflex accent (Whitney 1889:85-86).

2.4.2. S Lowering and Flop

We have thus far seen that S Spread applies to a S that is followed by either HL or LL, and that it fails to apply when followed by LH or just by L. However, if it is followed by HH, the S not only fails to spread, but it also lowers to H!. In other words, it lowers to H, whereupon a downstep, or floating L tone, is inserted between it and the next H to preserve a difference in pitch level.

(83) Sentence frame: Ngawona ____ nguzrunyi 'I saw ____ in the forest'

<p>a. ...uku | nguzrunyi |</p> <p style="text-align: center;">H | H H |</p> <p style="text-align: center;">p | p</p>	<p>b. ...Ndelya-ngo | nguzrunyi |</p> <p style="text-align: center;">H H | H H |</p> <p style="text-align: center;">p | p</p>	
<p>...uku | nguzrunyi |</p> <p style="text-align: center;">S | H H |</p> <p style="text-align: center;">p | p</p> <p style="text-align: center;">n/a</p>	<p>...Ndelya-ngo | nguzrunyi |</p> <p style="text-align: center;">H S | H H |</p> <p style="text-align: center;">p | p</p> <p style="text-align: center;">n/a</p>	<p>FINAL RAISING</p> <p>S SPREAD</p>
<p>...uku | nguzrunyi |</p> <p style="text-align: center;">H | L H H |</p> <p style="text-align: center;">p | p</p>	<p>...Ndelya-ngo | nguzrunyi |</p> <p style="text-align: center;">H H | L H H |</p> <p style="text-align: center;">p | p</p>	<p>S LOW- ERING</p>
<p>Ngá'wóná úkù ngú'zrúnyî</p> <p>'I saw firewood in the forest'</p>	<p>Ngá'wóná Ndélyà-ngó ngú'zrúnyî</p> <p>'I saw Ndelya-ngo in the forest'</p>	<p>DEFAULT, TONE SHIFT</p>

<p>c. | ngawona mkipfi | nguzrunyi |</p> <p style="text-align: center;">| HLH H H | H H |</p> <p style="text-align: center;">p | p</p>		
<p>| ngawona mkipfi | nguzrunyi |</p> <p style="text-align: center;">| HLH H H | S* | H H |</p> <p style="text-align: center;">p | p</p> <p style="text-align: center;">n/a</p>		<p>H ATTACHMENT, FINAL RAISING</p> <p>S SPREAD</p>
<p>| ngawona mkipfi | nguzrunyi |</p> <p style="text-align: center;">| HLH H H | H* | L H H |</p> <p style="text-align: center;">p | p</p> <p style="text-align: center;">Ngá'wóná m'kípfi ngú'zrúnyî</p>		<p>S LOWERING</p> <p>OTHER RULES</p>
<p>'I saw a big, ugly wasp in the forest'</p>		

This can be accomplished by a rule of S Lowering, given in (84):

(84) S LOWERING

$$S \rightarrow H \textcircled{L} / \begin{array}{c} \sigma \\ | \\ \text{---} \end{array} \begin{array}{c} \sigma \\ | \\ H \end{array}$$

The introduction of a floating L tone by S Lowering has implications for underspecification and the point at which Default applies. I will address those implications in section 2.4.3.

S Lowering, as written in (84), has a single following H tone for its trigger. This is because the rule also applies when only one syllable follows in the utterance and that syllable bears H tone. Such a case arises in (85) below when the absence of a second following syllable has prevented S Spread from applying.

(85) Sentence frame: **Nalewona** ___ pfo '(S)he saw ___ there'

$$\begin{array}{c} * \\ \text{a. } \dots \text{Ndelya-ngo} \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ p \end{array} \right| \end{array}$$

$$\begin{array}{c} * \\ \dots \text{Ndelya-ngo} \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ S \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ p \end{array} \right| \end{array}$$

FINAL RAISING

n/a -- no second following syllable

S SPREAD

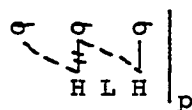
$$\begin{array}{c} * \\ \dots \text{Ndelya-ngo} \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \text{pfo} \\ | \\ L \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ H \end{array} \right| \left| \begin{array}{c} \sigma \\ | \\ p \end{array} \right| \end{array}$$

S LOWERING

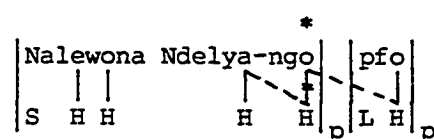
An additional rule, Flop, is fed by the output of S Lowering just in case the sequence H!H occupies the last two syllables of a p-phrase, a condition that is met here. With the application of Flop, given in preliminary form in (86), we derive the surface forms in (87). Further discussion of Flop appears in 3.5, 3.7 and Appendix A. I treat

its interaction with Default in section 2.4.3. Essentially, what this rule does is to flop each H of a p-final H!H sequence one syllable backward, while retaining the original association line of the second H tone. It has the effect of preventing a H!H contour from surfacing on the u-final syllable in (87).

(86) FLOP (first approximation)



(87)



FLOP

"Nalèwóná Ndèlyà-ngó 'pfó

TONE SHIFT, DEFAULT

*"Nalèwóná Ndèlyà-ngó pfó!'

'(S)he saw Ndelya-ngo there/here'

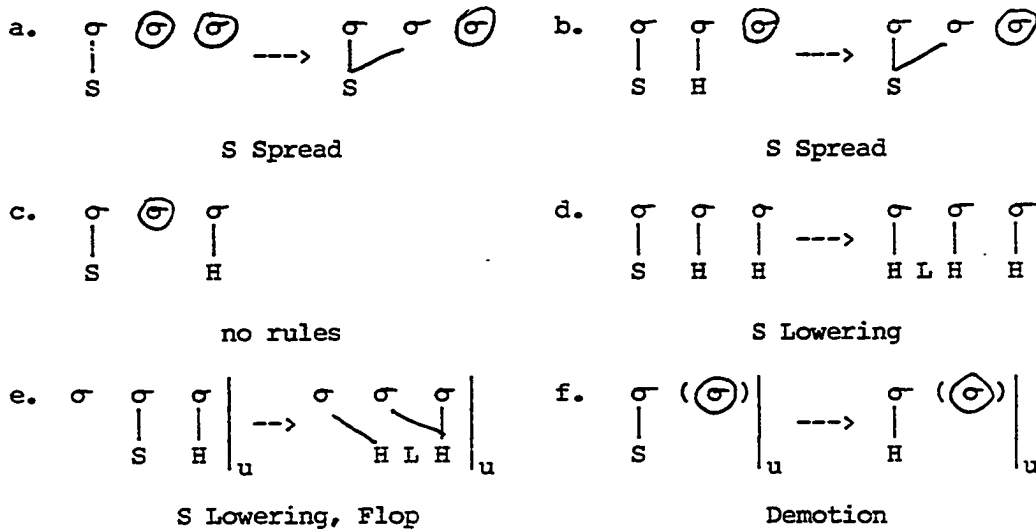
Since S Lowering applies even though only one syllable follows the S in the derivation shown in (85) and (87), S Lowering must not place any conditions on the second syllable following the S. As a result, it crucially follows S Spread, since if it preceded it would be expected to erroneously apply to the forms in (82), bleeding S Spread. Such a hypothetical scenario is depicted in example (88).

(88) Sentence frame: Ngeciwona ___ inu 'I'll see ___ today'

a. ...uku	inu	
H	H	
p	p	
...	...	
S	H	
p	p	
...	...	
H	LH	
p	p	
n/a -- no superhigh		
*Ngeciwóná ùkù í'nú	*Ngeciwóná Ndèlyà-ngó í'nú	DEFAULT, TONE SHIFT
'I'll see a piece of firewood today'	'I'll see Ndelya-ngo today'	

To summarize, there are six basic tonal contexts in which a S tone may be found (excluding other S tones, which will be discussed in section 3.1.1). These are represented in (89), along with the rules that apply in each context.

(89) S Spread/S Lowering/Flop paradigm



2.4.3. S Lowering, Flop and the ordering of Default

In an effort to avoid surreptitiously introducing ternary feature distinctions through underspecification, Pulleyblank (1983) has maintained that no rule should refer to an unmarked feature value in its structural description before that value has been supplied by Default. He has further suggested constraining the theory so that Default rules may only apply at the beginning or end of a component. Data from Kivunjo appear not to contradict the first claim, but call the second into question.

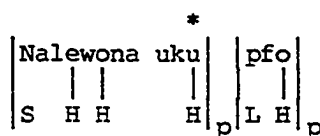
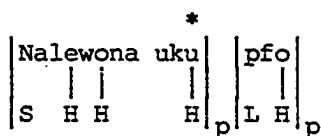
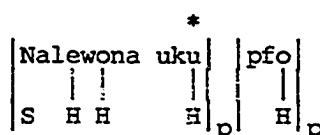
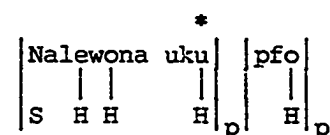
In Kivunjo, L must be underspecified at the beginning of the p-level component in order for H Attachment and Final Raising to apply properly, yet before the end of the p-level we already find a rule that introduces a specified L: S Lowering. Worse yet, another p-level rule -- Flop -- not only refers to L in its structural description, but in fact must apply to a fully specified tonal representation. In

example (87) above we saw Flop shift the H before the downstep onto a preceding H-toned syllable, vacuously producing a H tone. However, when that same H flops backward onto a L-toned syllable, the result is not a H tone, as would be expected if L were unspecified (90a), but a rising tone, as in (90b):

(90) Sentence frame: Nalewona ____ pfo '(S)he saw a ____ there'

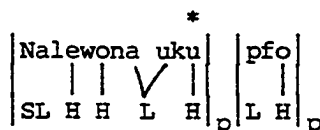
a. Underspecified:

b. Specified:

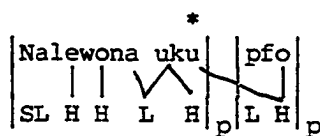
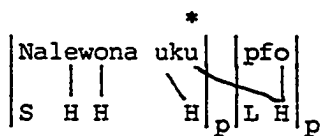


FINAL RAISING,
S LOWERING

n/a



DEFAULT



FLOP

*Nalèwóná ùkú 'pfo

Nalèwóná ùkú 'pfo

TONE SHIFT

The fact that a rising tone results when a H! flops onto a L-toned syllable indicates that at this point in the derivation L tone is represented on an equal footing with H tone. This is exactly what we expect to happen if L tone is specified when Flop applies.

These facts are consistent with the notion that rules should not refer to a default feature value in its structural description before that value has been supplied to all syllables unspecified for that

feature. While S Lowering introduces a floating L tone, it does not require one to be present in its structural description, and so need not follow Default. Flop, however, requires the presence of a floating L in order to apply, and by Pulleyblank's first criterion should follow Default. That Flop indeed follows Default is shown by the independent fact that Flop's output interacts with L-toned syllables as if they bear specified tone. Thus we find confirmation of Pulleyblank's first proposal regarding Default.

Pulleyblank's second claim -- that Default rules may only apply between components -- is not supported by the Kivunjo facts. Flop is, as we will see in 3.5, 3.7 and Appendix A, demonstrably a p-level rule, yet it clearly must follow Default. The motivation for Pulleyblank's proposal is to grant Default special status as an automatic convention rather than a language-specific, extrinsically ordered rule. While the restriction of Default to transitions between components is too strong, in the interest of preserving the spirit of Pulleyblank's proposal I suggest a different way of constraining the timing of Default:

(91) DEFAULT TIMING CONVENTION

The application of the first rule to insert the default value for a given feature triggers the automatic application of that feature's Default rule throughout the current domain at that point in the derivation.

By this convention, Default L will be supplied throughout the current domain of rule application in time for Flop to apply. The cross-linguistic applicability of The Default Timing Convention is a subject

for further study.

2.4.4. Direction of iteration

As formulated in (81) above, S Spread might be expected to iterate, reapplying to its own output until it has spread rightward to within two syllables of a H tone or the end of the utterance. This is, however, not the case:

(92)

FINAL
RAISING

S SPREAD

DEFAULT,
TONE SHIFT

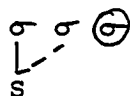
S SPREAD (if left-
to-right iterative)

TONE SHIFT, DEFAULT

The incorrect derivation in (92) presumes that the direction of iteration for S Spread is from left to right. Yet, as I will show in Chapter 3, S Spread in fact iterates from right to left when it has multiple adjacent targets to choose from. Since S Spread is a rightward spreading rule, right-to-left iteration will suffice to prevent

it from applying to its own output. I restate the rule with reference to direction of iteration in (93):

(93) S SPREAD



(right-to-left iterative)

In its direction of iteration, S Spread patterns with the language's other spreading rule, H* Spread, which I restate in (94) below. But since H* Spread is a leftward spreading rule, the result of its right-to-left iteration is that it maximally reapplies to its own output.

(94) H* SPREAD (repeated from (31))



(right-to-left iterative)

It is possible that the direction in which S Spread and H* Spread iterate need not be mentioned specifically in their statements, since the direction of iteration for p-level and u-level spreading rules is uniformly right to left.

2.4.5. Interaction of S Spread with H Attachment and H* Spread

We have seen that H Attachment feeds S Spread through the intermediate step of Final Raising. It is also the case that H Attachment bleeds S Spread. Since it adds a H* tone to a previously toneless syllable, and is ordered before S Spread for independent reasons, we should expect it to bleed S Spread of its input if it applies to the second syllable following a S tone. This happens when

we put a LLL penultimate-accented word such as maembe 'mangoes' after a H-final final-accented word such as Ndelya-ngo across a p-boundary:

(95)	$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \quad \text{p} \quad \text{p} \end{array}$	
	$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \quad \text{p} \quad \text{H}^* \quad \text{p} \end{array}$	H ATTACHMENT
	$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \quad \text{p} \quad \text{S}^* \quad \text{p} \end{array}$	FINAL RAISING
n/a		S SPREAD
	$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \quad \text{maembe} \\ \text{S} \quad \text{L} \quad \text{HH} \quad \text{L} \quad \text{H} \quad \text{S} \quad \text{p} \quad \text{LS}^* \quad \text{L} \quad \text{p} \end{array}$	DEFAULT, H* SPREAD
Ngilèénéngà Ndèlyà-ngo ma'émbe		OTHER RULES
'I gave Ndelya-ngo mangoes'		

If, however, we move the initial S one syllable back, H Attachment does not interfere with S Spread, since it does not attach to the second syllable following the initial S.

(96)	$\begin{array}{c} * \qquad \qquad * \\ \text{Ngileenenga mburu} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{H} \quad | \quad | \quad \text{p} \quad \text{p} \end{array}$	
	$\begin{array}{c} * \qquad \qquad * \\ \text{Ngileenenga mburu} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{H} \quad | \quad | \quad \text{p} \quad \text{H}^* \quad \text{p} \end{array}$	H ATTACHMENT
	$\begin{array}{c} * \qquad \qquad * \\ \text{Ngileenenga mburu} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{S} \quad | \quad | \quad \text{p} \quad \text{S}^* \quad \text{p} \end{array}$	FINAL RAISING
	$\begin{array}{c} * \qquad \qquad * \\ \text{Ngileenenga mburu} \quad \text{maembe} \\ \text{S} \quad \text{HH} \quad \text{S} \quad | \quad | \quad \text{p} \quad \text{S}^* \quad \text{p} \end{array}$	S SPREAD
	$\begin{array}{c} * \qquad \qquad * \\ \text{Ngileenenga mburu} \quad \text{maembe} \\ \text{S} \quad \text{L} \quad \text{HH} \quad \text{L} \quad \text{S} \quad | \quad | \quad \text{p} \quad \text{LS}^* \quad \text{L} \quad \text{p} \end{array}$	DEFAULT, H* SPREAD
	Ngilèénéngà mbùrù mā'émbé	OTHER RULES
	'I gave the goat mangoes'	

Note that in (95) and (96) H* Spread, unlike H Attachment must follow S Spread. This is because in (96) S Spread bleeds H* Spread of part of its input -- the final syllable of mburu -- by spreading rightward onto a toneless syllable that would otherwise be fair game for H* Spread. This is an empirical reason for not collapsing H Attachment and H* Spread into a single rule.

2.5. Accent Retraction

2.5.1. Completing the tone-accent-phrasing paradigm

At this point we have covered all but four members of the tone-accent paradigm in (21-24). Sections 2.2.1 and 2.2.4 accounted for the u-final variants of the three LLL keywords, while their junctural variants were derived in section 2.2.3. Section 2.2.2 covered the penultimate-accented and unaccented HL keywords and all six H-final keywords in junctural position, 2.2.4 derived their u-final variants, and 2.4.1 accounted for the phonologically conditioned spreading and lowering of S tone in their junctural variants. This is schematized in (97-98) below. Rules that apply only in certain tonal contexts appear in parentheses.

(97) U-final position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising Demotion	H Attachment Final Raising Demotion	no rules
HLL			
HL	Final Raising Demotion		no rules
LH	no rules	Final Raising Demotion	no rules
HH	no rules	Final Raising Demotion	no rules

(98) Junctural position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising (S Spread)	H Attachment Final Raising (S Spread/Lowering) (Flop)	no rules
HLL			
HL	Final Raising (S Spread)		no rules
LH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules
HH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules

The lacunae in our coverage of the paradigm are the three HLL keywords and the final-accented HL keyword. These are the subject of the present section.

I begin with the HLL final-accented keyword Ndewikio 'Blessed One' and the HLL unaccented keyword muolrombo 'person from Rombo', which behave unremarkably. Ndewikio receives final accent by virtue of its passive suffix, and muolrombo loses its accent because it is an ethnonym. The accented final toneless syllable of Ndewikio receives a tone by H Attachment, and after undergoing Final Raising and Demotion, surfaces with !H tone in u-final position. Unaccented muolrombo remains unchanged.

(99) a.	Nde	| wiki-u-a |		b.	| olrombo |		
		| H |	stem		| H |	stem	
		*			*		
	Nde	| wiki-u-a |			| olrombo |		STEM ACCENT RULE
		| H |	stem		| H |	stem	
		*					
	Nde	| wiki-o |					VOWEL COALESCENCE
		| H |	stem				
				mu	| olrombo |		ETHNONYM DERIVATION, DEACCENTING
					| H |	stem	
		*			*		
	| ngilewona Ndewikio |			| ngilewona muolrombo |			LEXICAL INSERTION, P-PHASE FORMATION
	| S H H H |	p		| S H H H |	p		
		*		n/a -- no accent			H ATTACHMENT, FINAL RAISING
	| ngilewona Ndewikio |						
	| S H H H S* |	p					
	" Ngilèwóná Ndèwìkí'ó			" Ngilèwóná mùòlrómbò			OTHER RULES, DEMOTION
	'I saw Ndewikio'			'I saw a person from Rombo'			

STEM ACCENT
RULE

VOWEL
COALESCENCE

ETHNONYM DERI-
VATION,
DEACCENTING

LEXICAL INSER-
TION, P-PHRASE
FORMATION

H ATTACHMENT,
FINAL RAISING

OTHER RULES,
DEMOTION

In junctural position, Ndewikio's inserted H* undergoes Final Raising, but not Demotion, and so surfaces with a final S tone, as shown in example (100). Muolrombo still undergoes no change.

(100) Sentence frame: **Ngeciwona** ____ **ngama** 'I'll see ____ tomorrow'

*		
a. ...Ndewikio	| ngama |	b. ...muolrombo | ngama |
H	p	H
H	p	H
*		
...Ndewikio	| ngama |	n/a -- no accent
H	S*	H
H	p	H
H	p	H
		H ATTACHMENT & FINAL RAISING
Ngeciwóná Ndèwìki'ò ngamǎ		OTHER RULES
'I'll see Ndewikio tomorrow'		
'I'll see a person from Rombo tomorrow'		

If the second syllable after Ndewikio's final syllable is toneless, S Spread applies, predictably:

(101) Sentence frame: **Ngilewona** ____ **ukou** 'I saw ____ yesterday '
Ngawona ____ **inu** today

*		
a. ...ndewikio	| ukou |	b. ...ndewikio | inu |
H	p	H
H	p	H
*		
...ndewikio	| ukou |	...ndewikio | inu |
H	S*	H
H	p	H
H	p	H
		H ATTACHMENT, FINAL RAISING
*		
...ndewikio	| ukou |	...ndewikio | inu |
H	S*	H
H	p	H
H	p	H
		S SPREAD
Ngilèwóná Ndèwìki'ò "ukou"Y		OTHER RULES
Ngá'wóná Ndèwìki'ò "inu"~		
'I saw Ndewikio yesterday' 'I saw Ndewikio today'		

Thus Ndewikio and muolrombo can be handled by our existing set of rules with no additional machinery. The same is not true, however, of the penultimate-accented HLL and final-accented HL members of the

paradigm, which are discussed in the next section.

2.5.2. Two exceptions: evidence for Accent Retraction

The two remaining items in the paradigm, penultimate-accented HLL leeri 'money' and final-accented HL Ndemino 'Despised One', do not behave as the rules presented so far might predict. To begin with, the H of Ndemino should not be expected to raise in junctural position, since it is not attached to an accented syllable. Yet it does raise, as seen in (102).

(102) Nde|min-u-a|
 | |
 H |
 |stem

 *
 Nde|min-u-a|
 | |
 H |
 |stem

STEM ACCENT RULE

 *
 Nde|min-o|
 | |
 H |
 |stem

VOWEL COALESCENCE

 *
ngeciwona Ndemino	inu		
S H H H	p	H	p

LEXICAL INSERTION,
P-PHRASE CONSTRUCTION

 *
ngeciwona Ndemino	inu		
S H H S	p	H	p

FINAL RAISING

"Ngeciwóná Ndèmino" inû

DEFAULT, TONE SHIFT

'I will see Ndemino today'

Similarly, the H of leeri should not be expected to raise juncturally because it, too, is attached to an unaccented syllable. Yet it also

becomes S. Further, the resultant S surfaces as such not only in junctural position, but also in u-final position, as shown in (103) below. Thus it appears to undergo Final Raising, but not Demotion. This is odd, because up until now we have seen that Demotion always reduces stem-penultimate accent to zero in u-final position, thereby causing S to lower to H.

(103) a. $\begin{array}{c} * \\ \text{Ngawona leeri} \\ \text{HLH H H H} \\ \text{p} \end{array}$	b. $\begin{array}{c} * \\ \text{Ngawona leeri} \mid \text{inu} \\ \text{HLH H H H} \mid \text{H} \\ \text{p} \mid \text{p} \end{array}$	
$\begin{array}{c} * \\ \text{Ngawona leeri} \\ \text{HLH H H S} \\ \text{p} \end{array}$	$\begin{array}{c} * \\ \text{Ngawona leeri} \mid \text{inu} \\ \text{HLH H H S} \mid \text{H} \\ \text{p} \mid \text{p} \end{array}$	FINAL RAISING
$\begin{array}{c} * \\ \text{Ngawona leeri} \\ \text{HLH H H S} \\ \text{p} \end{array}$	$\begin{array}{c} * \\ \text{Ngawona leeri} \mid \text{inu} \\ \text{HLH H H S} \mid \text{H} \\ \text{p} \mid \text{p} \end{array}$	S SPREAD
n/a	n/a -- not u-final	DEMOTION
Ngá'wóná léeri'	Ngá'wóná léeri' inû	DEFAULT, TONE SHIFT
'I saw money'	'I saw money today'	

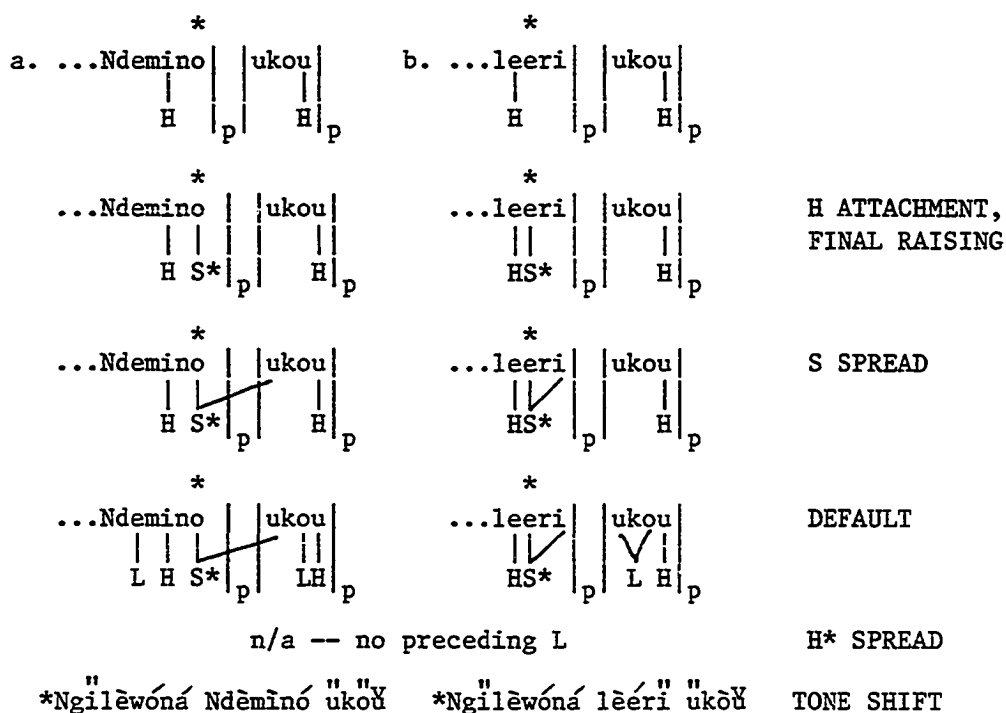
Since leeri's H is word-antepenultimate, it is always followed by two toneless syllables, and so Final Raising always feeds S Spread in leeri, regardless of the tones of the following word.

The other peculiarity about the Ndemino and leeri word classes is that their accented toneless syllables fail to receive a tone by H Attachment. If instead they received a H* tone, we would expect the incorrect derivations shown in (104) for u-final position.

(104) a. $\begin{array}{c} | \text{Ngilewona Ndemin}^* \text{o} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} | \\ | \text{p} \end{array}$	b. $\begin{array}{c} | \text{Ngawona leeri}^* | \\ | \text{HLH} \quad \text{H} \quad \text{H} \quad \text{H} | \\ | \text{p} \end{array}$	
$\begin{array}{c} | \text{Ngilewona Ndemin}^* \text{o} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} \quad \text{S}^* | \\ | \text{p} \end{array}$	$\begin{array}{c} | \text{Ngawona leeri}^* | \\ | \text{HLH} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{S}^* | \\ | \text{p} \end{array}$	H ATTACHMENT, FINAL RAISING
$\begin{array}{c} | \text{Ngilewona Ndemin}^* \text{o} | \\ | \text{S} \quad \text{L} \quad \text{H} \quad \text{H} \quad \text{L} \quad \text{H} \quad \text{S}^* | \\ | \text{p} \end{array}$	$\begin{array}{c} | \text{Ngawona leeri}^* | \\ | \text{HLH} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{S}^* \text{L} | \\ | \text{p} \end{array}$	DEFAULT
n/a -- no preceding L		H* SPREAD
*Ngilèwóná Ndēmīnó 'I saw Ndemino'	*Ngá'wóná léérí 'I saw money'	TONE SHIFT, DEMOTION

Furthermore, we would expect the inserted H* tones to remain raised in junctural position, yielding the incorrect junctural variants in example (105):

(105) Sentence frame: **Ngilewona** ____ **ukou** 'I saw ____ yesterday'



'I saw Ndemino yesterday' 'I saw money yesterday'

Clearly we do not want to resort to exception features, treating each of these facts as an isolated anomaly. Thus the logical question to ask is whether there is a single factor that unites all of these phenomena, which can lead us to a simple, one-step solution. As we will see shortly, such a factor indeed exists.

What Ndemino and leeri have in common, to the exclusion of all other tone-accent classes, is that each contains an accented toneless syllable immediately preceded by a H that is the final H in the p-phrase. In each case, the accented toneless syllable behaves as if it were unaccented (by failing to receive a H*), while the pretonic H behaves as if it were accented (by raising to S). This strongly

suggests that the accent has shifted back one syllable. Since Ndemino and leeri are the only items in the paradigm that have an immediately pretonic p-final H, we may assume that such a configuration triggers a rule of Accent Retraction, given in (106).

(106) ACCENT RETRACTION



Accent Retraction moves an accent off of a toneless syllable and onto an immediately preceding H-toned syllable. In the ensuing discussion we will see that Accent Retraction solves each of the anomalies observed.

First, as a result of Accent Retraction, the H of Ndemino receives the accent it needs to undergo Final Raising, as shown in (107). Accent Retraction also bleeds H Attachment as desired by shifting accent away from the final syllable of Ndemino.

(107) $\begin{array}{c} \text{ngeciwona Ndemin}^* \text{ino} \mid \text{inu} \mid \\ \mid \text{S} \mid \text{H} \mid \text{H} \mid \text{H} \mid \text{p} \mid \text{H} \mid \text{p} \end{array}$

$\begin{array}{c} \text{ngeciwona Ndemin}^* \text{ino} \mid \text{inu} \mid \\ \mid \text{S} \mid \text{H} \mid \text{H} \mid \text{H} \mid \text{p} \mid \text{H} \mid \text{p} \end{array}$

ACCENT RETRACTION

n/a -- bled by Accent Retraction

H ATTACHMENT

$\begin{array}{c} \text{ngeciwona Ndemin}^* \text{ino} \mid \text{inu} \mid \\ \mid \text{S} \mid \text{H} \mid \text{H} \mid \text{S} \mid \text{p} \mid \text{H} \mid \text{p} \end{array}$

FINAL RAISING

"Ngeciwóná Ndēmīno inû

DEFAULT, TONE SHIFT

'I'll see Ndemino today'

In leeri, Accent Retraction likewise allows the word's antepenultimate H-toned syllable to undergo Final Raising, and prevents the attachment of a H* to the word's toneless penult. Until now, we have only seen Final Raising applying to word-penultimate and word-final syllables, due to the way in which accent is assigned to stems in the lexicon. Yet in leeri Accent Retraction produces an antepenultimate accent, which bears a tonally p-final H. Since Final Raising only requires adjacency to the p-boundary on the tonal tier, leeri's antepenultimate accented H meets the rule's structural description just as if it were attached to a penultimate or final syllable.

(108)
$$\begin{array}{c} * \\ \text{Ngeciwazra leeri} \quad | \quad \text{inu} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{H} \quad | \quad \text{p} \quad \text{H} \quad | \quad \text{p} \end{array}$$

$$\begin{array}{c} * \\ \text{Ngeciwazra leeri} \quad | \quad \text{inu} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{H} \quad | \quad \text{p} \quad \text{H} \quad | \quad \text{p} \end{array}$$

ACCENT RETRACTION

n/a — bled by Accent Retraction

H ATTACHMENT

$$\begin{array}{c} * \\ \text{Ngeciwazra leeri} \quad | \quad \text{inu} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{S} \quad | \quad \text{p} \quad \text{H} \quad | \quad \text{p} \end{array}$$

FINAL RAISING

$$\begin{array}{c} * \\ \text{Ngeciwazra leeri} \quad | \quad \text{inu} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{S} \quad | \quad \text{p} \quad \text{H} \quad | \quad \text{p} \end{array}$$

S SPREAD

"
Ngeciwázrá lèeri inû

TONE SHIFT, DEFAULT

'I'll get money today'

In u-final position, leeri undergoes the same sequence of rules as in (108). However, unlike penultimate and final targets of Final Raising, the antepenultimate S of leeri escapes Demotion, as shown in example (109):

(109) $\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} | \\ | \text{p} \end{array}$

$\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} | \\ | \text{p} \end{array}$

ACCENT RETRACTION

n/a -- bled by Accent Retraction

H ATTACHMENT

$\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{S} | \\ | \text{p} \end{array}$

FINAL RAISING

$\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{S} | \\ | \text{p} \end{array}$

S SPREAD

$\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{L} \quad \text{H} \quad \text{H} \quad \text{L} \quad \text{S} \quad \text{L} | \\ | \text{p} \end{array}$

DEFAULT

$\begin{array}{c} * \\ | \text{Ngeciwazra leeri} | \\ | \text{S} \quad \text{L} \quad \text{H} \quad \text{H} \quad \text{L} \quad \text{S} \quad \text{L} | \\ | \text{p} \end{array}$

TONE (AND
ACCENT) SHIFT

n/a -- accent not on u-final syllable

DEMOTION

"Ngeciwázrá leëri"

TONE SHIFT, DEFAULT

'I'll get money'

Because of S Spread, the S of leeri is linked to both the antepenult and the penult before Tone Shift, and to the penult and ultima after Tone Shift. Assuming, as we did in 2.2.5, that for independent reasons accent shifts along with tone, leeri's accent will shift from the antepenult to the penult. Thus Demotion will not apply to leeri because its accent is not linked to the u-final syllable even after

Tone Shift. The S will continue to be licensed because it remains attached to an accented syllable.

Thus by positing a single, natural rule of Accent Retraction, we may account for the entire pattern of irregularities seen in the p-final variants of the HLL penultimate-accented and HL final-accented word classes.

2.5.3. Accent Retraction and the case for accent

It is not surprising to find a rule such as Accent Retraction in Kivunjo, since Accent Retraction has the effect of broadening the range of instances in which Final Raising may apply. It participates in the language's "conspiracy" to match up accentual prominence with tonal prominence, although in a different way from the rules we have seen before: While H Attachment brings a H tone to a toneless accented syllable, Accent Retraction brings an accent to a H-toned unaccented syllable. Rules such as this are not unprecedented in the linguistic literature. As mentioned earlier, two Pacific languages, Fore (Nicholson and Nicholson 1962) and Golin (Bunn and Bunn 1970), are reported to have stress that is assigned with reference to the location of lexical H tone.

Accent Retraction also lends support to the case for accent in Kivunjo. In section 2.2 we saw that a nonaccentual analysis would have to assign rule features to individual syllables to make sense of the paradigm, and that assigning rule features to syllables was a less constrained notational variant of an accentual analysis. The Accent Retraction data confirm this, since to account for leeri and Ndemino a

nonaccentual analysis would have to shift [+H Attachment] to a preceding H-toned syllable, manipulating that feature as if it were a phonetically based suprasegmental feature such as stress or tone. In some cases, as will be seen in section 2.6, retraction takes place across a word boundary, which would be difficult to motivate if [+H Attachment] were a feature of words rather than syllables. Finally, in order to bleed H Attachment as well as feeding Final Raising, the non-accentual counterpart of Accent Retraction would have to shift both features simultaneously, treating them as a unit. In sum, the rule of Accent Retraction provides further evidence that accent is the trigger of p-level tone raising in Kivunjo Chaga.

2.5.4. Summary of the tone-accent-phrasing paradigm

With the rules introduced in sections 2.4-5, we have filled in the four remaining gaps in the tone-accent-phrasing paradigm (97-98). I give the completed paradigm in (110-111):

(110) U-final position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising Demotion	H Attachment Final Raising Demotion	no rules
HLL	Accent Retraction Final Raising S Spread	H Attachment Final Raising Demotion	no rules
HL	Final Raising Demotion	Accent Retraction Final Raising Demotion	no rules
LH	no rules	Final Raising Demotion	no rules
HH	no rules	Final Raising Demotion	no rules

(111) Junctural position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising (S Spread)	H Attachment Final Raising (S Spread/Lowering) (Flop)	no rules
HLL	Accent Retraction Final Raising S Spread	H Attachment Final Raising (S Spread/Lowering) (Flop)	no rules
HL	Final Raising (S Spread)	Accent Retraction Final Raising (S Spread)	no rules
LH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules
HH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules

2.6. Unaccented p-phrases and Accent Reduction

In Chapter 2 so far the focus of discussion has been on accent-triggered rules that apply to the final word in a p-phrase. I have therefore omitted reference to any accents which may appear on non-p-phrase-final words in examples up until now. As long as the p-final word bears an accent, all preceding accents in the p-phrase are irrelevant to p-level rules. However, if the p-final word is unaccented, the question arises whether the p-phrase-penultimate word's accented syllable might be eligible to undergo certain p-level rules.

To answer this question, let us first consider the examples of unaccented keywords already seen in preceding sections, which I repeat in (112-116).

(112) LLL and LL unaccented nouns (repeated from (37) and (56))

- | | |
|---|---|
| <p>a. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{c} \text{Naiolonga mcaka} \\ \left \begin{array}{c} \quad \\ \text{S} \quad \text{H} \end{array} \right \end{array} \right _p \\ \text{Naiòlongà mcàkà} \\ \text{'(S)he's pointing at a Chaga p.'}\end{array}$</p> | <p>b. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{c} \text{Naiolonga Ladi} \\ \left \begin{array}{c} \quad \\ \text{S} \quad \text{H} \end{array} \right \end{array} \right _p \\ \text{Naiòlongà Lādì} \\ \text{'(S)he's pointing at Ladi'}\end{array}$</p> |
| <p>c. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{c} \text{Ngilewona mcaka} \\ \left \begin{array}{c} \quad \quad \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \right \end{array} \right \left \begin{array}{c} \text{ukou} \\ \left \begin{array}{c} \\ \text{H} \end{array} \right \end{array} \right _p \\ \text{Ngilèwóná mcàkà ùkòŸ} \\ \text{'I saw a Chaga person yesterday'}\end{array}$</p> | <p>d. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{c} \text{Ngilewona Ladi} \\ \left \begin{array}{c} \quad \quad \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \right \end{array} \right \left \begin{array}{c} \text{ukou} \\ \left \begin{array}{c} \\ \text{H} \end{array} \right \end{array} \right _p \\ \text{Ngilèwóná Lādì ùkòŸ} \\ \text{'I saw Ladi yesterday'}\end{array}$</p> |

(113) HLL unaccented noun (repeated from (79) and (80))

*	*		*	*	
a.	Ngilewona	muolrombo	b.	Ngeciwona	muolrombo
	| S | H | H | H |	| p |		| S | H | H | H |	| p |

Ngilêwóná mùòlrómbò

Ngèciwóná mùòlrómbò ngàmá

'I saw a person from Rombo'

'I'll see a p. from R. tomorrow'

(114) HL unaccented noun (repeated from (44))

*	*	
	Ngilewona	mkiwoso
	| S | H | H | H |	| p |

Ngilêwóná mkiwòsò ùkòù

'I saw a person from Kibosho yesterday'

(115) LH unaccented noun (repeated from (49))

*	*	
	Ngeciwona	msia
	| S | H | H | H |	| p |

Ngèciwóná msià ngámá

'I'll see a person from Siha tomorrow'

(116) HH unaccented noun (repeated from (54))

*	*	
	Necialyika	mmriti
	| S | H | H | H | H |	| p |

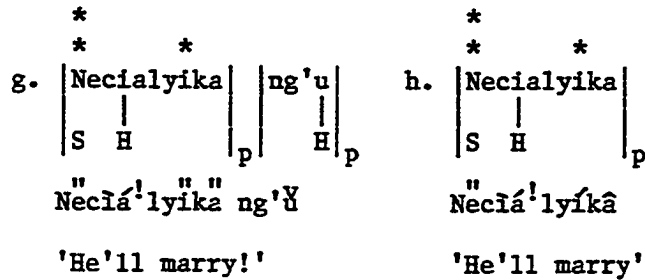
Neciályikà mmrítí ngámá

'He'll marry a person from Mriti tomorrow'

In examples (112-116) I have indicated the preceding verb's stem-penultimate accent, which is assigned by the same Stem Accent Rule that applies to nouns. I also indicate each verb's initial accent,

which will come into play later in this discussion. When these verbs appear p-finally they undergo the same p-level rules that have been discussed above, as can be seen in example (117) below. To create the junctural sandhi environment, I have placed after the verb the emphatic particle ng'u, which is not part of the VP and hence does not form a p-phrase with the verb.

- (117)
- | | |
|--|---|
| <p>a. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Ngilewona} \end{array} \right \left \begin{array}{c} \text{ng'u} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \quad \text{H} \end{array} \right \left \begin{array}{c} \text{H} \end{array} \right _p \\ \text{Ngilêwóna} \text{ ng'ŭ} \\ \text{'I saw!'} \end{array}$</p> | <p>b. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Ngilewona} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \quad \text{H} \end{array} \right _p \\ \text{Ngilêwónâ} \\ \text{'I saw'}$</p> |
| <p>c. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Ngeciwona} \end{array} \right \left \begin{array}{c} \text{ng'u} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \quad \text{H} \end{array} \right \left \begin{array}{c} \text{H} \end{array} \right _p \\ \text{Ngeciwóna} \text{ ng'ŭ} \\ \text{'I'll see!'} \end{array}$</p> | <p>d. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Ngeciwona} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \quad \text{H} \end{array} \right _p \\ \text{Ngeciwónâ} \\ \text{'I'll see'}$</p> |
| <p>e. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Naiolonga} \end{array} \right \left \begin{array}{c} \text{ng'u} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \end{array} \right \left \begin{array}{c} \text{H} \end{array} \right _p \\ \text{Naiðlóngá} \text{ ng'ŭ} \\ \text{'He's pointing!'}$</p> | <p>f. $\begin{array}{c} * \\ * \quad * \\ \left \begin{array}{ccc} \text{Naiolonga} \end{array} \right \\ \left \begin{array}{ccc} \text{S} \quad \text{H} \end{array} \right _p \\ \text{Naiðlóngá} \\ \text{'He's pointing'}$</p> |



The derivation of these forms is straightforward: (117a-d) follows the HL penultimate-accented (mburu) pattern, (117e-f) the HLL penultimate-accented (leeri) pattern, and (117g-h) the LLL penultimate-accented (msulri) sandhi pattern.

Going back to examples (112-116), if the final unaccented word in the p-phrase contains one or more H tones, as in (113-116), no p-level raising rules will be able to apply to the phrase-penultimate word's accented syllable. This is because on the tonal tier the H tone or tones of the p-final unaccented word intervene between the accented syllable and the p-boundary, creating a barrier to both H Attachment and Final Raising. Both rules require that the tone attached to the accented syllable be the final specified tone in the p-phrase.



However, if the final unaccented word is toneless, there is no intervening H tone to prevent the application of H Attachment or Final Raising. Thus we might expect to find H Attachment applying to the

verb's penultimate accented syllable as in (119a), or Final Raising applying to the verb's accented H tone as in (119b). Yet neither of these rules applies, as seen from the ungrammaticality of the surface tone patterns derived in (119).

(119) a. $\begin{array}{c} * \\ * \quad * \\ \text{Necialyika mcaka} \\ | \\ \text{S H} \end{array} \Big|_p$	b. $\begin{array}{c} * \\ * \quad * \\ \text{Ngilewona mcaka} \\ | \quad | \\ \text{S H H} \end{array} \Big|_p$	
$\begin{array}{c} * \\ * \quad * \\ \text{Necialyika mcaka} \\ | \\ \text{S H} \end{array} \Big|_p$	n/a	H ATTACHMENT
$\begin{array}{c} * \\ * \quad * \\ \text{Necialyika mcaka} \\ | \quad | \\ \text{S H S}^* \end{array} \Big|_p$	$\begin{array}{c} * \\ * \quad * \\ \text{Ngilewona mcaka} \\ | \quad | \\ \text{S H S} \end{array} \Big|_p$	FINAL RAISING
*Nēcīá'lyika mcākā	*Ngilēwōnā mcākā	OTHER RULES
'He'll marry a Chaga p.'		
'I saw a Chaga person'		

Rather, H Attachment and Final Raising simply fail to apply, as if the accent on the p-phrase-penultimate word were not present.

One possible reason why H Attachment and Final Raising fail to apply in (119) might be that the accented syllable is too far from the p-boundary. So far we have only seen raising rules apply to p-phrase-antepenultimate, -penultimate and -final syllables. A test case for this hypothesis would be a structure in which the p-phrase-penultimate word's accented syllable is no more than three syllables from the p-boundary. Such a structure arises when a toneless unaccented disyllable in p-final position is preceded by a final-accented verb, as in

(120) below. As noted in section 2.1.4, passive verbs bear word-final accent because the passive suffix, before fusing with the stem-final vowel, occupies the stem-penultimate syllable and receives accent.

(120)	$\begin{array}{c} * \\ * \qquad * \\ \text{a. } \left| \begin{array}{c} \text{Kileenengo} \quad \text{Ladi} \\ \text{S} \quad \text{HH} \end{array} \right|_p \end{array}$	$\begin{array}{c} * \\ \text{b. } \left| \begin{array}{c} \text{Kyaenengo} \quad \text{Ladi} \\ \text{HLHH} \quad \text{H} \end{array} \right|_p \end{array}$	
	n/a	n/a	H ATTACHMENT
	n/a	n/a	FINAL RAISING
	Kilèénéngò Lādī	Kyá'énéngò Lādī	TONE SHIFT,
	'It was given to Ladi (distant past)'	'It was given to Ladi (recent past)'	DEFAULT

H Attachment ignores the final syllable of kileenengo 'it was given (distant past)', despite the fact that that syllable is within the range in which raising rules have been seen to apply so far. Likewise, Final Raising fails to raise the final H of kyaenengo 'it was given (recent past)', even though that H is accented and linked to the p-phrase-antepenultimate syllable.

These data would seem to suggest that word boundaries act as barriers to H Attachment and Final Raising. Yet we cannot simply restrict these rules to applying only within the p-phrase-final word for three reasons. First, to incorporate such a restriction into the two raising rules would require the inclusion of two levels of prosodic domain bracketing, as in (121-122):

(121) H ATTACHMENT (with word-boundary restriction)

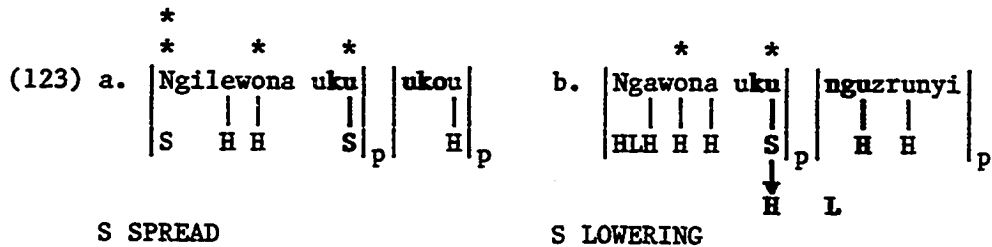
$$\phi \rightarrow H^* / \begin{array}{c} * \\ \textcircled{\sigma} \\ | \\ w[\dots ___\dots]_w \end{array}]_p$$

(122) FINAL RAISING (with word-boundary restriction)

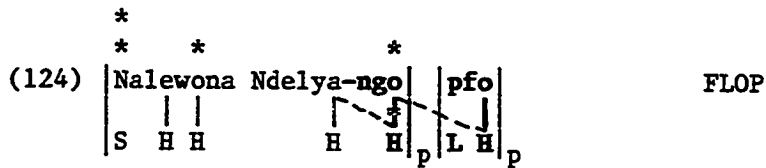
$$H \rightarrow S / \begin{array}{c} * \\ \sigma \\ | \\ w[\dots ___\dots]_w \end{array}]_p$$

As I will discuss at greater length in section 3.7, Selkirk (1980) has excluded rules such as these from a typology of Prosodic Hierarchy rules. This is because allowing a rule to require its target to be w-bounded and p-bounded at the same time would in effect grant prosodic bracketing symbols quasi-segmental status, imparting to them the same excessive power that was given to boundary symbols in SPE.

An alternative to changing the rule formulations of H Attachment and Final Raising as in (121-122) might be to claim that word-boundedness is a general property of p-level rules in Kivunjo. Yet this is easily disproved by looking at much of the data considered in this Chapter: All the other p-level and u-level rules of the language may apply across word boundaries. To begin with, H* Spread, as noted in example (35) above, spreads freely across word boundaries as long as its structural description continues to be met. S Spread and S Lowering regularly cross word boundaries, as can be seen in examples (80b) and (83a) from section 2.4.1, repeated here with target and trigger in boldface:



Flop likewise may cross a word juncture, as shown in (124), repeated from (87) in section 2.4.1.



Tone Shift applies routinely between words as well as inside them, as was illustrated in section 2.1.1 above. Thus we would have to stipulate that all and only the two accent-triggered rules in the language are sensitive to a left-hand word boundary.

The third and most compelling reason for not allowing word boundaries to be barriers to H Attachment and Final Raising is an empirical one. If word boundaries blocked these rules, we would predict the nonapplication of Final Raising in example (125):

(125)	$\begin{array}{|c|} \hline \text{nyama} \\ \hline \end{array}$	stem	
	$\begin{array}{c} * \\ \begin{array}{|c|} \hline \text{nyama} \\ \hline \end{array} \end{array}$	stem	STEM ACCENT RULE
	$\begin{array}{cc} * & * \\ \begin{array}{|c|c|} \hline \text{ngawona} & \text{nyama} \\ \hline \end{array} & \begin{array}{|c|c|c|} \hline \text{ngawona} & \text{nyama} & \text{inu} \\ \hline \end{array} \end{array}$	$\begin{array}{|c|c|c|} \hline \text{HLH} & \text{H} & \text{H} \\ \hline \end{array}$	LEXICAL INSERTION, P-PHRASE FORMATION
	$\begin{array}{cc} * & * \\ \begin{array}{|c|c|} \hline \text{ngawona} & \text{nyama} \\ \hline \end{array} & \begin{array}{|c|c|c|} \hline \text{ngawona} & \text{nyama} & \text{inu} \\ \hline \end{array} \end{array}$	$\begin{array}{|c|c|c|} \hline \text{HLH} & \text{H} & \text{H} \\ \hline \end{array}$	ACCENT RETRACTION
	n/a — accented syllable not toneless		H ATTACHMENT
	$\begin{array}{cc} * & * \\ \begin{array}{|c|c|} \hline \text{ngawona} & \text{nyama} \\ \hline \end{array} & \begin{array}{|c|c|c|} \hline \text{ngawona} & \text{nyama} & \text{inu} \\ \hline \end{array} \end{array}$	$\begin{array}{|c|c|c|} \hline \text{HLH} & \text{H} & \text{S} \\ \hline \end{array}$	FINAL RAISING
	$\begin{array}{cc} * & * \\ \begin{array}{|c|c|} \hline \text{ngawona} & \text{nyama} \\ \hline \end{array} & \begin{array}{|c|c|c|} \hline \text{ngawona} & \text{nyama} & \text{inu} \\ \hline \end{array} \end{array}$	$\begin{array}{|c|c|c|} \hline \text{HLH} & \text{H} & \text{S} \\ \hline \end{array}$	S SPREAD
	$\text{Ngá'wona nyama} \quad \text{Ngá'wona nyama inu}$		OTHER RULES
	$\text{'I saw meat'} \quad \text{'I saw meat today'}$		

Here the target of Final Raising is separated from the p-boundary by a word boundary, yet it still raises.

What distinguishes (125) from (120b) is the source of the accent on the antepenultimate H. In (120b) it originates in the p-phrase-penultimate word kyaenengo, while in (125) it originates one syllable to the right, in the p-final word nyama 'meat', and is retracted to the preceding word's final syllable by the p-level rule of Accent Retraction. Thus what prevents an accented syllable from undergoing

raising rules is an intervening word boundary not at the time the raising rules apply, but rather at an earlier stage in the derivation, before Accent Retraction has applied. Since in (119) and (120) the penultimate word's accent behaves as if invisible to raising rules, a rule of Accent Reduction will achieve the desired effect. I formulate this rule as a w-juncture rule on the p-domain (using Selkirk's rule typology) in (126):

(126) ACCENT REDUCTION

Reduce by one mark the grid column of any accent that occurs in the following environment:

* $\rightarrow \phi / [\dots[\dots______]_w[\dots]_w\dots]_p$

By stating it as a reduction rule, we will ensure that the double accent associated with verbal S is not fully deleted, only reduced to a single accent. Since the only environment we have seen in which verb-initial accent must retain its two grid marks is in a domain that does not meet (126)'s structural description -- the u-final word, Accent Reduction may freely reduce verbal accents elsewhere in the utterance.

Accent Reduction will eliminate the verb's stem-penultimate accent in (119) and (120), as well as in (112-116), where except for p-phrases ending in toneless unaccented words, the effect will be vacuous. However, it will not remove the accent that originates on the penultimate syllable of nyama in (125), since nyama is p-final. Of course, Accent Reduction must be ordered before Accent Retraction, otherwise it will delete the accent of nyama once it is retracted onto

the verb. I give the final derivations in (127) below:

(127)

<p>a. $\begin{array}{c} * \\ * \quad * \\ \text{Kilesoko Ladi} \\ | \quad | \quad | \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \Big|_p$</p>	<p>b. $\begin{array}{c} * \\ \text{Kyasoko Ladi} \\ | \quad | \quad | \\ \text{HLH} \quad \text{H} \quad \text{H} \end{array} \Big|_p$</p>	<p>c. $\begin{array}{c} * \quad * \\ \text{Ngalya nyama} \\ | \quad | \\ \text{HLH} \quad \text{H} \end{array} \Big|_p$</p>	
<p>$\begin{array}{c} * \\ * \\ \text{Kilesoko Ladi} \\ | \quad | \quad | \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \Big|_p$</p>	<p>$\begin{array}{c} * \\ \text{Kyasoko Ladi} \\ | \quad | \quad | \\ \text{HLH} \quad \text{H} \quad \text{H} \end{array} \Big|_p$</p>	<p>$\begin{array}{c} * \\ \text{Ngalya nyama} \\ | \quad | \\ \text{HLH} \quad \text{H} \end{array} \Big|_p$</p>	<p>ACCENT REDUCTION</p>
<p>n/a</p>	<p>n/a</p>	<p>$\begin{array}{c} * \\ \text{Ngalya nyama} \\ | \quad | \\ \text{HLH} \quad \text{H} \end{array} \Big|_p$</p>	<p>ACCENT RETRACTION</p>
<p>n/a</p>	<p>n/a</p>	<p>$\begin{array}{c} * \\ \text{Ngalya nyama} \\ | \quad | \quad \diagdown \\ \text{HLH} \quad \text{S} \end{array} \Big|_p$</p>	<p>FINAL RAISING, S SPREAD</p>
<p>Kilēsókó Lādī 'It was snatched from Ladi (dis- tant past)'</p>	<p>Kyá'sókó Ládī 'It was snatched from Ladi (re- cent past)'</p>	<p>Ngá'lya nyama~ 'I ate meat (recent past)'</p>	<p>DEFAULT, TONE SHIFT</p>

d. $\begin{array}{c} * \\ * \quad * \\ \hline \text{Necialyika mcaka} \\ \hline \text{S} \quad \text{H} \end{array} \Big|_p$	e. $\begin{array}{c} * \\ * \quad * \\ \hline \text{Ngilewona mcaka} \\ \hline \text{S} \quad \text{H} \quad \text{H} \end{array} \Big|_p$	
$\begin{array}{c} * \\ * \\ \hline \text{Necialyika mcaka} \\ \hline \text{S} \quad \text{H} \end{array} \Big|_p$	$\begin{array}{c} * \\ * \\ \hline \text{Ngilewona mcaka} \\ \hline \text{S} \quad \text{H} \quad \text{H} \end{array} \Big|_p$	ACCENT REDUCTION
n/a	n/a	H ATTACHMENT
n/a	n/a	FINAL RAISING
"Nečlályikà mcàkà	Ngilêwóná mcàkà	TONE SHIFT, DEFAULT
'He'll marry a Chaga person'	'I'll see a Chaga person'	

In this way we solve two problems at once: Accent Reduction sees to it that H Attachment and Final Raising fail to apply to accents that originate farther back than the p-final word, but allows them to apply freely to accents that end up in a preceding word through Accent Retraction. Accent Reduction also accounts for the fact that only the two tone-to-accent assignment rules are sensitive to whether their target is in the p-final word or not.

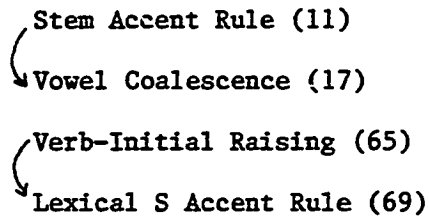
These facts also argue for an accentual analysis in that rules deleting or reducing all but the rightmost occurrence of a rule application feature in a phrase are not typologically ordinary, but rules that delete or reduce all but the rightmost (or in left-dominant languages, the leftmost) phrasal occurrence of stress or accent are commonplace (cf. the Nuclear Stress Rule of English and comparable rules in many other stress languages).

2.7. Summary of rules

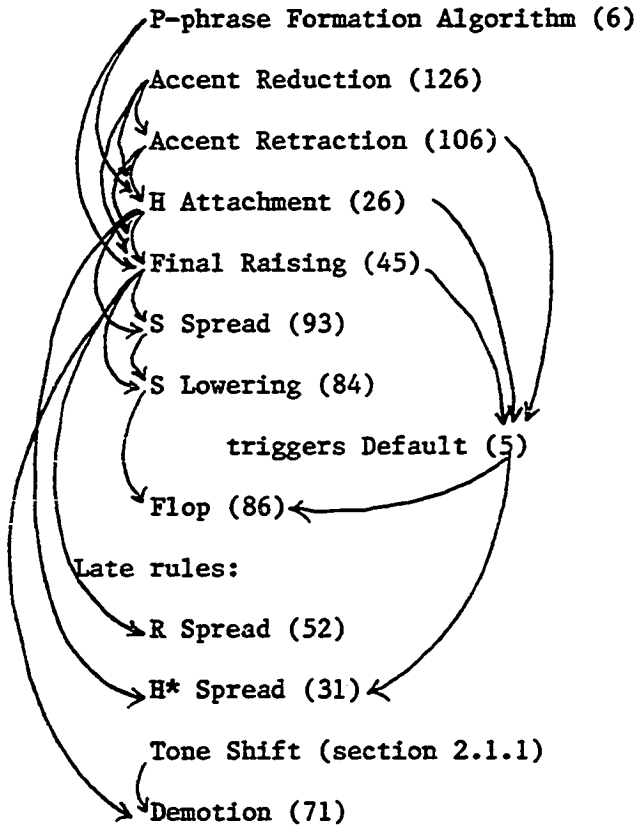
In (128) I schematize the rule inventory and rule orderings motivated thus far. Arrows indicate crucial orderings between rules.

(128) Rule Inventory

Lexical:



P-level:



Conventions:

Matching Convention (72)

Delinking Convention (73)

Default Timing Convention (91)

[high] underspecified until S Lowering

Examples (129-131) show a revised tabulation of rules that apply to each of the members of the tone-accent-phrasing paradigm. In parentheses are those rules which do not necessarily apply to the given keyword in all tonal contexts.

(129) P-internal position: rules which apply

	penultimate accent	final accent	no accent
LLL	Accent Reduction	Accent Reduction	no rules
HLL	Accent Reduction	Accent Reduction	no rules
HL	Accent Reduction	Accent Reduction	no rules
LH	Accent Reduction	Accent Reduction	no rules
HH	Accent Reduction	Accent Reduction	no rules

(130) U-final position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising Demotion	H Attachment Final Raising Demotion	no rules
HLL	Accent Retraction Final Raising S Spread	H Attachment Final Raising Demotion	no rules
HL	Final Raising Demotion	Accent Retraction Final Raising Demotion	no rules
LH	no rules	Final Raising Demotion	no rules
HH	no rules	Final Raising Demotion	no rules

(131) Junctural position: rules which apply

	penultimate accent	final accent	no accent
LLL	H Attachment Final Raising (S Spread)	H Attachment Final Raising (S Spread/Lowering) (Flop)	no rules
HLL	Accent Retraction Final Raising S Spread	H Attachment Final Raising (S Spread/Lowering) (Flop)	no rules
HL	Final Raising (S Spread)	Accent Retraction Final Raising (S Spread)	no rules
LH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules
HH	no rules	Final Raising (S Spread/Lowering) (Flop)	no rules

CHAPTER 3: PHRASAL CYCLICITY

The rich p-level phonology of Kivunjo Chaga and its web of crucial rule interactions provide fertile ground for testing the hypothesis advanced in Chapter 1 -- that p-level rules apply cyclically. In the first three sections of this chapter I will argue for p-level cyclicity on the basis of four ordering paradoxes that arise between (a) S Spread and itself, (b) S Spread and S Lowering, (c) H Attachment and Accent Retraction, and (d) S Spread and Accent Retraction. These paradoxes can be resolved satisfactorily only by assuming that p-level rules apply cyclically to each successive p-phrase as it is created from the syntactic string. The data from which these paradoxes arise are (a) a tone sequence that I have dubbed the Rival S Configuration, (b) the paradigm of interaction between the fifteen tone-accent types with reduced demonstratives, and (c) a sandhi environment that I will refer to as "strong" p-juncture.

On the basis of phrasing data to be presented in Appendix C, I have arrived at the following algorithm for p-phrase construction in Kivunjo Chaga:

(1) Kivunjo Chaga p-phrase formation (proceeds from left to right)

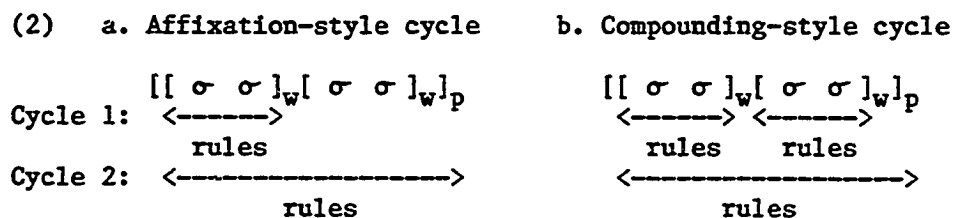
- For each pair of consecutive words X and Y,
 (a) if X p-governs Y, then X and Y form
 part of a single p-phrase;
 (b) otherwise they are phrased separately.

Definition of p-government:

X p-governs Y if X is the head of a
maximal projection that dominates Y.

The step-by-step procedure outlined by this algorithm, if interleaved

with the p-level phonology, produces an affixation-style cycle at the p-level, starting presumably at the beginning of the utterance and preceding rightward. As illustrated in (2a) below, an affixation-style cycle is one in which each successive cycle is triggered by the addition of fresh material. This contrasts with a compounding-style cycle (2b), in which the entire utterance is exhaustively subjected to rule application on each cycle.



In section 3.4 an examination of p-phrases that contain more than one word will reveal that the cyclic domain at the p-level is in fact based not on the p-phrase, but on the word. This is not surprising given the word-by-word nature of the algorithm in (1), and the hypothesis that cyclicity derives from the interleaving of phonology with individual steps in the p-phrase construction process. Thus, as each new word is evaluated for its phrasing relationship to the preceding and following words, we will see that a cycle of phonological rules applies, regardless of whether the word is p-final or p-internal, as shown in (3a).

(3) a. Word cycle

Cycle 1: $[[w\ w]_p[w\ w]_p]_u$
 $\langle \text{---} \rangle$
 rules
Cycle 2: $\langle \text{---} \rangle$
 rules
Cycle 3: $\langle \text{---} \rangle$
 rules
Cycle 4: $\langle \text{---} \rangle$
 rules

b. P-phrase cycle

$[[w\ w]_p[w\ w]_p]_u$
 $\langle \text{---} \rangle$
rules
 $\langle \text{---} \rangle$
rules

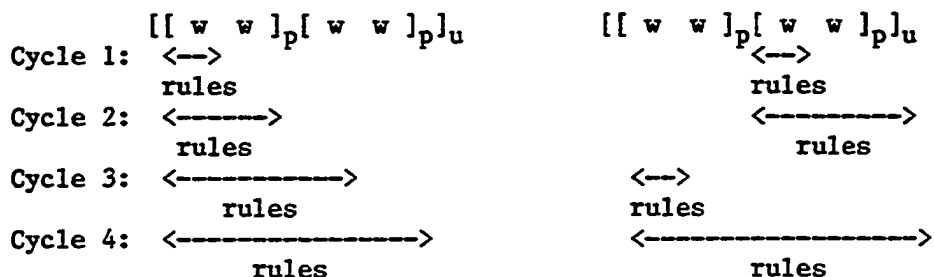
Before section 3.4, however, there will be no empirical basis for determining whether the p-phrase or the word is the correct domain, since all crucial p-phrases will contain only one word. I will therefore assume a p-phrase-based cycle in sections 3.1-3, not adopting the word-based cycle until section 3.4.

In section 3.5 I will discuss how the rules Flop and S Spread must be modified in light of data from cyclic derivations. Flop becomes a w-limit rule, and S Spread must refer to the accentual status of the syllable to which the spreading S is attached. In the process, I motivate an accentual convention reminiscent of stress clash resolution. I will also show that Accent Reduction can be replaced by part (b) of the Matching Convention introduced in 2.2.5. This convention deletes accents that have not gotten linked to a S tone by the end of a cycle.

In section 3.6 I will address the question of whether p-phrase construction proceeds strictly from left to right or from the most nested constituent outward.

(4) a. Left-to-right cycle

b. An inside-out cycle



Apparent examples of inside-out cyclicity can all be shown to result from the interaction of accents of different degrees. In sections 3.1-4, therefore, it will suffice to assume that cyclicity operates from left to right.

Section 3.7 will assess the implications of cyclicity for a typology of prosodic rules. I will show first that all of the rules so far assigned to the p-level in fact freely apply across p-boundaries, and that it suffices to specify that these rules apply within cumulative cyclic domains at the phrasal level to account for their phrasing-sensitive behavior. Three rules that have heretofore been formulated with reference to a p-boundary (H Attachment and Final Raising) or a w-boundary (Flop) can be restated without boundary references: In the case of H Attachment and Final Raising, this allows us to collapse these rules into a single operation of phrasal tone feature assignment. For Flop to be stated without reference to a boundary, Tone Shift must be ordered before Flop — in effect, Tone Shift must become a cyclic rule. The mechanics of this will be dealt with in Appendix A. The revised version of Flop that results from this ordering is more a phonetically plausible rule than are earlier

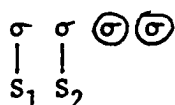
proposed versions of Flop.

The fact that no p-level rules actually refer to prosodic domain boundaries in their structural descriptions poses a problem for Prosodic Hierarchy theory. After the revisions in 3.6, p-level rules are still structure-sensitive, but they are not absolutely confined to apply within any particular prosodic domain smaller than the utterance — only the phrasal cyclic domain, which grows incrementally larger with each cycle. And yet the prosodic domain that serves as the building block for this cyclic rule application is the smallest phrasal domain in the language: the phonological word. I therefore propose that p-level rules be characterized as applying within an unspecified domain, so that they apply whenever new structure is created, regardless of the domain.

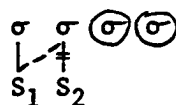
3.1. Argument #1: The Rival S Configuration (S Spread, S Lowering)

Because of the indifference of S Spread to the tonal specification of the syllable immediately following the S, it is possible to set up a tonal configuration in which two adjacent S syllables compete to spread. In such a configuration, shown in (5), a sequence of two toneless syllables must follow the two S-toned syllables so that either of the S tones has an opportunity to spread. For ease of reference, I will call this the Rival S Configuration.

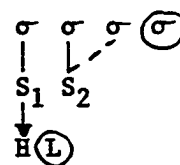
(5) Rival S Configuration



If S_1 spreads:



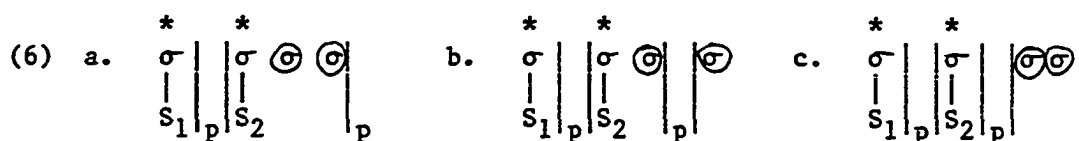
If S_2 spreads:



By varying the phrasing of this configuration, we will be able to identify the role that phrasing plays in predicting which S will spread. The role of phrasing in determining the result will then shed light on the question of cyclicity.

3.1.1. Setting up the Rival S Configuration

I will initially focus only on S tones that result from p-level rule application. With S of lexical origin ruled out, both of the S tones in (5) must be derived from accented H tones by Final Raising. S_1 must be attached to a p-final syllable, because only a H which is the last H in the p-phrase may raise. Consequently any phrasing of the Rival S Configuration that does not contain a lexical S must place a p-juncture between the two S tones. S_2 , on the other hand, can arise from Final Raising in three different ways, depending on its position in its p-phrase. In (6a) below, it is attached to the p-phrase-antepenultimate syllable, which has received accent by Accent Retraction; in (6b) it is linked to an accented penult, and in (6c) it is attached to the final and only syllable of a p-phrase that consists of an accented monosyllable.



A three-phrase utterance is needed to create the structures in (6). This can be done by adding an indirect object to the "verb + direct object + adverb" sentence frame used to build most of the two-

phrase utterances in Chapter 2. The indirect object, which intervenes between the verb and the direct object, will supply S_1 , and need not vary. It should have an underlying accented H-toned final syllable, which is available in the HH final-accented keyword Ndelya-ngo. To achieve the different phrasing possibilities for S_2 , the direct object following Ndelya-ngo must vary between a HLL penultimate-accented word such as the keyword leeri 'money', a HL penultimate-accented word such as mburu 'goat', and a H accented monosyllable such as ngu 'firewood' (plural of the LH final-accented keyword uku 'piece of firewood'). For the third phrase in the construction I use the LLH adverb ukou 'yesterday', which has enough toneless syllables to allow for the environment of S Spread in each case. Thus the configurations in (5) will be exemplified by the sentence frame and three options given in example (7):

- (7) Ngileenenga Ndelya-ngo _____ ukou 'I gave N. _____ yesterday'
- | | |
|--------------|-------------------|
| <u>leeri</u> | <u>'money'</u> |
| <u>mburu</u> | <u>'a goat'</u> |
| <u>ngu</u> | <u>'firewood'</u> |

With an affixation-style p-phrase-based cycle, the derivation of this construction will proceed as in (8):

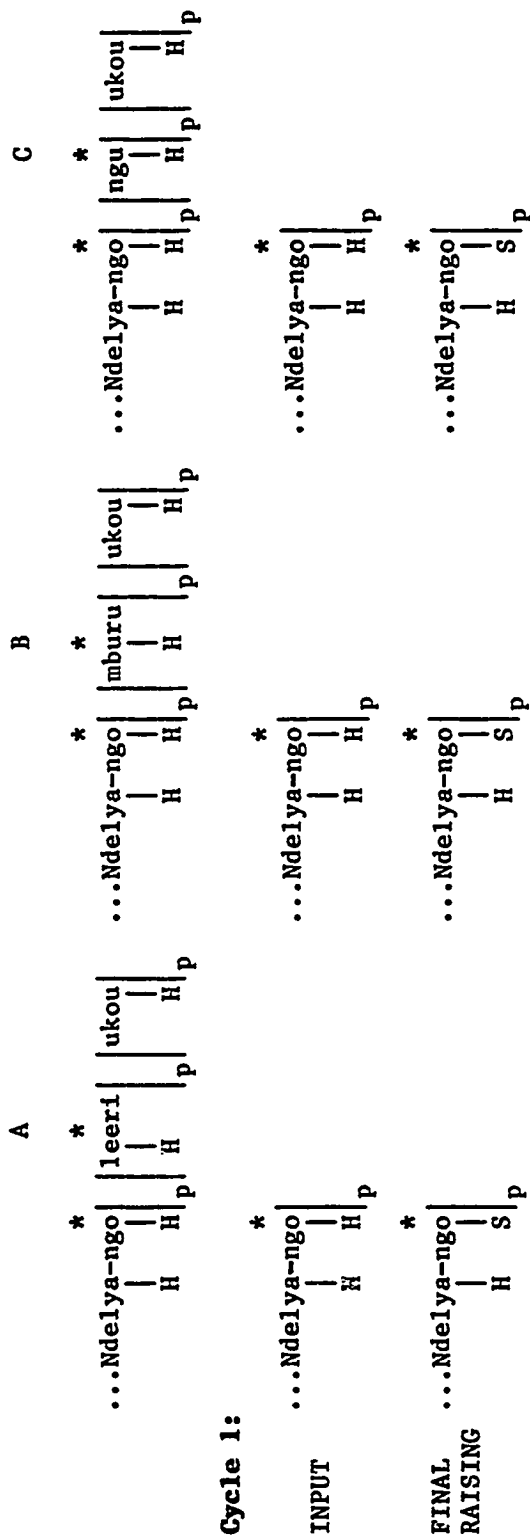
- (8)
- | | |
|----------|--|
| | verb + indirect object + direct object + adverb |
| parsing: | [_____] _p |
| Cycle 1: | <-----rules-----> |
| parsing: | [_____] _p [_____] _p |
| Cycle 2: | <-----rules-----> |
| parsing: | [_____] _p [_____] _p [_____] _p |
| Cycle 3: | <-----rules-----> |

When we examine the outcome of each phrasing option, the right-

most extent of surface S tone compared with a fixed reference point will tell us which tone has raised and spread. If S_1 spreads first, it will delink S_2 , preventing S_2 from spreading, as S Spread requires its target to be linked to a syllable. Consequently the underlying HHLL of the Rival S Configuration will surface as SSLL (shifted one syllable rightward by Tone Shift). If, on the other hand, S_2 spreads first, it will prevent S_1 from spreading by placing a tone on the second syllable following S_1 , thereby violating the structural description of S Spread for S_1 . S Lowering will then change S_1 to H!. Thus if S_2 spreads, underlying HHLL will derive H!SSL on the surface (likewise shifted one syllable to the right). (I will discuss the phonetic realization of the sequence H!S in Appendix B.)

Since in each case S_1 is the final S of Ndelya-ngo, that tone may serve as our fixed reference point. After Tone Shift it will surface on the first syllable following Ndelya-ngo so that in effect we can tell which H has spread by observing the surface tone of the third syllable following Ndelya-ngo. If that syllable bears L tone, we know that S_1 has spread at the expense of S_2 . If, however, the third syllable bears S tone, S_2 must have spread, bleeding application of S Spread to S_1 . In (9) below I provide affixation-style left-to-right cyclic derivations of the three possible phrasings of the configuration. To conserve space I omit the verb from the derivation.

(9) Sentence frame: Ngileenenga Ndelya-ngo ____ ukou 'I gave Ndelya-ngo ____ yesterday'



Cycle 2:

	A	B	C
INPUT	<p> * * ...Ndelya-ngo | leeri | | | | H S | p | H | </p>	<p> * * ...Ndelya-ngo | mburu | | | | H S | p | H | </p>	<p> * * ...Ndelya-ngo | | | | | H S | p | H | | ngu | </p>
ACCENT RETRACTION	<p> * * ...Ndelya-ngo | leeri | | | | H S | p | H | </p>	n/a	n/a
FINAL RAISING	<p> * * ...Ndelya-ngo | leeri | | | | H S | p | H | </p>	<p> * * ...Ndelya-ngo | mburu | | | | H S | p | H | </p>	<p> * * ...Ndelya-ngo | | | | | H S | p | H | | ngu | </p>
S SPREAD	<p> * * ...Ndelya-ngo | leeri | | | | H S | p | H | </p>	<p> * * ...Ndelya-ngo | mburu | | | | H S | p | H | </p>	<p>blocked by boundary</p>
S LOWERING	<p> * * ...Ndelya-ngo | leeri | | | | H H | p | LS </p>	n/a	<p> * * ...Ndelya-ngo | | | | | H H | p | L S | ngu | </p>
FLOP	n/a	n/a	<p> * * ...Ndelya-ngo | | | | | H H | p | L S | ngu | </p>

Cycle 3:

	A	B	C
INPUT	<p>...Ndelya-ngo | leeri | ukou | H | H | LS | p | H | p</p>	<p>...Ndelya-ngo | mburu | ukou | H | S | p | p | H | p</p>	<p>...Ndelya-ngo | ngu | ukou | H | H | L S | p | H | p</p>
S SPREAD	<p>n/a -- see section 3.5.3</p>	<p>bled by S Spread on Cycle 2</p>	<p>...Ndelya-ngo | ngu | ukou | H | H | L S | p | H | p</p>

U-Level:

OTHER RULES	<p>...Ndelyã-ngó le'eri' ùkòY '...N. money yesterday'</p>	<p>...Ndelyã-ngo mburu' ùkòY '...N. a goat yesterday'</p>	<p>...Ndelyã-ngó' ngu' ùkòY '...N. firewood yesterday'</p>
-------------	--	--	---

The surface tone patterns given at the end of the derivations in (9) show L tone on the third syllable after Ndelya-ngo in Case B, but S tone in Cases A and C. Thus in Case B we find that underlying HHLL has produced SSLL, showing that S_1 has spread, while in Case A HHLL has become H!SSL, showing that S_2 has spread. In Case C, while the presence of S on the third following syllable indicates that S_2 has spread, the location of downstep is unexpectedly one syllable early, yielding the tone pattern !SSSL. I will now go through each derivation in turn to show that these three distinct tone patterns can only be accounted for coherently with reference to cyclicity.

All three derivations are identical on the first cycle, whose domain consists of the verb plus the indirect object Ndelya-ngo. In each case the accented final H of Ndelya-ngo raises by Final Raising. S Spread, however, cannot yet apply to S_1 because the two necessary following syllables are not yet available. Thus it is not until Cycle 2 that differences among the three cases begin to emerge.

3.1.2. Case A: S Spread bleeds itself through iteration

In Case A on the second cycle, Accent Retraction first shifts the penultimate accent of leeri to its antepenult, feeding Final Raising. This time, when S Spread's turn comes to apply, it finds two potential targets: S_2 -- followed by two toneless syllables -- clearly meets the rule's structural description; S_1 -- followed first by S_2 and then by a toneless syllable -- also meets the structural description of S Spread since the presence of a tone on the immediately following syllable is irrelevant. As S Spread cannot apply to both, it must choose between the two tones. In the surface form of Case A the sequence H!SS follows Ndelya-ngo, which indicates that S Spread has chosen S_2 , and S Lowering has subsequently lowered S_1 .

The most natural reason for this choice is that S Spread iterates from right to left, selecting the rightmost target that meets its structural description -- in this case, S_2 . Any alternative account would have to attribute the choice of target to some sort of blocking effect that would prevent S_1 from satisfying the rule's structural description.

One such alternative account would propose that even though S Spread is not blocked by an immediately following H, the rule might be blocked by an immediately following S. If this were the case, it would have the desired effect of eliminating S_1 from the competition in Case A. However, it would also eliminate S_1 in Cases B and C. Yet the presence of only two surface S tones following Ndelya-ngo in Case B shows that in that context S_1 may indeed spread at the expense of S_2 . S tone is therefore no more a barrier to S Spread than is H tone.

Another possibility might be that the p-phrase boundary after S_1 is what blocks S Spread. However, the same problem arises with this proposal as with the S blocking proposal: There is a p-boundary after S_1 in all three phrasings of the Rival S Configuration, yet S_1 spreads in Case B despite the presence of that boundary. In addition, S Spread routinely crosses p-boundaries in other contexts, as can be seen in any of the examples of S Spread given previously in 2.4.1.

We are therefore left with the conclusion that in Case A both S tones meet the structural description of S Spread on the same cycle, and that in the absence of other factors eliminating one tone or the other, S Spread iterates from right to left, choosing the rightmost eligible target.

By the end of Cycle 2 the derivation of Case A is complete, and the concatenation of the third p-phrase adds no information crucial to deciding the outcome of the competition between S_1 and S_2 . Since the structural description of S Spread is met for both tones on the same cycle, this example does not present any cyclic rule orderings. Rather, it serves as a control for the other two derivations by showing that the unmarked outcome of the Rival H Configuration is for S_2 to spread, producing a S tone on the third syllable after Ndelya-ngo on the surface.

3.1.3. Case B: S Spread bleeds itself through cyclicity

In Case B, the H of mburu is already accented, and so undergoes Final Raising on Cycle 2 without the intercession of Accent Retraction. When S Spread applies, it has no choice: It cannot spread S_2 ,

because S_2 is followed by only a single syllable. The additional toneless syllable that S_2 needs to see in order to spread will not be visible to p-level rules until the next cycle. In the meantime, however, S_1 is free to spread, as it is followed by S_2 and a toneless syllable. In spreading, S_1 causes S_2 to delink. By the time the environment for S_2 to spread finally appears on the third cycle, it is too late: S_2 is no longer linked to any syllable and so cannot spread. As a result only two S-toned syllables follow Ndelya-ngo in the surface form of Case B, and the third following syllable bears L tone.

This cyclic analysis of Case B accomplishes the desired effect of allowing S Spread to apply once on Cycle 2, bleeding its own reapplication on Cycle 3. It is necessary to assume that S Spread tries to apply twice in the derivation, since in this case reapplication cannot be the result of iteration: We have already established in Case A that iterative reapplication of S Spread proceeds from right to left. Without cyclicity, therefore, we would need to assume S Spread iterates from left to right in Case A, but from right to left in Case B. This would inappropriately increase the power of the grammar, allowing direction of iteration for a given rule to be determined by placement of a phrase boundary within the string to which the rule applies.

Another way of avoiding cyclicity would be to eliminate one of the potential targets from the competition. In Case B, a blocking relationship between the two S tones would be ineffective, since in this case it is S_2 that we want to prevent from spreading. Our only

recourse would be to propose that the presence of a p-boundary between the second and third syllables blocks the rule, but not a p-boundary between the first and second syllables.

We can reject such a proposal for two reasons. To start with, it would be very awkward to state this condition, given that we would still need to allow for a boundary between the first and second syllables:

(10) S SPREAD (non-cyclic, with boundary prohibition
between the second and third syllables)

$\begin{array}{c} \sigma \quad \sigma \quad Y \quad (\sigma) \\ \downarrow \quad \diagdown \\ S \end{array}$	$\begin{array}{l} Y \neq]_p[\\ Y \neq \sigma^p \end{array}$
--	---

A more compelling reason for rejecting this analysis, though, is empirical: The presence of a boundary between the two following syllables in fact does not block S Spread, as can be seen in (11), repeated from example (64a) of Chapter 2, where mburu is not preceded by a S:

(11) $\begin{array}{c} \text{Ngilewona mburu} \\ \text{S H H H} \end{array} \begin{array}{c} * \\ \text{ukou} \\ \text{H} \end{array} \begin{array}{c} \text{p} \\ \text{p} \end{array}$

Cycle 1:

$\begin{array}{c} \text{Ngilewona mburu} \\ \text{S H H S} \end{array} \begin{array}{c} * \\ \text{p} \end{array}$

FINAL RAISING

Cycle 2:

$\begin{array}{c} \text{Ngilewona mburu} \\ \text{S H H S} \end{array} \begin{array}{c} * \\ \text{ukou} \\ \text{H} \end{array} \begin{array}{c} \text{p} \\ \text{p} \end{array}$

S SPREAD

Ngilēwona mbūru ukòŭ

DEFAULT, TONE SHIFT

'I saw a goat yesterday'

Given the failure of an absolute condition, we would have to set up a hierarchy of configurations to which S Spread would preferentially attempt to apply, as I have illustrated in (12).

(12) S SPREAD (non-cyclic, with disjunctively ordered phrasing conditions)

a. $\begin{array}{c} \sigma X \sigma Y \textcircled{\sigma} \\ \text{L} \\ \text{S} \end{array} \text{p}$

$X, Y \neq \text{p}$
 $X, Y \neq \sigma$

b. $\begin{array}{c} \sigma \text{p} \sigma Y \textcircled{\sigma} \\ \text{L} \\ \text{S} \end{array}$

$Y \neq \text{p}$
 $Y \neq \sigma$

c. $\begin{array}{c} \sigma \sigma \textcircled{\sigma} \\ \text{L} \\ \text{S} \end{array}$

S Spread would, in this analysis, first scan the utterance for the string shown in (12a), where no p-boundaries may intervene between any of the syllables meeting the structural description of S Spread. This

would guarantee that it would pick S_2 first in Case A. In Case B, S Spread would find no strings satisfying version (12a), and so would move on to look for (12b), which it would find in the three syllables beginning with S_1 . This would correctly force S Spread to choose S_1 in Case B. Finally, the apparent indifference of S Spread to phrase boundaries in noncompetitive contexts such as (11) would follow from the availability of a third, phrasing-neutral option, (12c), as a last resort when structures matching the descriptions in (12a-b) could not be found.

As example (12) shows, it would be necessary to incorporate this hierarchy of phrasing conditions into the structural description of S Spread using disjunctive ordering of the sort found in expansions of SPE-style stress rule statements. However, the advent of metrical theory and underspecification have rendered unnecessary most examples of disjunctivity in phonological rule statements. Furthermore, even according to the evaluation metric traditionally applied to disjunctive rule environments, (12) fails: Unlike the stress rules of SPE, the disjunctive parts of (12) would be impossible to collapse into a single formula using parentheses.

Yet another problem is that the correlation between location of boundary and order in the hierarchy of (12) is totally arbitrary. One might, for example, expect a progression from a p-phrase after the third syllable in (12a) to one after the second syllable in (12b), and not until (12c) a p-phrase after the first syllable. Cyclicity, on the other hand, offers a principled and natural account, with no complications added to S Spread, for why only a boundary located after

the third syllable of the Rival S Configuration blocks spreading of S_2 . We may conclude, then, that there is no noncyclic analysis which can account for the facts of both Case A and Case B without doing violence to present or even past notions of what constitutes a constrained theory of phonological rules.

3.1.4. Case C: An ordering paradox between S Lowering and S Spread

In Case C, just as in Case B, S Spread cannot apply on Cycle 2 to S_2 because there are not enough syllables following it in the domain of Cycle 2 to meet the structural description of S Spread. However, while in Case B only the second syllable is unavailable, in Case C both syllables are absent. By the same token, while in Case B S_1 has just enough following syllables to satisfy S Spread, in Case C S_1 is followed by only one syllable. As a result, in Case C S Spread cannot apply to either tone on Cycle 2, because the structural description for S Spread will not be met for either of them until Cycle 3.

Before S Spread has a chance to reapply on Cycle 3, however, S_1 undergoes S Lowering on Cycle 2, since it is followed on the next syllable by a [+high] tone that has not been eliminated by S Spread. The resulting H!S sequence in p-final position then triggers Flop (recall again that S is a H tone with the added feature [+raised]), which shifts S_1 , now a H, backward one syllable and spreads the now downstepped S_2 to the syllable vacated by S_1 . This is why the downstep in Case C surfaces one syllable earlier than might otherwise have been expected.

While in Case A S_2 spreads because both S_1 and S_2 are eligible for S Spread on Cycle 3 and S Spread iterates leftward, in Case C S_2 spreads because neither tone is eligible on Cycle 2, with the result that S_1 is taken out of the running by S Lowering, and on Cycle 3 S_2 stands unopposed. Thus technically the outcome of Case C is not a consequence of right-to-left iteration, which would have also favored S_2 , but rather results from the fact that S Lowering on Cycle 2 has bled S Spread of potential input on Cycle 3, leaving S_2 as its only target. Within the same p-phrase, however, S Lowering does not bleed S Spread, but is instead bled by that rule, as was shown in 2.4.2. Thus Case C presents a marginal example of an ordering paradox between S Spread and S Lowering.

This second ordering paradox can be brought into focus if we eliminate the possibility that the spreading of S_2 is what bleeds S Spread's application to S_1 . We can do that by only allowing a single toneless syllable to follow S_2 , so that the environment for S Spread is met only for S_1 . This can be accomplished by substituting a LH adverb such as ngama 'tomorrow' for the LLH adverb ukou in the frame for Case C. The H on the second syllable of ngama will block S Spread from applying to S_2 , but will not prevent the rule from spreading S_1 .

(13) $\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngama} \\ \text{H} \end{array} \begin{array}{c} | \\ \text{p} \end{array}$

Cycle 1:

$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

FINAL RAISING

Cycle 2:

$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

FINAL RAISING

n/a

S SPREAD

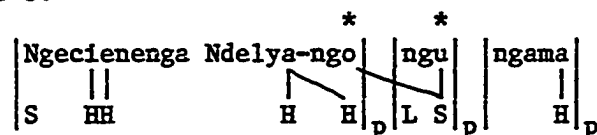
$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{L} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

S LOWERING

$\begin{array}{c} \text{Ngecienenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{H} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{L} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array}$

FLOP

Cycle 3:



n/a

S SPREAD

U-Level:

"Ngeciénéngà Ndèlyà-ngo 'ngu ngamã

tone shift, default

*Ngeciénéngà Ndèlyà-ngo ngu ngamã

'I'll give Ndelya-ngo firewood tomorrow'

As the outcome of (13) shows, whether S_2 spreads or not has no bearing on whether S_1 spreads in the phrasing context represented in Case C. Rather, the brevity of the second cyclic domain both prevents S_1 from spreading and produces the environment for Flop once S Lowering has applied to S_1 . S Lowering is therefore responsible for bleeding S Spread's application to S_1 on Cycle 3.

Thus we have an ordering paradox of the form A-B-A, in which a rule (S Spread) must both precede and follow another rule (S Lowering).

A noncyclic analysis of Case C would have to follow the same pattern as that proposed for Case B. The same disjunctive statement of environments for S Spread given in (12) for Case B would be required -- in this case (12a) would fail, but (12b) would find a match in the three syllables beginning with S_2 . After S Spread applied, S Lowering would lower S_1 and Flop would shift S_1 and spread S_2 . However, the objections to (12) just raised in Case B would hold equally in this instance.

None of the disjunctive parts of (12), however, would be able to account for the failure of S Spread to apply in (13), since in (13) it is not another application of S Spread which bleeds S Spread. Here, without cyclicity, S Lowering could not precede S Spread to bleed it. Rather, an absolute condition would have to be added to the already complex disjunctive statement of S Spread in (12), prohibiting it from applying when boundaries intervene between all three syllables in the rule's structural description:

(14) S SPREAD (non-cyclic, further revised to include (13))

- a. $\begin{array}{c} \sigma \text{ X } \sigma \text{ Y } \textcircled{\sigma}]_p \\ \text{---} \text{---} \text{---} \\ \text{L} \\ \text{S} \end{array}$ $\begin{array}{l} \text{X, Y} \neq]_p[\\ \text{X, Y} \neq \sigma^p[\end{array}$
- b. $\begin{array}{c} \sigma]_p[\sigma \text{ X } \textcircled{\sigma} \\ \text{---} \text{---} \text{---} \\ \text{L} \\ \text{S} \end{array}$ $\begin{array}{l} \text{X} \neq]_p[\\ \text{X} \neq \sigma^p[\end{array}$
- c. $\begin{array}{c} \sigma \sigma \textcircled{\sigma} \\ \text{---} \text{---} \text{---} \\ \text{L} \\ \text{S} \end{array}$
- d. CONDITION ON ALL SUBCASES: $\begin{array}{c} * \sigma]_p[\sigma]_p[\textcircled{\sigma} \\ \text{---} \text{---} \text{---} \\ \text{L} \\ \text{S} \end{array}$

The absolute prohibition in (14d), however, makes an incorrect prediction when the syllable immediately following the S is toneless. As can be seen in (15) below, the presence of p-boundaries between each of the three relevant syllables does not prevent S Spread from applying if the second syllable is toneless. (The L-toned monosyllable is a reduced demonstrative which, by virtue of its status as a specifier, does not phrase with the preceding noun. It also fails to phrase with the following adverb, as it does not p-govern the

adverb.)

(15) $\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H H} \\ \text{p p H p} \end{array}$

Cycle 1:

$\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H H} \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H S} \\ \text{p} \end{array}$

FINAL RAISING

Cycle 2:

$\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H S} \\ \text{p p} \end{array}$

n/a

S SPREAD

n/a

S LOWERING

n/a

FLOP

Cycle 3:

$\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H S} \\ \text{p p H p} \end{array}$

$\begin{array}{c} * \\ \text{Ngilewona uku} \\ \text{S H H S} \\ \text{p p H p} \end{array}$

S SPREAD

U-level:

Ngilêwóná ùkù lù ùkòŷ

TONE SHIFT, DEFAULT

'I saw this piece of firewood yesterday'

In a cyclic analysis, the difference between (13) and (15) is

straightforward: After S Spread fails to apply on Cycle 2, the conditions for S Lowering are met only in (13). In (15) the immediately following syllable is L-toned, and while by itself that syllable is insufficient to trigger S Spread, it triggers no other rules that destroy the environment for S Spread's reapplication on Cycle 3. A noncyclic analysis could not attribute the difference between (13) and (15) to interaction with S Lowering, and so would have no recourse other than to encumber the statement of S Spread with yet another ad hoc stipulation. The condition added in (14d) would have to be modified so that it only applied if the syllable immediately following the S bore H tone:

(16) S SPREAD (non-cyclic, revised to include both (13) and (15))

- a. $\begin{array}{c} \sigma X \sigma Y \textcircled{S}]_p \\ \swarrow \quad \searrow \\ L \quad \quad \quad \\ S \end{array}$ $\begin{array}{l} X, Y \neq]_p[\\ X, Y = \sigma^p[\end{array}$
- b. $\begin{array}{c} \sigma]_p[\sigma X \textcircled{S} \\ \swarrow \quad \searrow \\ L \quad \quad \quad \\ S \end{array}$ $\begin{array}{l} X \neq]_p[\\ X \neq \sigma^p[\end{array}$
- c. $\begin{array}{c} \sigma \sigma \textcircled{S} \\ \swarrow \quad \searrow \\ L \quad \quad \quad \\ S \end{array}$
- d. CONDITION ON ALL SUBCASES: $\begin{array}{c} * \sigma]_p[\sigma]_p[\textcircled{S} \\ \swarrow \quad \searrow \quad \uparrow \\ L \quad \quad \quad H \\ S \end{array}$

Given the crucial orderings among its subparts, (16) or its earlier version in (12) is equivalent to having three separate rules of S Spread each of which is subject to the same ad hoc constraint which applies to no other rules in the language, and which follows from no

general linguistic principles.

3.1.5. Conclusions

In summary, any noncyclic analysis of the Rival H Configuration must explain, without being able to temporarily eliminate the third p-phrase from the domain of rule application, why S Spread's choice of target depends on the number of syllables in the second cyclic domain. As we have seen, this involves drastically encumbering the rule of S Spread with a set of disjunctively ordered conditions on intervening p-boundaries. A cyclic analysis, on the other hand, allows us to derive the correct results without modifying S Spread or any other rule, since it allows the phonology access to progressively larger domains according to a straightforward, syntactically motivated parsing procedure. This has the desired effect of restricting the input to S Spread in exactly the cases where it does not apply.

The choice, therefore, is clear: either the cumbersome rule (or rules) of S Spread in (16) without cyclicity, or the simple rule of S Spread in example (65) of Chapter 2, along with the assumption that rules apply cyclically to multiphrasal strings -- an assumption that falls out naturally if we assume that phonological rules automatically apply whenever structure is created or reorganized.

We have seen motivation for two cyclic orderings in this section: In example (9), Case B, S Spread must apply first on Cycle 2, bleeding its own reapplication on Cycle 3. This reverses the normal right-to-left direction in which S Spread bleeds itself through noncyclic iteration (Case A). In Case B of example (9) and in example (13), S

Lowering applies on Cycle 2, bleeding S Spread on Cycle 3. This contradicts the normal case in which S Spread bleeds S Lowering on the same cycle.

3.2. Argument #2: Reduced demonstratives (H Attachment, Accent Retraction)

3.2.1. Derived input to Accent Retraction

Another configuration diagnostic of cyclicity is one in which an accented toneless syllable is immediately preceded by a syllable whose [+H] tone is not lexical, but was placed there by H Attachment. Such a configuration is exemplified in two variants in (17), where the H* in (17a) represents the diacritically marked accentual H tone added by H Attachment, and the S* in (17b) is the form that tone takes after undergoing Final Raising:

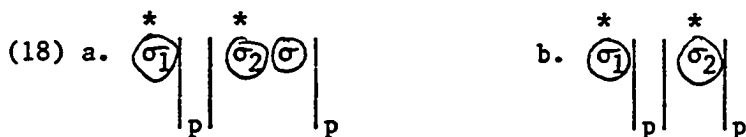


Either configuration in (17) meets the structural description of Accent Retraction, since S is in fact a H tone with the added feature [+raised]. As we will see shortly, Accent Retraction does apply in this configuration. From that we may conclude that H Attachment feeds Accent Retraction. Yet normally it is Accent Retraction that feeds or bleeds H Attachment (see 2.4.2). This scenario therefore results in an A-B-A ordering paradox on the basis of which an argument for cyclicity can be built.

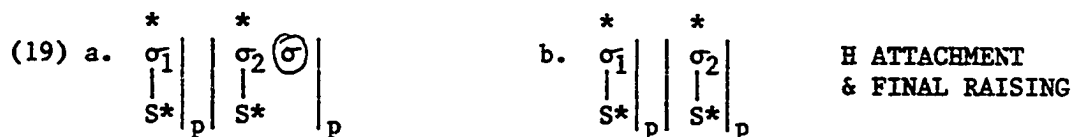
In order to set up an actual example of this paradox, we need at least a word boundary between the two syllables, since no words of Kivunjo are lexically derived with more than one accent. However, as we have seen in 2.4.3, accent is deleted from non-p-final words. Thus there must be a p-boundary between σ_1 and σ_2 in order for σ_1 's accent

to survive. The p-boundary must also be present for a H* to be attached to σ_1 .

Turning now to the second syllable, our only way of telling whether Accent Retraction has applied is to place σ_2 in a position where it meets the structural description for H Attachment, and then to observe whether Accent Retraction bleeds H Attachment. In order to be eligible for H Attachment, σ_2 must be either p-phrase-penultimate, followed by another toneless syllable, or p-final. Due to the nature of the lexical Stem Accent Rule, we will never find an accented toneless syllable farther back in the p-final word than the penult. In either event σ_2 must be contained within the p-final word, otherwise Accent Reduction will deaccent it. Thus the source of σ_2 must be a one-word p-phrase containing either a penultimate-accented toneless disyllable or an accented toneless monosyllable, as shown in (18).

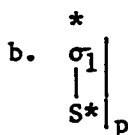
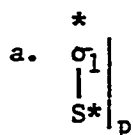


If both of the p-phrases in (18) underwent p-level rules simultaneously, we would expect Accent Retraction not to apply, since in noncyclic contexts Accent Retraction must precede H Attachment. Thus we would expect (18a) and (18b) each to receive two H* tones, raised to S* by Final Raising, as shown in (19):



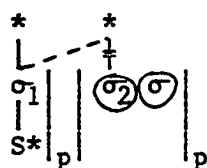
If, on the other hand, the first p-phrase undergoes p-level rules on an earlier cycle than the second, we predict that the S* of σ_1 will trigger retraction of σ_2 's accent, bleeding H Attachment.

(20) Cycle 1:



H ATTACHMENT
& FINAL RAISING

Cycle 2:



n/a



n/a

ACCENT
RETRACTION

H ATTACHMENT

The accent of σ_1 will presumably absorb the retracted accent, much as a contour consisting of two identical tones is indistinct from a single tone.

$$(21) \quad \begin{array}{c} \sigma \\ \wedge \\ H \quad H \end{array} = \begin{array}{c} \sigma \\ | \\ H \end{array} \quad \begin{array}{c} * \quad * \\ \vee \\ \sigma \end{array} = \begin{array}{c} * \\ | \\ \sigma \end{array}$$

If we are to distinguish between the surface outcomes of the predicted forms in (19) and (20), there must be enough following toneless syllables for a S attached to either σ_1 or σ_2 to undergo S Spread:

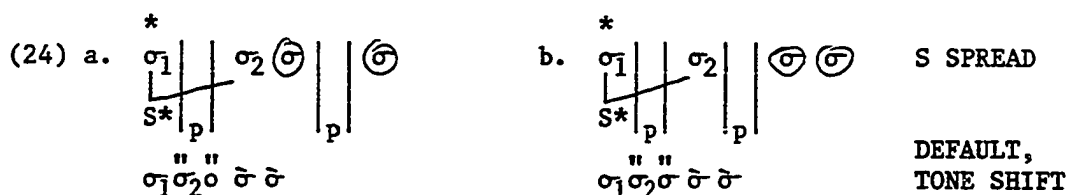
(22) Cyclic outcome:



(23) Noncyclic outcome:

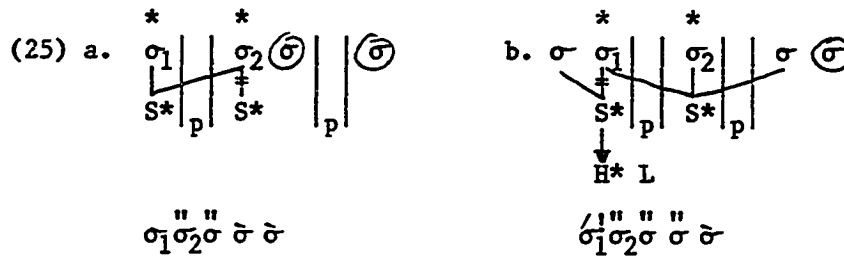


The cyclic examples in (22) are straightforward: in both forms the S attached to σ_1 will spread one syllable rightward, so that the rightmost extent of S on the surface after Tone Shift will be on the first syllable after σ_2 , as shown in (24).

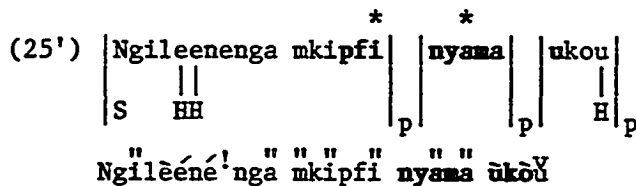


The outcome of the noncyclic derivations in (23), however, is slightly more complicated. A pair of adjacent S tones followed by a pair of toneless syllables matches the description of the Rival S Configuration discussed in 3.1.1. (23a) corresponds in its phrasing to Case B, and (23b) to Case C. In (23a), therefore, we know that the S attached to σ_1 will spread at the expense of the S attached to σ_2 , with the result that the rightmost extent of S on the surface after Tone Shift will be on the first syllable that follows σ_2 . In (23b), however, it is the S attached to σ_2 that spreads, so that the rightmost extent of S on the surface in that case will be on the second syllable after σ_2 . The S attached to σ_1 will undergo S Lowering and

Flop.



If we compare (24) and (25), it is clear that in the (a) examples the cyclic and noncyclic analyses make identical predictions. Thus, regardless of our assumptions about cyclicity, we correctly predict that the underlying structure in (18a) will surface with S tone extending one syllable past σ_2 . In the example given below, σ_2 is the first syllable of nyama, and the immediately following syllable, ma, is in fact the rightmost extent of S tone on the surface.

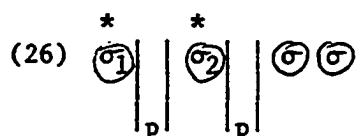


'I gave the big, ugly wasp meat yesterday'

In the (b) examples of (24-25), however, the two analyses make distinct predictions: In the noncyclic analysis we expect to see a surface downstep between σ_1 and σ_2 , and S tone extending two syllables after σ_2 , while in the cyclic analysis we expect no downstep, and S extending only one syllable after σ_2 .

Thus in order to decide which analysis is correct, only data from

the (b) configuration will be of use. I illustrate the underlying tone-accent-phrasing configuration we need to create in example (26):



The presence of two p-boundaries in (26) indicates that the test utterance will need to comprise at least three p-phrases. To supply σ_1 we need a final-accented toneless word such as kipfi. To supply the last two toneless syllables in (26) we can use the adverb ukou, just as we did in exemplifying the Rival S Configuration in 3.1.1. For σ_2 , we need a toneless, accented monosyllable. There are no toneless monosyllabic nouns in Kivunjo, so we cannot create (26) out of a double object construction as we did in 3.1.1. Fortunately, however, there is a class of phonologically reduced demonstratives that are toneless, accented monosyllables. Although they follow the noun just as a noun's modifiers and complements do, Kivunjo demonstratives anomalously phrase apart from the noun, apparently because of their special status as specifiers (see Appendix C for more discussion of this). Thus if we place a reduced demonstrative after kipfi we will obtain the first two syllables of (26) along with the desired p-boundary between σ_1 and σ_2 . Since the demonstrative does not p-govern the following adverb ukou, it is followed by a p-boundary as well, providing the second p-boundary needed in (26).

(27)
$$\begin{array}{c} * \\ \dots \text{mkipfi} \left| \begin{array}{c} | \\ \text{cu} \\ | \\ \text{p} \end{array} \right| \left| \begin{array}{c} | \\ \text{ukou} \\ | \\ \text{H} \\ | \\ \text{p} \end{array} \right| \end{array} \quad \text{'...this big, ugly wasp yesterday'}$$

To make a complete utterance, the NP mkipfi cu 'this big, ugly wasp' and the adverb ukou must be complements of a verb. Thus our test case for cyclicity between H Attachment and Accent Retraction is the sentence in (28):

(28)
$$\begin{array}{c} * \quad * \\ \left| \begin{array}{c} \text{Ngilewona} \\ | \\ \text{S} \end{array} \right| \left| \begin{array}{c} \text{mkipfi} \\ | \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{H} \\ | \\ \text{H} \end{array} \right| \left| \begin{array}{c} | \\ \text{cu} \\ | \\ \text{p} \end{array} \right| \left| \begin{array}{c} | \\ \text{ukou} \\ | \\ \text{H} \\ | \\ \text{p} \end{array} \right| \end{array} \quad \begin{array}{l} \text{'I saw this big, ugly} \\ \text{wasp yesterday'} \end{array}$$

3.2.2. The tone and accent of reduced demonstratives

While the tone-accent patterns of mkipfi and ukou are familiar from Chapter 2, that of the reduced demonstrative is not. Thus, before going through the derivation of (28), we must first consider the evidence that reduced demonstratives are in fact toneless and accented, and that they phrase separately from the preceding noun. For convenient reference, I tabulate the segmental forms that reduced demonstratives take in the 16 noun classes, alongside their full counterparts. In the case of 'this', the reduced form of the demonstrative consists of a bare agreement morpheme with no stem. The reduced forms of both 'this' and 'that (by you/previously referred to)' exhibit uniform tonal-accentual behavior regardless of their noun class.

(29) Reduced and full demonstrative agreement paradigm

Noun Class	'this'		'that (by you, or previously referred to)'	
	reduced	full	reduced	full
1	cu	icu	co	ico
2	wa	iwa	wo	iwo
3	cu	icu	co	ico
4	i	ii	yo	iyo
5	lyi	ilyi	lyo	ilyo
6	gha	igha	gho	igho
7	ki	iki	kyo	ikyo
8	shi	ishi	sho	isho
9	i	ii	yo	iyo
10	tsi	itsi	tso	itso
11	lu	ilu	lo	ilo
12	ka	ika	ko	iko
14	ku	iku	ko	iko
15	(w)u	i(w)u	wo	iwo
16	ha	iha	ho	iho
17	ku	iku/kunu	ko/pfo	ipfo

To begin with, we know that the reduced demonstrative is toneless because of its behavior in u-final position. Consider the reduced demonstrative that follows the class 9 noun numba in (30):

(30) $\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{Ngilewona} & \text{numba} & \end{array} \right| \begin{array}{c} | \\ i \\ | \end{array} \\ \left| \begin{array}{ccc} \text{S} & \text{H} & \text{H} \end{array} \right| \begin{array}{c} | \\ \text{H} \\ | \end{array} \begin{array}{c} | \\ \text{p} \\ | \end{array} \end{array}$

$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{Ngilewona} & \text{numba} & \end{array} \right| \begin{array}{c} | \\ i \\ | \end{array} \\ \left| \begin{array}{ccc} \text{S} & \text{H} & \text{H} \end{array} \right| \begin{array}{c} | \\ \text{H} \\ | \end{array} \begin{array}{c} | \\ \text{p} \\ | \end{array} \end{array}$

ACCENT RETRACTION

$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{Ngilewona} & \text{numba} & \end{array} \right| \begin{array}{c} | \\ i \\ | \end{array} \\ \left| \begin{array}{ccc} \text{S} & \text{H} & \text{H} \end{array} \right| \begin{array}{c} | \\ \text{S} \\ | \end{array} \begin{array}{c} | \\ \text{p} \\ | \end{array} \end{array}$

FINAL RAISING

"Ngilêwóná nùmbà í

DEFAULT, TONE (& ACCENT)
SHIFT, DEMOTION

'I saw this house'

If the reduced demonstrative were underlyingly H-toned, we would expect the following incorrect derivation:

(31)	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \\ \begin{array}{|c|c|c|} \hline \text{S} & \text{H} & \text{H} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{H} \\ \hline \end{array} \begin{array}{|c|} \hline \text{p} \\ \hline \end{array} \end{array} \quad \begin{array}{|c|} \hline \text{i} \\ \hline \end{array} \begin{array}{|c|} \hline \text{H} \\ \hline \end{array} \begin{array}{|c|} \hline \text{p} \\ \hline \end{array}$	
	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \\ \begin{array}{|c|c|c|} \hline \text{S} & \text{H} & \text{H} \\ \hline \end{array} \quad \begin{array}{|c|} \hline \text{H} \\ \hline \end{array} \begin{array}{|c|} \hline \text{p} \\ \hline \end{array} \end{array} \quad \begin{array}{|c|} \hline \text{i} \\ \hline \end{array} \begin{array}{|c|} \hline \text{S} \\ \hline \end{array} \begin{array}{|c|} \hline \text{p} \\ \hline \end{array}$	FINAL RAISING
	*Ngilēwóná nũmbā í	DEFAULT, TONE SHIFT, DEMOTION

In the above examples, u-final Demotion cancels out the effects of Final Raising, so that we cannot tell whether the reduced demonstrative carries an accent. In order to detect the reduced demonstrative's accent, we need to place the NP numba i 'this house' in junctural position:

(32)	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	
	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	ACCENT RETRACTION
	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{S} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	FINAL RAISING
	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{S} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	S SPREAD
	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{S} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	DEFAULT, TONE SHIFT
	<p>"Ngilèwóná nùmbà í ukòŸ</p> <p>'I saw this house yesterday'</p>	

If the demonstrative were unaccented we would expect the incorrect derivation in (33), in which no raising takes place:

(33)	$\begin{array}{c} \text{Ngilewona} \quad \text{numba} \quad | \quad | \quad | \quad \text{ukou} \\ \text{S} \quad \text{H} \quad \text{H} \quad \quad \text{H} \quad | \quad | \quad | \quad \text{H} \\ \text{p} \quad \quad \quad \text{p} \quad \quad \quad \text{p} \end{array}$	
n/a		ACCENT RETRACTION
n/a		FINAL RAISING
n/a		S SPREAD
	$\text{*Ngilèwóná nùmbà í ukòŸ}$	DEFAULT, TONE SHIFT

As for phrasing, the correct tones in (30) and (32) could be derived even in the absence of a p-boundary between the noun and the reduced demonstrative. The accent from the demonstrative would still retract, feeding Final Raising in (30) and (32) and Demotion in (30).

(34) Sentence frame: Ngilewona _____ ukou 'I saw _____ yesterday'

a. ...leeri | tsi | ukou |
 | | |
 H p H p

b. ...msulri | cu | ukou |
 | | |
 p p H p

*
...leeri |
|
H |

*
...leeri |
 V
 S |
 p

*
...msulri

```

      *
...msulri
      |
      S*

```

* RETRACTION,
H ATTACHMENT,
FINAL RAISING,
S SPREAD

$$\begin{array}{ccccc} & * & & * & \\ \dots & \text{leeri} & | & | & \text{tsi} & | \\ & \vee & & & & \\ & \text{s} & & & & \\ & & | & | & & | \\ & & \text{p} & & & \text{p} \end{array}$$

$$\begin{array}{ccccc} & * & & * & \\ \dots & \text{leeri} & | & | & \text{tsi} & | \\ & \vee & & & | & \\ & s & | & p & s^* & | \\ & & & & & p \end{array}$$

```

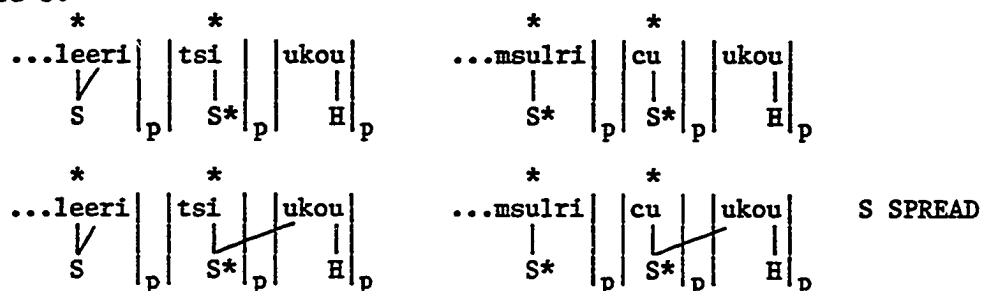
      *      *
...msulri| |cu|
      |   |   |
      S*  |   |
          p   p

```

$$\begin{array}{ccccc} & * & & * & \\ \dots msulri & | & & | & cu & | \\ & | & & | & | & \\ & S^* & & & S^* & \end{array}$$

183

Cycle 3:

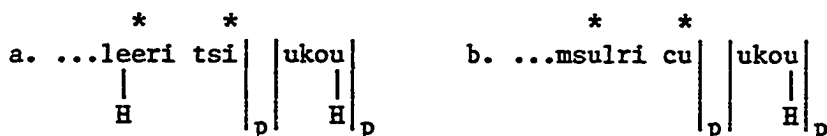


U-level:

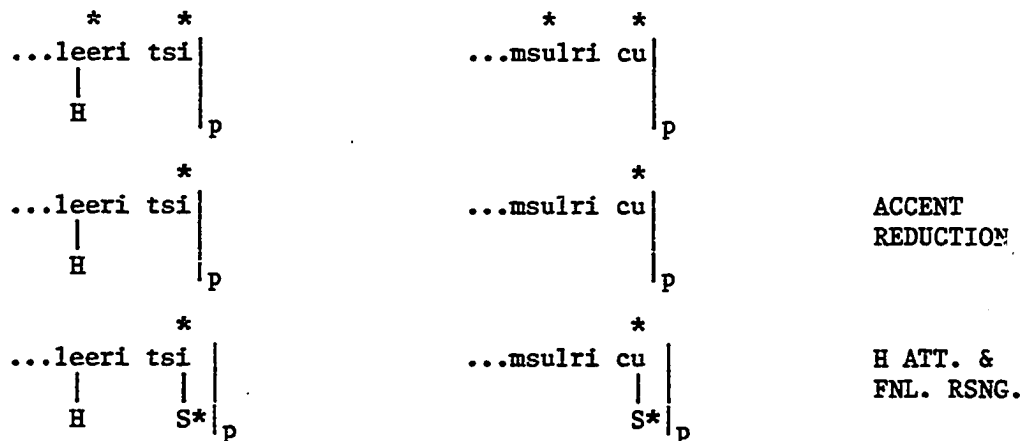
$\dots l\ddot{e}eri \text{ ' } tsi \text{ ' } ukou \text{ ' } \ddot{u}$	$\dots !\ddot{m}sulri \text{ ' } !cu \text{ ' } ukou \text{ ' } \ddot{u}$	DEFAULT, H* SPREAD, TONE SHIFT
'...this money (Class 10) yesterday'	'...this nobleman (Class 1) yesterday'	

If these forms lacked a p-boundary between the noun and the demonstrative, only the demonstrative could undergo raising rules, and we would expect the incorrect outcomes in (35):

(35) Sentence frame: **Ngilewona** ___ **ukou** 'I saw ___ yesterday'



Cycle 1:



...leeri tsi | ukou |
 | | |
 H S*_p H_p

$$\begin{array}{ccccc} & & * & & \\ \dots msulri & cu & | & | & ukou \\ & | & & & | \\ & S^* & | & & H \\ & & p & & p \end{array}$$

...leeri tsi | | ukou |
 | | |
 H S* p H p

...msulri cu | | ukou |
 S* | | H |
 p | | p

*...lèé! rǐ tsi' ukou'v

*...! " " " " " "v
msulri cu ukou

(28)

Ngilewona			mkipfi	
	H	H		
S				

cu	
p	

ukou	
	H
	p

 'I saw this big, ugly wasp yesterday'

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the surface after Tone Shift.

- (36) a. Cyclic outcome: Ngilèwóná 'mkipfi cu ukòŷ
 b. Noncyclic outcome: *Ngilèwóná 'mkipfi 'cu ukòŷ

The asterisk preceding the form in (36b) indicates that the noncyclic analysis produces an ungrammatical result. Thus we may conclude that the cyclic derivation given in (37) below is the correct derivation of the surface form of (28):

(37) $\left| \begin{array}{c} \text{Ngilewona mkipfi} \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array} \left| \begin{array}{c} \text{cu} \\ \text{p} \end{array} \right| \begin{array}{c} * \\ \text{ukou} \\ \text{H} \end{array} \left| \begin{array}{c} \text{p} \end{array} \right|$

Cycle 1:

$\left| \begin{array}{c} \text{Ngilewona mkipfi} \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array}$

$\left| \begin{array}{c} \text{Ngilewona mkipfi} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{S}^* \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array}$

H ATTACHMENT &
FINAL RAISING

Cycle 2:

$\left| \begin{array}{c} \text{Ngilewona mkipfi} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{S}^* \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array} \left| \begin{array}{c} \text{cu} \\ \text{p} \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array}$

$\left| \begin{array}{c} \text{Ngilewona mkipfi} \\ \text{S} \quad \text{H} \quad \text{H} \quad \text{S}^* \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array} \left| \begin{array}{c} \text{cu} \\ \text{p} \end{array} \right| \begin{array}{c} * \\ \text{p} \end{array}$

ACCENT RETRACTION

n/a — no accented toneless syllable H ATTACHMENT

Cycle 3:

			*					
|	Ngilewona	|	kipfi	|	cu	|	ukou	|
|	S	|	H H	|	S*	|	H	|
				p	p		p	

			*					
|	Ngilewona	|	kipfi	|	cu	|	ukou	|
|	S	|	H H	|	S*	|	H	|
				p	p		p	

S SPREAD

U-level:

Ngilèwona 'mkipfi cu ukòv

DEFAULT, H* SPREAD,
TONE SHIFT

'I saw this big, ugly wasp yesterday'

As can be seen in (37), H Attachment applies first to σ_1 on Cycle 1, feeding Accent Retraction on Cycle 2, which in turn must precede H Attachment on Cycle 2 in order to bleed its reapplication to σ_2 .

(38) Cycle 1: H Attachment

Cycle 2: Accent Retraction

H Attachment

This is a standard A-B-A ordering paradox, where one rule (H Attachment) can be shown to be crucially ordered both before and after another rule (Accent Retraction) in the same derivation. If H Attachment did not precede Accent Retraction on Cycle 1, the H* it inserts could not feed Accent Retraction. If, however, Accent Retraction did not precede H Attachment on Cycle 2, we would expect the accented toneless syllable of cu to receive a H* of its own.

To derive the same result, a noncyclic analysis of (37) would have to dispense with one of the crucial orderings in (38). It could not eliminate the ordering of Accent Retraction before H Attachment,

because this ordering is necessary to prevent H* from being attached to immediately post-H toneless accented syllables in normal contexts, as was shown in 2.4.2. Thus a noncyclic analysis must eliminate the ordering of H Attachment before Accent Retraction: Some other reason must be found for the retraction of accent from σ_2 onto σ_1 or for the failure of H Attachment to apply to σ_2 .

One way of doing this would be to attribute the retraction of accent off of σ_2 in (37) to the presence of accent, rather than H tone, on σ_1 . This would release Accent Retraction from any crucial ordering with respect to H Attachment on σ_1 , so that the only crucial ordering between the two rules would be that needed to bleed H Attachment on σ_2 . In order to make accent a possible trigger of Accent Retraction in addition to H tone, however, we would have to augment the rule so that it could apply in either of the environments shown in (39a-b) below.

(39) ACCENT RETRACTION (revised to allow accent as trigger)

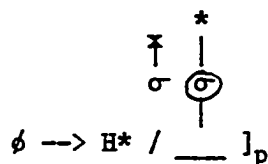


For the data in (37) it is not necessary to order the two structural descriptions in (39) disjunctively, yet it is also not possible to collapse them into a single formula since accent and tone are represented on different tiers. Thus we are left with either a single rule of Accent Retraction with two possible structural descriptions, as in (39), or two similar but separate rules of Accent Retraction. Either

analysis represents an undesirable augmentation of the grammar compared with a cyclic analysis, in which no new rules or modifications of existing rules are necessary.

An alternative to modifying Accent Retraction would be to build into the statement of H Attachment the blocking effect that the accent of σ_1 has on H Attachment to σ_2 . This could be done by adding the stipulation that the syllable immediately preceding the targeted accented toneless syllable not bear accent:

(40) H ATTACHMENT (revised not to apply in posttonic position)



There are two major problems with such an approach. First, (40) adds an ad hoc constraint to the statement of H Attachment. Why should accent on an adjacent syllable have such a blocking effect? In particular, why the syllable preceding? An immediately preceding accent is not a barrier to adjacency with the p-boundary: the H* can attach to the toneless accented syllable without crossing the association line between the penultimate accent and its syllable. Without the condition in (40), though, H Attachment patterns with Final Raising in being a simple rule that matches up the prominence feature of accent with the tonally prominent features [+high] and [+raised], subject only to an adjacency requirement and a prohibition on crossing association lines and contour tones.

Secondly, if in order to eliminate an ordering paradox with Accent Retraction, we are to allow an immediately preceding accented syllable to block application of H Attachment, there is no reason not to add a condition allowing an immediately preceding H-toned syllable to block H Attachment, thereby eliminating the need for Accent Retraction altogether. Recall, however, that the motivation for Accent Retraction as a separate rule comes from the fact that it not only bleeds H Attachment, but also feeds Final Raising. Thus in order to incorporate Accent Retraction into H Attachment we would be required to incorporate it into Final Raising as well. This would in effect sacrifice the generalization embodied by Accent Retraction to a desire not to allow phonological rules to apply cyclically. Here, as in the case of the Rival S Configuration, the choice is between two package deals: cyclic application of simply stated rules, or non-cyclic application of rules encumbered with numerous ad hoc conditions.

3.3. Argument #3: Strong juncture (H Attachment, S Spread and Accent Retraction)

3.3.1. Strong juncture

Additional evidence for cyclic interaction between H Attachment and Accent Retraction may be found in a subcase of the junctural sandhi context that I will call "strong" juncture. Syntactically, the difference between "strong" and "weak" juncture is difficult to characterize. While in some contexts one type or the other is obligatory, in many other contexts both types of juncture may occur between two p-phrases, depending on pragmatic factors. Generally, strong juncture marks focus or emphasis on a constituent adjacent to the juncture, or greater contrast between the two constituents separated by the juncture. It may be that strong juncture marks a prosodic constituent larger than the p-phrase, but smaller than the intonational phrase. I will give a more complete description of the syntactic distribution and prosodic status of strong juncture in Appendix C.

Phonologically, the difference between strong and weak juncture is that at strong juncture all fifteen members of the tone-accent paradigm undergo raising (i.e., H Attachment and/or Final Raising), whereas at weak juncture only a subset of the paradigm experiences raising, as I showed in detail in Chapter 2. I give the paradigm of strong-juncture sandhi variants in (41), placing in boldface those items which normally do not raise at weak juncture.

(41) Strong-juncture tone-accent paradigm:

	<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
...LLL	m- [!] sulri] _p [⁽ σ ⁾	m- [!] ki-pfi] _p [⁽ σ ⁽ σ ⁾	m- [!] caka] _p [⁽ σ ⁽ σ ⁾
...HLL	leeri] _p [ð̃	Nde-wiki- [!] o] _p [⁽ σ ⁽ σ ⁾	mu-olro [!] mbò] _p [⁽ σ ⁽ σ ⁾
...HL	mburu] _p [⁽ σ ⁾	Nde-min-o] _p [⁽ σ ⁾	m-kiwosó] _p [⁽ σ ⁾
...LH	numbà] _p [⁽ σ ⁽ σ ⁾	u-kù] _p [⁽ σ ⁽ σ ⁾	m-sià] _p [⁽ σ ⁽ σ ⁾
...HH	nguku] _p [⁽ σ ⁽ σ ⁾	Nde-lya-ngò] _p [⁽ σ ⁽ σ ⁾	m-writi] _p [⁽ σ ⁽ σ ⁾

For comparison, I repeat the weak-juncture paradigm from example (24) of Chapter 2, this time with unraised items in boldface:

(42) Weak-juncture tone-accent paradigm:

	<u>penultimate accent</u>	<u>final accent</u>	<u>no accent</u>
...LLL	m- [!] sulri] _p [⁽ σ ⁾	m- [!] ki-pfi] _p [⁽ σ ⁽ σ ⁾	m-càkà] _p [ð̃
...HLL	leeri] _p [ð̃	Nde-wiki- [!] o] _p [⁽ σ ⁽ σ ⁾	mu-olrómbò] _p [ð̃
...HL	mburu] _p [⁽ σ ⁾	Nde-min-o] _p [⁽ σ ⁾	m-kiwosó] _p [ð̃
...LH	numbà] _p [⁽ σ ⁾	u-kù] _p [⁽ σ ⁽ σ ⁾	m-sià] _p [⁽ σ ⁾
...HH	ngukú] _p [⁽ σ ⁾	Nde-lya-ngò] _p [⁽ σ ⁽ σ ⁾	m-writí] _p [⁽ σ ⁾

The generalization that emerges from a comparison of (41) and (42) is that those items which fail to raise at weak juncture behave at strong juncture as if accented on the final syllable, while those items which do raise at weak juncture raise in exactly the same way at strong juncture. Thus, since final-accented words always raise even at weak juncture, they do not change at strong juncture. On the other hand, unaccented words, which never raise at weak juncture, behave exactly like their final-accented counterparts at strong juncture. H-

final penultimate-accented words, which are overlooked by Final Raising at weak juncture, likewise behave as if they were final-accented at strong juncture; yet LL-final penultimate-accented words remain distinct from their final-accented counterparts, raising according to their usual weak-juncture pattern.

This pattern suggests that somehow strong juncture causes an accent to be attached to the last syllable of the p-final word.

(43) ACCENT ATTACHMENT (first approximation)

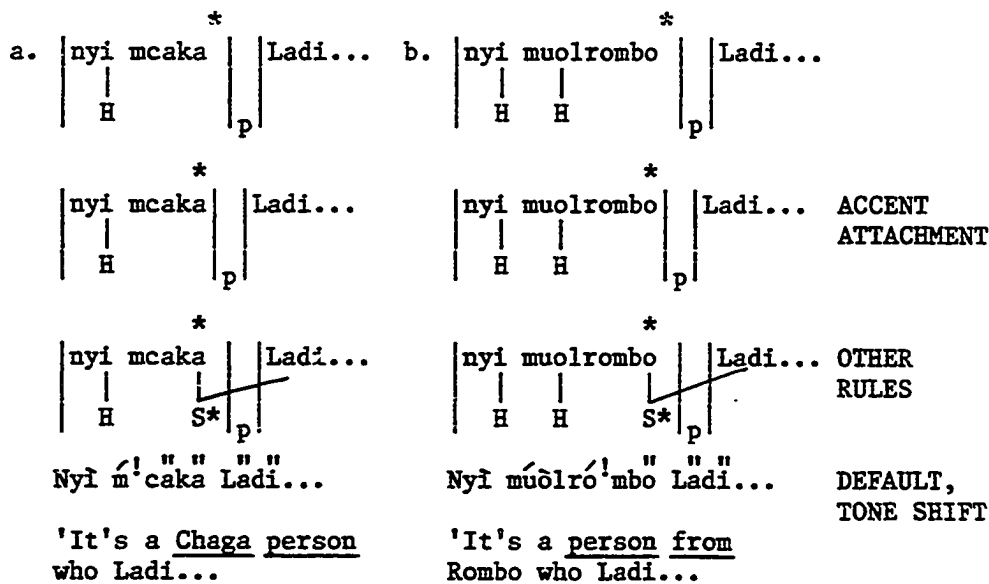
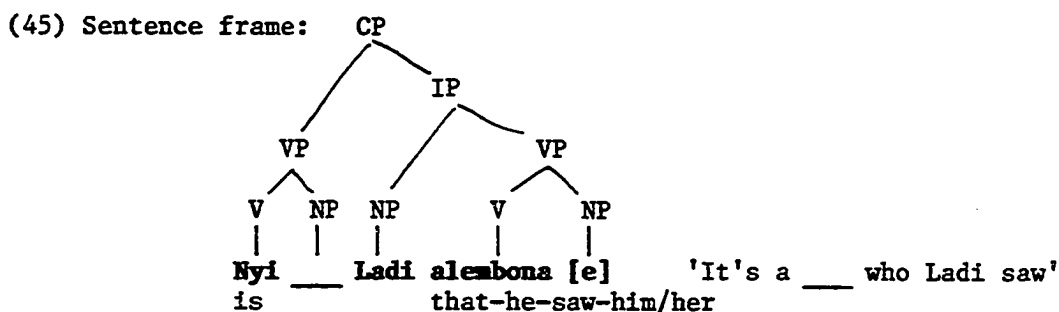
$$\phi \rightarrow * / \begin{array}{c} \text{---} \\ | \\ \sigma \end{array}]_p \text{ [+strong]}$$

An alternative way of formulating Accent Attachment would assume that strong juncture is not marked by a diacritic feature as in (43), but rather by the presence of a focus morpheme that consists of a floating accent. (This would be comparable to the floating tones associated with intonational phrase boundaries in English, the added accent found finally in Swahili questions (Ashton 1947), or the added accent that marks uncompleted sentence intonation in Bengali (Hayes & Lahiri ms). In such an analysis, Accent Attachment would not have to refer to any diacritic feature attached to the p-boundary, but would simply attach an already present floating accent to the p-final syllable, as in example (44):

(44) ACCENT ATTACHMENT (final version)

$$\begin{array}{c} * \\ \vdots \\ \sigma \end{array}]_p$$

In unaccented words this rule straightforwardly accounts for the imitation of the final-accented tone pattern at strong juncture. I illustrate the strong-juncture variants of unaccented words in (45) below, placing them in a cleft construction that consistently requires strong juncture after the fronted word. (Unlike English, Kivunjo Chaga has no relative complementizer, but instead uses a special relative form of the verb in such constructions.)



the form of the verb *iwona* 'to see' in (45) and its form in (46) is the result of movement-conditioned clitic doubling that is sensitive to the distinction between human and non-human NPs: When a human object is fronted in Kivunjo, an object clitic -- singular (Class 1) *m-* 'him/her' or plural (Class 2) *wa-* 'them' -- must be added to the verb; when a non-human object is fronted, no clitic is required.)

(46) Sentence frame: **Nyi** ____ **Ladi** **alewona** 'It's a ____ that Ladi saw'
is that-he-saw

a.	$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{numba} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$	b.	$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{nyi} & \text{nguku} & \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{ccc} \text{H} & \text{H} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$	
	$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{numba} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$		$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{nyi} & \text{nguku} & \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{ccc} \text{H} & \text{H} & \text{H} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$	ACCENT ATTACHMENT
	$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{numba} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{cc} \text{H} & \text{S} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$		$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{nyi} & \text{nguku} & \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right| \\ \left| \begin{array}{ccc} \text{H} & \text{H} & \text{S} \end{array} \right| \left| \begin{array}{c} \text{p} \end{array} \right| \end{array}$	OTHER P-LEVEL RULES
	Nyĩ núbà Ladi àlèwónâ		Nyĩ ngukú Ladi àlèwónâ	DEFAULT, TONE SHIFT
	'It's a <u>house</u> that Ladi saw'		'It's a <u>chicken</u> that Ladi saw'	

The addition of an accent to the final syllable of an already final-accented word produces vacuous results. The lexical accent absorbs the added accent, just as in section 3.2.1 a lexical accent was seen to absorb a retracted accent.

(47) Sentence frame: Nyi ____ Ladi alebona 'It's (a) ____ that Ladi saw'
alembona who

a. $\begin{array}{c|c|c} & & ** \\ \text{nyi mkipfi} & & \text{La...} \\ | & & \\ \text{H} & & \\ & | & \\ & \text{p} & \end{array}$ b. $\begin{array}{c|c|c} & & ** \\ \text{nyi Ndewikio} & & \text{Ladi...} \\ | & | & \\ \text{H} & \text{H} & \\ & & | \\ & & \text{p} \end{array}$

*		*		
|nyi mkipfi|	|Ladi...	|nyi Ndewikio|	|Ladi...	ACCENT
|		|		ATTACHMENT
H		H	H	(vacuous)
p		p		

*		*	
nyi mkipfi	Ladi...	nyi Ndewikio	Ladi...
H	S* _p	H	S* _p

OTHER RULES

Nyì m'k'ipfi Ladi àlèwónâ Nyì Ndéwìkí!o Ladi... DEFAULT,
TONE SHIFT

'It's a big ugly wasp
that Ladi saw'

c.

nyi	Ndemino
H	H

* *

Ladi...
D

*

nyi	Ndemino	Ladi...	ACCENT
|	|	|	ATTACHMENT
H	H	p	(vacuous)

nyɪ Ndemino | Ladi... ACCENT
| H H | RETRACTION
| p |

*		
nyi Ndemino	Ladi...	
| H	| S	
	| D	OTHER P-LEVEL RULES

Nyì Ndémìno " " Ladì àlèmbònâ	DEFAULT, TONE SHIFT
-------------------------------	------------------------

'It's Ndemino who Ladi saw'

d.	$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ndelya-ngo} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{H} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \\ \text{p} \end{array} \right|$	e.	$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{uku} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \\ \text{p} \end{array} \right|$	
	$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ndelya-ngo} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{H} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \\ \text{p} \end{array} \right|$		$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{uku} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \\ \text{p} \end{array} \right|$	ACCENT ATTACHMENT (vacuous)
	$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{Ndelya-ngo} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{S} \\ \text{p} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \end{array} \right|$		$\left| \begin{array}{c} \text{nyi} \\ \text{H} \end{array} \right| \left| \begin{array}{c} \text{uku} \\ \text{S} \end{array} \right| \left| \begin{array}{c} \text{Ladi...} \\ \text{p} \end{array} \right|$	OTHER P-LEVEL RULES
	Nyĩ Ndélyā-ngo " " Ladi ālēm̀bônâ		Nyĩ úkù Ladi ālèwónâ	DEFAULT, TONE SHIFT
	'It's <u>Ndelya-ngo</u> who Ladi saw'		'It's a <u>piece of firewood</u> that Ladi saw'	

Note that in (45c) and (47c) the added accent undergoes Accent Retraction, just as lexical accent does. We may therefore assume that Accent Attachment applies early in the derivation, so as to feed Accent Retraction. Consequently, when strong-juncture accent is added to the final syllable of the HL penultimate-accented keyword mburu it is not surprising that the added accent retracts, merging with the accent already present on the penultimate syllable:

(48) $\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{mburu} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \text{p} \end{array}$

$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{mburu} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \text{p} \end{array}$

ACCENT
ATTACHMENT

$\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{mburu} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \text{p} \end{array}$

ACCENT
RETRACTION

$\begin{array}{c} * \\ \left| \begin{array}{cc} \text{nyi} & \text{mburu} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{S} \end{array} \right| \text{p} \end{array}$

OTHER
P-LEVEL
RULES

Nyî mburu Ladi àlèwónâ

DEFAULT,
TONE SHIFT

'It's a goat that Ladi saw'

Thus the strong-juncture variant of mburu is identical with that word's weak juncture variant.

The remaining cases, in which the strong-juncture accent does not merge with the original accent, leaving two potential landing sites for H Attachment, involve an ordering paradox. This paradox, as I will show in the next section, can be solved with cyclicity.

3.3.2. Two ordering paradoxes: Accent Retraction and H Attachment, Accent Retraction and S Spread

A problem arises with the LL-final penultimate-accented keywords. Like other keywords that raise at weak juncture, msulri and leeri surface with the same tones at strong juncture as they do at weak juncture. Yet the noncyclic analysis we have so far been assuming, in which Accent Attachment simply precedes all the other p-level rules, predicts an incorrect outcome for LL-final p-phrases.

As we have seen in (45c), (47c)) and (48), Accent Attachment clearly must feed Accent Retraction, which in turn bleeds H Attachment on the final syllable. Thus before Accent Retraction and H Attachment have a chance to apply, the strong-juncture accent will attach to the final syllable of the LL-final keywords msulri and leeri. As a result, each word ends up with two accents: one on the penult and one on the ultima. In the case of leeri, the original, penultimate accent retracts to the H-toned antepenult, leaving the ultima as the word's only toneless accented syllable. H Attachment should therefore be expected to attach a H* to the final syllable of leeri, and Final Raising should then raise the H* rather than the antepenultimate lexical H, which is no longer p-final on the tonal tier and thereby fails to meet Final Raising's structural description. I illustrate this scenario in (49b) below.

Unlike the original penultimate accent of leeri, that of msulri has nowhere to retract to, so that when H Attachment applies it finds msulri with two toneless accented syllables to choose from. We would therefore expect, given the rule's sensitivity to p-boundary-adjacen-

(49) Sentence frame: Nyi ____ Ladi alewona 'It's (a) ____ that Ladi saw'
alewona who

The derivations in (49) predict that at strong juncture msulri leeri should behave as if they were final-accented. But in fact, is not what happens. Rather, H Attachment ignores the final

toneless accented syllable of msulri and attaches to its penult instead. Further, H Attachment inexplicably fails to apply to the final toneless accented syllable of leeri, whereupon Final Raising raises the H attached to the antepenult just as it does at weak juncture.

The apparently anomalous behavior of msulri and leeri at strong juncture can be neatly accounted for, however, if we assume that the accent associated with strong juncture is added on the second cycle. In a cyclic analysis, the output of the rules that normally apply to msulri and leeri at weak juncture will feed Accent Retraction in such a way that the effect of adding the strong-juncture accent is cancelled out -- yielding the correct outcome. In msulri the S* attached to its penult will cause the strong-juncture accent, added on Cycle 2, to retract; in leeri the S will spread rightward to the penult, providing the necessary adjacent [+H] to trigger Accent Retraction.

(50) Sentence frame: Nyi ____ Ladi alewona 'It's (a) ____ that Ladi saw'
alembona who

a. $\begin{array}{c} \text{nyi msulri} \\ | \\ \text{H} \end{array} \quad \begin{array}{c} * \\ | \\ \text{p} \end{array} \quad \begin{array}{c} * \\ | \\ \text{p} \end{array} \quad \text{La...}$ b. $\begin{array}{c} \text{nyi leeri} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ | \\ \text{p} \end{array} \quad \begin{array}{c} * \\ | \\ \text{p} \end{array} \quad \text{La...}$

Cycle 1:

*

nyi	msulri
H	

p

*

nyi	leeri
H	H

p

n/a

*

nyi	leeri
H	H

p

ACCENT
RETRACTION

*

nyi	msulri
H	S*

p

*

nyi	leeri
H	S

p

P-LEVEL
RULES

Cycle 2:

* *

nyi	msulri		
H	S*		

p p

* *

nyi	leeri		
H	S		

p p

* *

nyi	msulri		
H	S*		

p p

* *

nyi	leeri		
H	S		

p p

ACCENT
ATTACHMENT

*

nyi	msulri		
H	S*		

p p

**

nyi	leeri		
H	S		

p p

ACCENT
RETRACTION

n/a

n/a

H ATT. &
FNL. RSNG.

Cycle 3:

*

nyi	msulri			Ladi...
H	S*			

p p

**

nyi	leeri			Ladi...
H	S			

p p

*

nyi	msulri			Ladi...
H	S*			

p p

n/a

S SPREAD

U-level:

Nyi m' "sulri" Ladi ãlẽmbõnã Nyi "" "" Ladi ãlẽwónã

OTHER
RULES

'It's a nobleman who
Ladi saw'

'It's money that Ladi
saw'

In (50a), just as with reduced demonstratives, H Attachment on Cycle 2 feeds Accent Retraction on Cycle 3, reversing the order in which these two rules usually apply. In (50b) it is S Spread on Cycle 2 that feeds Accent Retraction on Cycle 3. Yet normally S Spread follows Accent Retraction. This is not a direct rule interaction, but mediated by the rules of H Attachment and Final Raising, both of which must follow Accent Retraction and precede S Spread. Thus the strong-juncture forms of leeri and msulri, taken together with the rest of the p-level phonology, yield two ordering paradoxes:

(51) Strong juncture ordering paradoxes:

a. C1: **Accent Retraction**

H Attachment

(for leeri, Ndemino at weak juncture)

(for msulri at strong juncture)

C2: **Accent Retraction**

b. C1: **Accent Retraction**

Final Raising

(for leeri, Ndemino at weak juncture)

S Spread

(for leeri at strong juncture)

C2: **Accent Retraction**

The cyclic analysis of strong juncture in LL-final keywords given in (50) is also compatible with the other members of the tone-accent paradigm. With unaccented words and penultimate-accented H-final words, no rules apply on the first cycle, but on the second cycle the derivation proceeds exactly as in (45) and (46) above.

a. ...mkiwoso | * | | Ladif...
 | | |
 H p p

b. ...numba | * | * | Ladif...
 | | |
 H p p

Cycle 2:

Cycle 3:

U-level:

Final-accented words undergo all relevant p-level rules on the first

cycle, so that on the second cycle the floating accent has no additional effect:

(53) Sentence frame: **Nyi** ____ **Ladi alewona** 'It's (a) ____ that Ladi saw'

a. $\begin{array}{c} | \text{nyi} \text{ mkipfi} | \\ | \text{H} \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array} | \text{Ladi...}$ b. $\begin{array}{c} | \text{nyi} \text{ uku} | \\ | \text{H} \quad | \text{H} | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array} | \text{Ladi...}$

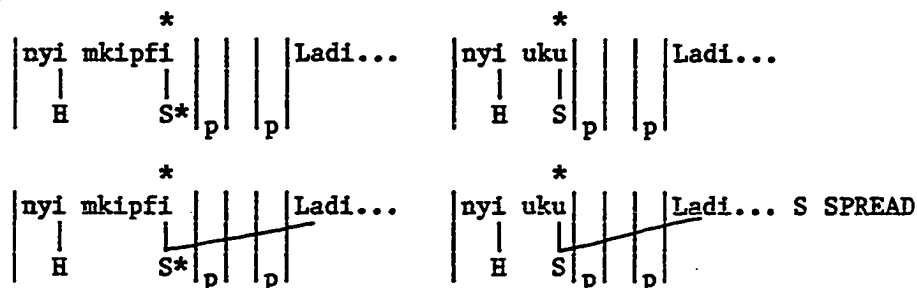
Cycle 1:

$\begin{array}{c} | \text{nyi} \text{ mkipfi} | \\ | \text{H} \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	$\begin{array}{c} | \text{nyi} \text{ uku} | \\ | \text{H} \quad | \text{H} | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	
$\begin{array}{c} | \text{nyi} \text{ mkipfi} | \\ | \text{H} \quad \text{S}^* | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	$\begin{array}{c} | \text{nyi} \text{ uku} | \\ | \text{H} \quad \text{S} | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	H ATT. & FINAL RAISING

Cycle 2:

$\begin{array}{c} | \text{nyi} \text{ mkipfi} | \\ | \text{H} \quad \text{S}^* | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	$\begin{array}{c} | \text{nyi} \text{ uku} | \\ | \text{H} \quad \text{S} | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	
$\begin{array}{c} | \text{nyi} \text{ mkipfi} | \\ | \text{H} \quad \text{S}^* | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	$\begin{array}{c} | \text{nyi} \text{ uku} | \\ | \text{H} \quad \text{S} | \\ | \quad p \end{array} \begin{array}{c} * \\ | \\ p \end{array} \begin{array}{c} * \\ | \\ p \end{array}$	ACCENT ATTACHMENT (vacuous)

Cycle 3:

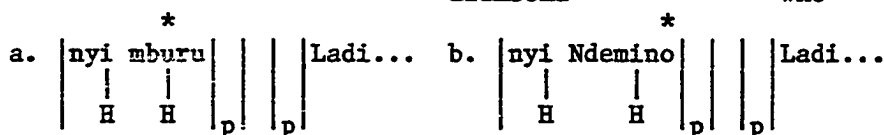


U-level:

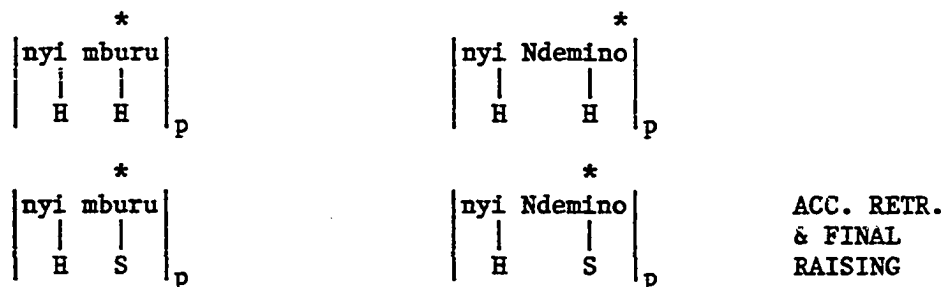
Nyɪ m'kɪpfi Ladi̯ àlèwónà	Nyɪ úkù Ladi̯ àlèwónà	DEFAULT, TONE SHIFT
'It's a <u>wasp</u> that Ladi saw'	'It's a <u>piece of fire-</u> <u>wood</u> that Ladi saw'	

In HL penultimate- and final-accented words, raising likewise takes place on the first cycle. On the second cycle the junctural accent retracts, merging with the word's lexical accent, and thus effecting no change.

(54) Sentence frame: Nyi ____ Ladi alewona 'It's (a) ____ that Ladi saw'
alembona who



Cycle 1:



Cycle 2:

$\begin{array}{c} * \quad * \\ \text{nyi mburu} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	$\begin{array}{c} * \quad * \\ \text{nyi Ndemino} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	
$\begin{array}{c} * * \\ \text{nyi mburu} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	$\begin{array}{c} * * \\ \text{nyi Ndemino} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	ACCENT ATTACHMENT
$\begin{array}{c} * \\ \text{nyi mburu} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	$\begin{array}{c} * \\ \text{nyi Ndemino} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array}$	ACCENT RETRACTION

Cycle 3:

$\begin{array}{c} * \\ \text{nyi mburu} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array} \text{Ladi...}$	$\begin{array}{c} * \\ \text{nyi Ndemino} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array} \text{Ladi...}$	
$\begin{array}{c} * \\ \text{nyi mburu} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array} \text{Ladi...}$	$\begin{array}{c} * \\ \text{nyi Ndemino} \\ | \quad | \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{p} \quad \text{p} \end{array} \text{La... S SPREAD}$	

U-level:

Nyi mburu	Ladi àlèwónâ	Nyi Ndemino	Ladi àlèmbònâ	DEFAULT, TONE SHIFT
'It's a goat that saw'		'It's Ndemino who saw'		

3.3.3. Noncyclic alternatives

A noncyclic account of strong juncture would have to retract the accent added to the final syllables of msulri and leeri before H Attachment and S Spread had applied, in order to avoid the ordering paradoxes between those rules and Accent Retraction. We could accomplish this if we modified Accent Retraction by splitting it into two rules, just as in the noncyclic analysis proposed in 3.2.3 for the reduced demonstrative data:

(39) Accent Retraction (non-cyclic version — repeated from 3.2.3)



In the case of msulri, (39a) would bleed H Attachment on the final syllable. In leeri, (39a) would likewise bleed H Attachment, but it would also have to bleed (39b). Otherwise, if (39b) applied to the penultimate accent first, the environment for (39a) would be bled, yielding the incorrect tones as in (55):

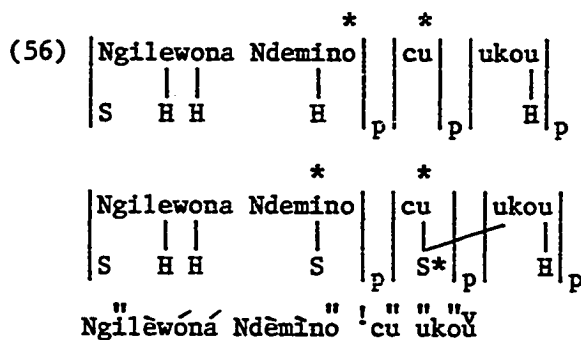
(55) Sentence frame: **Nyi** ____ **Ladi alewona** 'It's (a) ____ that Ladi saw'

$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{leeri} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \left| \text{p} \right. \end{array}$	
$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{leeri} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \left| \text{p} \right. \end{array}$	ACCENT ATTACHMENT
$\begin{array}{c} * \quad * \\ \left| \begin{array}{cc} \text{nyi} & \text{leeri} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{cc} \text{H} & \text{H} \end{array} \right| \left| \text{p} \right. \end{array}$	ACCENT RETRACTION (39b)
n/a	ACCENT RETRACTION (39a)
$\begin{array}{c} * \quad * \\ \left| \begin{array}{ccc} \text{nyi} & \text{leeri} & \text{S*} \end{array} \right| \left| \text{Ladi...} \right. \\ \left| \begin{array}{ccc} \text{H} & \text{H} & \text{p} \end{array} \right| \end{array}$	H ATTACHMENT, FINAL RAISING, S SPREAD
Nyi léé'ri "Ladi àlèwónâ	DEFAULT, H SPREAD, TONE SHIFT

This could be accomplished either by a disjunctive ordering of (39a)

before (39b) or by stipulating that Accent Retraction iterates from right to left.

Both of these solutions are unacceptable, however, because they predict the wrong outcome in another case analogous to leeri in strong juncture except with an intervening phrase boundary. This case involves a final-accented word followed by a reduced demonstrative, as shown in (56):



'I saw this Ndemino (as opposed to his namesake) yesterday'

Here, in order to derive the correct surface form, (39b) must apply to the leftmost accent first, bleeding the application of (39a) to the rightmost accent — exactly the outcome we needed to rule out in (55). This would require either the direction of iteration of Accent Retraction or the disjunctive ordering between (39a-b) to be contingent on whether a phrase boundary intervenes between the two accents. (We couldn't place an absolute restriction on Accent Retraction applying across phrase boundaries, cf. kipfi cu, numba i in examples (30-32, 37).) In effect, it would require the grammar to make use of the same information that cyclicity encodes, but in an ad hoc fashion, without

the constraints on the use of phrasing information that cyclicity offers.

A cyclic analysis of (56) would derive the correct outcome, in which the first accent retracts on Cycle 1, whereupon on Cycle 2 the second accent receives a H* tone and also raises:

(57)

Ngilewona	Ndemino	*	*	cu	ukou	
S	H H	H	p	p	H	p

Cycle 1:

Ngilewona	Ndemino	*	
S	H H	H	p

Ngilewona	Ndemino	*	
S	H H	S	p

ACCENT RETRACTION,
FINAL RAISING

Cycle 2:

Ngilewona	Ndemino	*	*	cu	
S	H H	S	p	p	

Ngilewona	Ndemino	*	*	cu	
S	H H	S	p	S*	p

H ATTACHMENT,
FINAL RAISING

Cycle 3:

Ngilewona	Ndemino	*	*	cu	Ladi	
S	H H	S	p	S*	p	

Ngilewona	Ndemino	*	*	cu	Ladi	
S	H H	S	p	S*	p	

S SPREAD

Ngilèwona Ndèmìno 'cu ukou

DEFAULT, TONE SHIFT

Thus in the strong juncture paradigm we have seen another argument for cyclicity based on two ordering paradoxes: At strong juncture, the LLL keyword msulri must first undergo H Attachment on its own cycle, and the accent associated with strong juncture must not be added until the following cycle, so that the H* introduced by H Attachment may feed Accent Retraction on the following cycle. Similarly, the HLL keyword leeri must first undergo S Spread on its own cycle, so that there will be a [+high] tone on the syllable immediately preceding the syllable that receives strong-juncture accent on the next cycle. The resulting ordering paradoxes, between H Attachment and Accent Retraction and between S Spread and Accent Retraction, cannot be resolved satisfactorily without reference to cyclicity.

3.4. The word as basic phrasal cyclic domain

3.4.1. Evidence for the word-based phrasal cycle

Now that the case for phrasal cyclicity has been made, various questions arise about the specific mechanism of cyclicity. The first such question I will address concerns what domains form the building blocks out of which cyclic domains are constructed. I will refer to these building blocks as "basic cyclic domains" to distinguish them from actual domains of cyclic rule application, which cumulatively include all material from earlier cycles in addition to the new material just added.

The simplest case would be for p-level rules to have the p-phrase as their basic cyclic domain. This has been our assumption thus far. However, in the examples given up until now it has been impossible to tell whether the basic cyclic domain for p-level rules is the p-phrase or the word. Ignoring the verbs that begin each of the key test sentences in 3.1-3, all of the p-phrases that interact cyclically with one another contain exactly one word:

(58) Schematic summary of arguments for cyclicity:

	Cycle:	1	2	3	Crucial ordering:
a. #1-Case B (ex. 9):	...	N] _p[	N] _p[	Adv] _p	[C1+C2] > [C1+C2+C3]
b. #1-Case C (9, 13):	...	N] _p[	N] _p[	Adv] _p	[C1+C2] > [C1+C2+C3]
c. #2 (28):	...	N] _p[	[Dem]	]_p [Adv] _p	C1 > C2
d. #3 (49):	...	N] _p[	*	]_p [N...	C1 > [C1+C2]

It is in fact logical to suppose that the basic domain of phrasal cyclicity might be the word instead of the p-phrase, because of the

word-by-word nature of the p-phrase formation algorithm in (1): The algorithm does not construct a p-phrase of many words in one step, but rather examines each word for its syntactic relationship to the next, one by one. It need only look ahead to the constituent immediately following the one being parsed, and in fact may not look beyond that constituent. Interleaved with each step in that algorithm, then, the phonology would add each successive word to the representation individually, evaluating its relationship to what immediately follows to determine whether that word is u-final, p-final, or neither.

In order to decide between the word and the p-phrase as the basic domain of phrasal cyclicity, we must substitute a single two-word p-phrase for the two p-phrases that crucially interact in the cases given in (58): these are C2 and C3 in (58a-b), and C1 and C2 in (58c-d). Such a substitution is impossible in (58d) because the item in C2, strong-juncture accent, always phrases separately from the preceding word (C1), as was shown in section 3.3. Likewise, in (58c) reduced demonstratives (C2) always phrase separately from the nouns they follow (C1), and never follow any other lexical category. There are no other toneless accented monosyllables in the language. In (58a-b), however, we can replace the adverb in C3 with an adjective that modifies the noun in C2. The noun in C2 will p-govern the following adjective, forming a single p-phrase with it, as illustrated in (59):

(59)	Cycle:	1	2	3?	Crucial ordering:
a. #1-Case B (ex. 9):	...N] _p [N Adj] _p				[C1+C2] > [C1+C2+C3]
	Ngileenenga Ndelya-ngo [NP ^{mburu} ngi-tutu]				'I gave N. a small
		9-small			goat'
b. #1-Case C (9, 13):	...N] _p [N Adj] _p				[C1+C2] > [C1+C2+C3]
	Ngileenenga Ndelya-ngo [NP ^{ngu} tsi-tutu]				'I gave N. a little
		10-small			firewood'

We can go on to rule out (59a) because its tonal configuration yields an inconclusive outcome. Regardless of whether the noun mburu has a cycle of its own or shares a cycle with the following adjective, the same tone pattern results, as shown in (60):

(60) [Ngileenenga Ndelya-ngo]_p[mburu ngitutu]_p 'I gave N. a small goat'

a. P-phrase cycle

b. Word cycle

Cycle 0 (word cycle only):

*

Ngileenenga	
S	HH

no rules

Cycle 1:

* *

Ngileenenga Ndelya-ngo	
S HH	H H

p

* *

...enenga Ndelya-ngo	
H	H H

p

*

Ngileenenga Ndelya-ngo	
S HH	H S

p

*

...enenga Ndelya-ngo	
H	H S

p

ACC. DEL.,
FINAL
RAISING

Cycle 2:

* * *

...ngo	mburu ngitutu	
S	H	H

p

* *

...ngo	mburu
S	H

p

* *

...ngo	mburu ngitutu	
S	H	H

p

n/a

ACCENT
REDUCTION

* *

...ngo	mburu ngitutu	
S	H	H

p

* *

...ngo	mburu
S	H

p

S SPREAD

Cycle 3 (word cycle only):

* *

...ngo	mburu ngitutu	
S	H	H

p

ACCENT
REDUCTION

U-level:

...ngö mburu ngitütü

...ngö mburu ngitütü

DEFAULT,
TONE SHIFT

In (60) the accented H of mburu fails to raise because mburu is not p-final. As a result the S of Ndelya-ngo does not compete with any other tone to undergo S Spread. The only question is whether S Spread will apply on the same cycle that mburu is added on. If it does not, the adjacent H of mburu will trigger S Lowering, bleeding S Spread's application on any future cycle. However, because mburu has two syllables, in both (60a) and (60b) the structural description for S Spread is met as soon as mburu is added to the derivation on Cycle 2. This is true irrespective of whether ngitutu is added on the same cycle as mburu or not.

We are thus left with only one potentially diagnostic configuration: (59b). Fortunately, in this instance p-phrase-based and word-based cycles make distinct predictions, as can be seen in (61):

(61) [Ngileenenga Ndelya-ngo]_p [ngu tsitutu]_p 'I gave N. a
little firewood'

a. P-phrase cycle

b. Word cycle

Cycle 0 (word cycle only):

no rules

Cycle 1:

* *

Ngileenenga	Ndelya-ngo
| S HH	| H H
|_p	

* *

...enenga	Ndelya-ngo
| H	| H H
|_p	

*

Ngileenenga	Ndelya-ngo
| S HH	| H S
|_p	

*

...enenga	Ndelya-ngo
| H	| H S
|_p	

ACC. RED.,
FINAL
RAISING

Cycle 2:

* *

...ngo	ngu tsitutu
| S	| H H
|_p	|_p

* *

...ngo	ngu
| S	| H
|_p	|_p

ACCENT
REDUCTION

* *

...ngo	ngu tsitutu
| S	| H H
|_p	|_p

n/a S SPREAD

n/a

* *

...ngo	ngu
| H	| L H
|_p	|_p

S LOWERING

n/a

* *

...ngo	ngu
| H	| L H
|_p	|_p

FLOP
(see 3.5)

Cycle 3 (only on word cycle):

* *

...ngo	ngu tsitutu
| H	| L H H
|_p	|_p

ACCENT
REDUCTION

U-level:

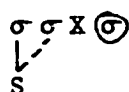
*...ngó ngú tsítùtǔ

*...ngó ngú tsítùtǔ DEFAULT,
TONE SHIFT

In (61), as in (60), the accented H of ngu is immune to Final Raising because it is not p-final. If the entire p-phrase ngu tsitutu were added on the next cycle as in (61a), we predict that the S of Ndelya-ngo would spread, because the structural description of S Spread would be created by ngu plus the first syllable of tsitutu. If, however, the next cycle adds only the word ngu, we predict that the S of Ndelya-ngo will fail to spread on Cycle 2 because there is only one syllable following the S, while S Spread needs to see two. S Lowering will then apply, bleeding S Spread on the next cycle when ngitutu comes on the scene.

The attested outcome is that of (61b), which supports the word-based cycle. An alternative account for (61b) that did not involve a word-based cycle would have to resort to the same kind of machinations as were used in 3.1.4 to avoid a cyclic analysis of example (9), Case C. We would start by placing a restriction on the presence of a word boundary after the second syllable in S Spread's structural description, as shown in (62):

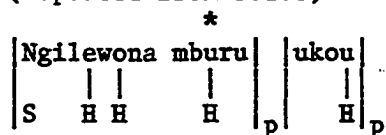
(62) S SPREAD (revised to account for (61b) without word cycle)



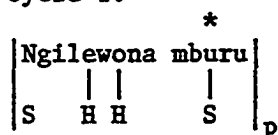
$X \neq]_w[$

However, this would incorrectly rule out application of S Spread in cases like (11), repeated from 3.1.3, since p-boundaries are also w-boundaries:

(11) (repeated from 3.1.3)

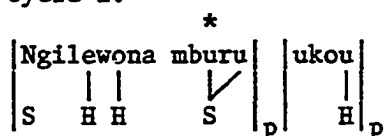


Cycle 1:



FINAL RAISING

Cycle 2:



S SPREAD

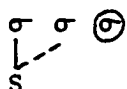
Ngilêwóná mbûru ukôŭ

DEFAULT, TONE SHIFT

'I saw a goat yesterday'

To accommodate (11), we could make the constraint in (62) more specific, so that it prevents S Spread from applying just in case word boundaries intervene between all three syllables in the rule's structural description.

(63) S SPREAD (revised to derive (61b) and (11) without word cycle)

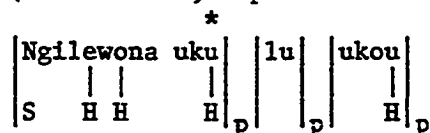


CONDITION: $\begin{array}{c} * \sigma \quad l_w \quad \sigma \quad l_w \quad \textcircled{\sigma} \\ \swarrow \quad \searrow \\ \text{S} \end{array}$

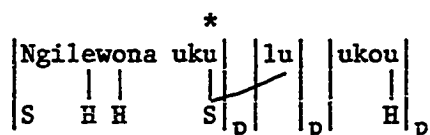
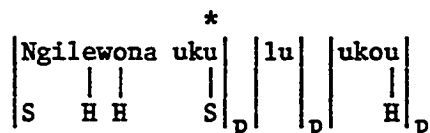
But even as constrained in (63), S Spread still would make the wrong predictions. Just as we saw in example (15) of section 3.1.4, the double-word boundary condition on S Spread only works if the syllable to which the S would spread bears H tone. If that syllable is tone-

less, S Spread is free to apply despite the presence of two word boundaries:

(15) (abbreviated, repeated from 3.1.4)



Cycle 3:



S SPREAD

U-level:

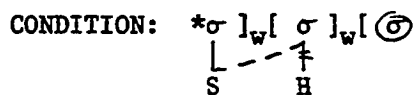
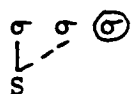
Ngilèwóná ùkù lù ùkòŷ

TONE SHIFT, DEFAULT

'I saw this piece of firewood yesterday'

To allow S Spread to apply in (15), we would therefore need to modify the constraint in (63) further so that it would only block spreading if the middle syllable bears H tone:

(64) S SPREAD (final revision to derive (61b, 11, 15) w/o word cycle)



The condition in (64) is undesirable for a number of reasons: To begin with, it cannot be incorporated into the formalism of the rule

without resorting to devices such as angled brackets, so to the extent that current phonological formalism reflects a properly constrained theory of phonology, the rule is highly marked. Secondly, the condition in (64) is completely ad hoc. It is not a general condition on all phonological rule application, but rather a stipulated condition on one rule. Why this particular rule? Why the presence of two word boundaries but not one? Finally, why should it be that the constraint only applies to one subset of the environments that normally trigger the rule -- those in which a H tone immediately follows the S tone?

In contrast, a word-based cyclic analysis allows S Spread to be stated simply. It predicts, without any ad hoc stipulations, that the double-boundary configuration in the constraint in (64) will be the only phrasing configuration to block the rule. It further predicts that this blocking effect will only prevail if the syllable immediately following the S bears H tone -- not by stipulation, but by the structural description of the independently motivated rule of S Lowering, which only lowers a S before a H-toned syllable.

3.4.2. Defining the phonological word

The phonological word for purposes of phrasing is in many cases equal to the morphosyntactic word. Nonetheless, there is a set of systematic exceptions to this isomorphism. Certain monosyllabic function words join with a following constituent to form a single phonological word. This fact alone would classify the domain in question as a clitic group in Hayes' (1989) and Nespor & Vogel's (1986) taxonomies of prosodic domains. However, for reasons that will become clear in section 3.4.3, I will continue to call this domain a word, not a clitic group, following Zec (1988) and Inkelas (1989).

The function words that I have found not to constitute independent phonological words are na 'and, with', ca 'like' and forms of the associative marker -a, a preposition or case marker equivalent to English 'of', used largely in possessive constructions. The associative marker, which inflects for noun class agreement with the possessed noun, forms a phonological word with the possessor noun.

- (65) a. [[ki-tapu]_w[ky-a Fulore]_w]_p 'Fulore's book'
7-book 7-AM (man's name)
- b. [[shi-tapu]_w[sh-a Fulore]_w]_p 'Fulore's books'
8-book 8-AM
- c. [[ku-ndu]_w[k-o Fulore]_w]_p 'Fulore's place'
17-place 17-AM

In most noun classes the associative marker bears H tone, but in Classes 1, 4 and 9 it is toneless:

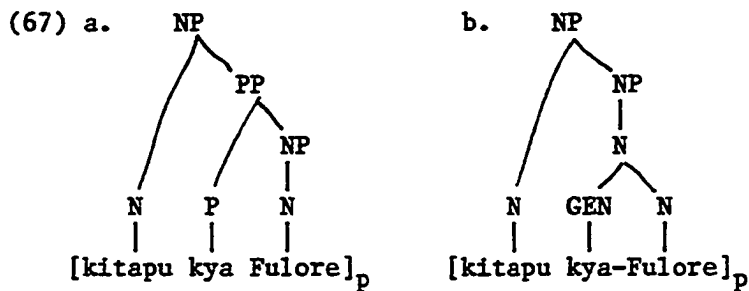
(66) Associative marker agreement paradigm
(underlying unshifted tones are marked)

Noun Class	Associative Marker	Noun Class	Associative Marker
1	ò	2	wá
3	ó	4	yā
5	lyá	6	ghá
7	kyá	8	shá
9	yà	10	tsá
11	ló		
12	ká		
14	kó		
15	wó		
16	kó		
17	há		

When it is H-toned, we can tell whether the associative marker gets its own cycle by observing its behavior in a construction parallel to (59b), which I repeat below.

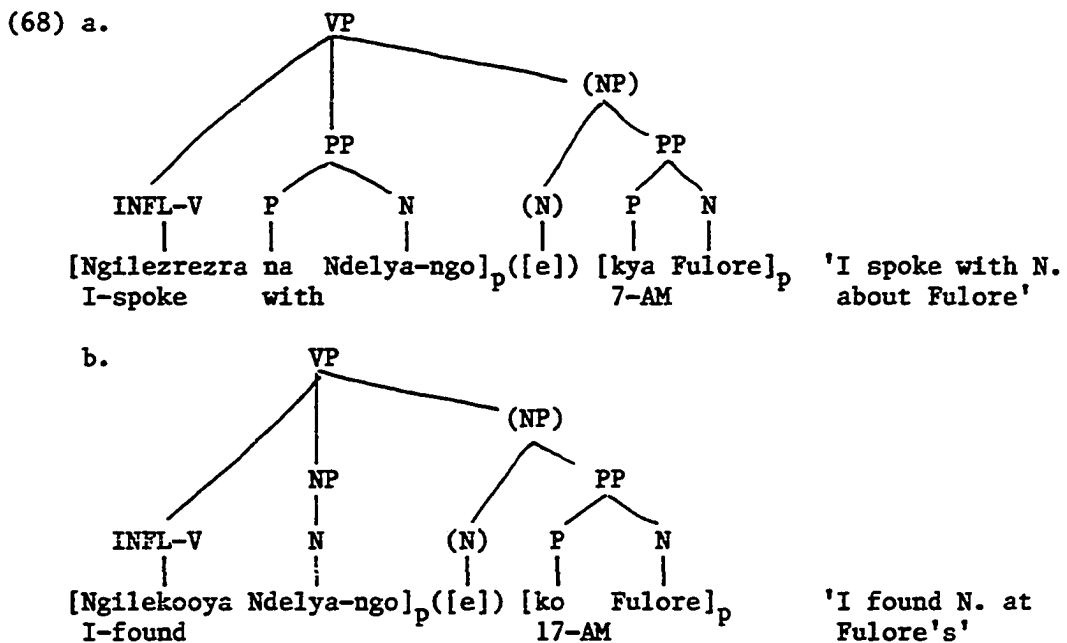
(59b) (repeated from 3.4.1) ...N]_p[N Adj]_p 'I gave Ndelya-ngo
Ngileenenga Ndelya-ngo [N_pngu tsitutu] a little firewood'

Normally the associative marker occurs between two nouns, as was shown in (65) above. In such cases the entire associative construction forms a single p-phrase, since the associative phrase is a modifier of the preceding noun. It is irrelevant whether the associative marker is considered a preposition or a genitive case marker for morphosyntactic purposes. In either case we obtain the same phrasing:



In (67a) the noun kitapu p-governs the preposition kya, which in turn p-governs the noun Fulore. In (67b) kitapu p-governs the genitive noun kya-Fulore.

In order to substitute the associative marker for ngu in (59b), however, we need to place the marker in p-phrase-initial position. This phrasing may arise when the associative phrase modifies a zero head, as in (68):



The agreement marking on the associative marker identifies the noun

class of the understood possessed noun: kindo 'thing, matter' (Cl. 7) in (68a) and kundu 'place' (Cl. 17) in (68b). In these two examples the inflected associative marker approaches a true preposition in semantic function. However, regardless of the presence or absence of the empty N position, the phrasing remains the same: The noun Ndelya-ngo may not p-govern any following word, because it is final in its NP.

Along the lines of the derivations in (61) above, we predict that the S of Ndelya-ngo will spread if the associative marker is not an independent word, as in (69) below. If, however, the associative marker is an independent word, we predict that the S of Ndelya-ngo will lower and flop backwards one syllable, as in (70).

(69) Outcomes expected if AM is not a phonological word:

- a. Ngilèzrézrá nà Ndèlyà-ngo kya Fúlòrě
- b. Ngilèkóóyà Ndèlyà-ngo kò Fúlòrě

(70) Outcomes expected if AM is a phonological word:

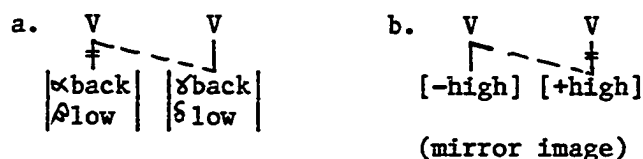
- a. *Ngilèzrézrá nà Ndèlyà-ngo 'kyá Fúlòrě
- b. *Ngilèkóóyà Ndèlyà-ngo 'kó Fúlòrě

The ungrammaticality of the outcomes in (70) indicates that the associative marker indeed joins with the following noun to form a single phonological word.

The associative marker in Classes 1, 4 and 9 lacks tone underlyingly, as do the preposition/conjunctions na and ca. As a result, we have no tonal diagnostic for whether these items are independent words. There is, however, a phrasal rule of Vowel Coalescence

that applies only across phonological word boundaries. This rule is fed by a process of Vowel Assimilation, which may apply both within words and across word boundaries. In Vowel Assimilation, values for the features [low] and [back] spread leftward from one vowel to a preceding adjacent vowel, while the feature [-high], if present, spreads at the expense of [+high] in either direction.

(71) VOWEL ASSIMILATION (optional across word-boundaries, strongly preferred within words)



For our purposes here, we will confine ourselves to one vowel combination -- a + i -- which assimilates to e + e by this process.

(72) Vowel Assimilation within words:

- | | |
|---|--|
| <p>a. i-wo lyi-ili
 5-stone 5-white</p> <p>b. ma-wo ma-ili --> ma-wo me-eli
 6-stone 6-white</p> | <p>'white stone'</p> <p>'white stones'</p> |
|---|--|

Vowel Assimilation spreads features, but does not delete V slots in the skeleton. Phrasal Vowel Coalescence then consolidates the two adjacent assimilated vowels, provided a phonological word boundary intervenes between them:

(73) PHRASAL VOWEL COALESCENCE (optional)

$V]_w[V \rightarrow V$

(74) Vowel Assimilation and Vowel Coalescence across word boundaries:

- a. nyama i-ya ~ nyameya 'that meat (over there)'
9-meat 9-yon
- b. nyama tsi-lya 'those (types of) meats
10-meat 10-yon (over there)'

(The tones of the two original syllables form a contour on the new coalesced syllable, but this appears to take place after all of the phrasal tone rules discussed thus far have applied, so that Phrasal Vowel Coalescence does not interact interestingly with the p-level tonal phonology.)

With Phrasal Vowel Coalescence, we can tell whether two morpho-syntactic words, the first vowel-final and the second vowel-initial, form separate phonological words by observing whether they may undergo Phrasal Vowel Coalescence as well as Vowel Assimilation, or only Vowel Assimilation.

I begin with the associative marker, which has already been shown not to form its own phonological word for tonal reasons. Both H-toned and toneless forms of the marker fail to undergo Vowel Coalescence with a following vowel-initial noun:

- (75) a. nunda ya ilruwu - nunda ye elruwu 'banana seed'
9-seed 9-AM banana
- b. nunda tsa ilruwu - nunda tse elruwu 'banana seeds'
10-seed 10-AM banana

Thus the associative marker's tonal behavior matches its behavior with

respect to Vowel Coalescence: in both cases it joins with the following noun to form a single phonological word.

The toneless prepositions/conjunctions na and ca likewise fail to undergo Phrasal Vowel Coalescence with a following vowel-initial word:

- (76) a. iyo na inyi - iyo ne enyi 'you and I'
 you and I/me
- b. mndu ca inyi - mndu ce enyi 'someone like me'
 person like I/me

This indicates that they, too, may not stand alone as phonological words.

Not all monosyllables are incapable of forming autonomous phonological words. Monosyllabic nouns such as ngu 'firewood' or nda 'louse' not only block S Spread through cyclicity, as we saw in 3.4.1, but they also undergo Phrasal Vowel Coalescence with a following word:

- (77) nda ing'anyi - ndeng'anyi 'a large louse'
 9-louse 9-large

Similarly, monosyllabic verbs stand on their own as phonological words. The only occurring monosyllabic verb forms are (a) imperatives of monosyllabic-stemmed verbs and (b) the copula nyi. Imperative verbs not only form a separate word from what follows, but also form a separate p-phrase for syntactic reasons to be discussed in Appendix C. Here I will illustrate the behavior of the copula nyi with respect to both Vowel Coalescence and tone rules:

- (78) a. [Ndèlyà-ngo]_p['nyí m̀sòlrɔ̃]_p 'Ndelya-ngo is a man'
 Ndelya-ngo is man
- b. *[Ndèlyà-ngo]_p['nyí-~~m̀~~sòlrɔ̃]_p
- c. nyí iembe - nyiembe 'it's a hoe'
 COP hoe

The failure of the accented H of Ndelya-ngo to spread at the expense of nyí's H tone, along with the fact that nyí's vowel coalesces with that of a following vowel-initial noun, indicate that nyí forms its own phonological word.

There are no monosyllabic adjectives in Kivunjo, nor do there appear to be lexical adverbs of only one syllable. Thus in determining the mapping from morphosyntactic constituents onto phonological words we need only consider the behavior of nouns and verbs on the one hand, and that of prepositions and conjunctions on the other. The generalization appears to be that morphosyntactic words belonging to the lexical categories N, V, A form independent phonological words, while morphosyntactic words that belong to nonlexical or functional categories such as P and Conj must cliticize to a neighboring lexical constituent to form a phonological word. The phonological word matches standard definitions of the prosodic domain called the Clitic Group. I give Hayes' definition below as representative:

(79) Clitic Group Formation (Hayes 1989, ex. (9))

- a. Every content word (lexical category) belongs to a separate Clitic Group.
- b. Defn.: The host of a Clitic Group is the content word it contains.

Defn.: X and Y share category membership in C if C dominates both X and Y.

Rule: Clitic words are incorporated leftward or rightward into an adjacent Clitic Group. The group selected is the one in which the clitic shares more category memberships with the host.

In the next section I will justify my use of the term "phonological word" instead of "clitic group" for this domain.

The distinction between lexical and functional categories needed to determine what stands alone as a phonological word is the same one needed to determine which grammatical categories receive accent in the lexicon. That the associative marker, na and ca all fail to receive lexically assigned accent is shown by their failure to undergo raising rules when they precede a p-final unaccented noun. Since in each case the function word forms a single phonological word with the following noun, Accent Reduction would not be expected to delete the function word's accent if it had one, and we would predict the ungrammatical outcomes in (81):

- (80) a. [Ngá'wóná kítápú kyà Ládi]ₚ 'I saw Ladi's book'
 b. [Ngá'wóná Lyíôpa]ₚ[na Ládi]ₚ 'I saw Lioba and Ladi'
 c. [Ngá'wóna "mndu"]ₚ[cè Ládi]ₚ 'I saw someone like Ladi'
- (81) a. *[Ngá'wóná kítápú kyà Ládi]ₚ
 b. *[Ngá'wóná Lyíôpa]ₚ[na Ládi]ₚ
 c. *[Ngá'wóna "mndu"]ₚ[ca Ládi]ₚ

Thus the distinction between lexical and functional morphosyntactic categories is a pervasive one, needed throughout the lexical and phrasal components of the phonology.

3.4.3. Phonological word vs. clitic group

Even though the basic domain of phrasal cyclicity in Kivunjo fits Hayes' (1989) definition of a clitic group, I nonetheless persist in calling this domain a "phonological word" because it appears to be the smallest phrasal domain in Kivunjo Chaga. Hayes (1989) and Nespor & Vogel (1986), however, reserve the term "word" for an even smaller domain that they consider to be the minimal phrasal domain in the Prosodic Hierarchy. Yet rules that have been previously identified as applying within the more restrictive "word" domain of Hayes and Nespor & Vogel may in fact be reanalyzable as postcyclic or noncyclic lexical rules (cf. Kiparsky (1984), Booij & Rubach (1987), and Halle & Mohanan (1985)). I therefore follow Zec (1988) and Inkelas (1989), who have proposed that no language makes reference to both the clitic group and a smaller word domain in its phrasal (postlexical) phonology. Where there is evidence for the two as distinct domains, the prediction is that the smaller of the two will have the characteristics of a lexical

domain, and the larger those of a phrasal domain.

The relevance of this question to the Kivunjo data lies in the fact that the phonological word is the basic cyclic domain for Kivunjo phrasal rule application, yet phrasal rules are not restricted to applying within that domain. I have proposed that the phonological word's status as basic cyclic domain follows from the fact that it is the basic building block from which p-phrases are built, and that phrasal cycles result from applying a list of phonological rules after each building block is added to the representation. The phonological word/clitic group could have this special status for one of two reasons: (a) because it is the domain immediately below the p-phrase in the Prosodic Hierarchy, or (b) because it is the smallest domain in the language. Reason (a) predicts that the clitic group might itself be constructed out of smaller "words" by a parallel process, and that the intonational phrase or utterance might likewise be constructed out of p-phrases in separate cyclic strata. Reason (b), on the other hand, predicts that all domains of the Prosodic Hierarchy are constructed simultaneously by scanning the utterance at the level of the hierarchy's minimal constituent -- the phonological word/clitic group. In 3.7 I will show that analysis (b) is in fact a more accurate representation of how phrasal rules apply in Kivunjo Chaga.

Below I state formally the two prosodic domain formation algorithms I have identified in Kivunjo Chaga -- one for the phonological word, and one for the p-phrase. The p-phrase algorithm has been slightly revised so that it now refers specifically to phonological

words rather than to lexical or syntactic words as its building blocks.

(81') Kivunjo Chaga Phonological Word (P-Word) Formation:

For each pair of consecutive morphosyntactic words X and Y,
 (a) if X does not belong a lexical class (N, A, V), and
 (b) if X shares more category memberships with Y than
 it shares with any morphosyntactic word Z that may
 immediately precede X,
 then X and Y form part of a single phonological word;
 otherwise, they belong to separate words.

Definition of shared category membership:

X and Y share category membership in C if C dominates
both X and Y.

(81'') Kivunjo Chaga Phonological Phrase (P-Phrase) Formation:

For each pair of consecutive phonological words X and Y,
 if X p-governs Y,
 then X and Y form part of a single phonological phrase;
 otherwise, they are phrased separately.

Definition of p-government:

X p-governs Y if X is the head of a maximal projection
that dominates Y.

3.5. Rule modifications occasioned by cyclic facts

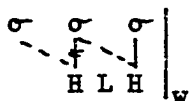
The data presented in sections 3.1-4 reveal that we must modify our formulations of two rules, Flop and S Spread, in order to account for the patterns of (non-)application that they exhibit in cyclic derivations. In the case of Flop, this entails rewriting the rule so that it applies not only at p-boundaries, but also at w-boundaries. With S Spread, we must restrict the rule so that it spreads only from accented syllables, in order to prevent unwanted iteration across cycles.

In addition to the obligatory revisions of Flop and S Spread, I will also show that word-based cyclicity allows Accent Reduction to be replaced with part (a) of the Matching Convention, first introduced in 2.2.5. On each word's cycle, after H Attachment and Final Raising have applied, the Matching Convention and Delinking Convention (examples (72-73) in section 2.2.5) will ensure the removal of accents that have not been realized with S tone.

3.5.1. Flop applies at w-boundaries

In section 3.4.1, the crucial case for word-based cyclicity in (61b) shows application of Flop on Cycle 2 even though the second cyclic domain, ngu, is not bounded by a right-hand p-boundary. In order for Flop to apply in (61b), it must be rewritten so as to refer to a w-boundary instead of a p-boundary:

(82) FLOP (revised)



This will allow the rule to apply in (61b), while also letting it apply at all boundaries stronger than the word, such as p-boundaries and u-boundaries. We will eventually see in 3.7.3 that the statement of Flop need not mention any boundary at all.

3.5.2. Accent Reduction

A felicitous by-product of word-based cyclicity is that we can eliminate the rule of Accent Reduction, replacing it with part (a) of the Matching Convention invoked in 2.2.5 for Demotion. I repeat the convention below:

(83) Matching Convention (repeated from 2.2.5)

- a. Every accent must be attached to a [+raised] autosegment, and
- b. Every [+raised] autosegment must be attached to an accent.

The Delinking Convention enforces the prohibition embodied in the Matching Convention by delinking the accent from the syllable (it has no other option, since it cannot delink a nonexistent [+raised] feature):

(83') Delinking Convention (repeated from 2.2.5)
(Halle & Vergnaud 1982, ex. 12d)

If the application of a rule results in a violation of the conditions — either universal or language-specific — which must be met by well-formed representations in the language in question, the violation is removed by deleting links between autosegments and core phonemes established by earlier rules or conventions.

The Matching Convention comes into effect only after H Attachment and Final Raising have applied, otherwise it would delete stem-penul-

timate accents in all positions, bleeding H Attachment and Final Raising of their input. However, once Final Raising has had a chance to attach [+raised] to eligible accented syllables, I will assume the convention operates automatically, whenever it is applicable. We will see another instance of the Matching Convention in the next section as well.

The crucial cases for Accent Reduction involve p-phrases of more than one word whose final word is unaccented, but whose penultimate word contains an accented syllable that would, if p-final, be eligible for H Attachment and/or Final Raising.

- (84) a.
$$\begin{array}{c} * \\ \left| \begin{array}{ccc} \text{Kilesoko} & \text{Ladi} & \end{array} \right| \\ \left| \begin{array}{ccc} \text{S} & \text{H} & \text{H} \end{array} \right| \quad \left| \right|_p \end{array}$$

'It was snatched
from Ladi (dis-
tant past)'
- b.
$$\begin{array}{c} * \\ \left| \begin{array}{ccc} \text{Kyasoko} & \text{Ladi} & \end{array} \right| \\ \left| \begin{array}{ccc} \text{HLH} & \text{H} & \text{H} \end{array} \right| \quad \left| \right|_p \end{array}$$

'It was snatched
from Ladi (re-
cent past)'

If each p-internal word gets its own cycle, H Attachment and Final Raising will try to attach tone features to the word's accented syllable, but will fail because there is no right-hand p-boundary in the current cyclic domain. The Matching Convention will then cause the word's accent to delete.

(85) Cycle 1:

a. $\begin{array}{c} | \text{Kilesoko} \\ | \quad | \quad | \\ \text{S} \quad \text{H} \quad \text{H} \end{array}$	b. $\begin{array}{c} | \text{Kyasoko} \\ | \quad | \quad | \\ \text{HLH} \quad \text{H} \quad \text{H} \end{array}$	
n/a	n/a	H ATTACHMENT
n/a	n/a	FINAL RAISING
$\begin{array}{c} | \text{Kilesoko} \\ | \quad | \quad | \\ \text{S} \quad \text{H} \quad \text{H} \end{array}$	$\begin{array}{c} | \text{Kyasoko} \\ | \quad | \quad | \\ \text{HLH} \quad \text{H} \quad \text{H} \end{array}$	MATCHING CONVENTION

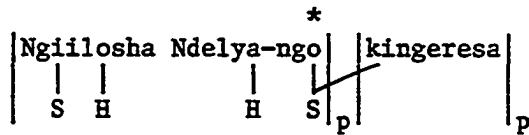
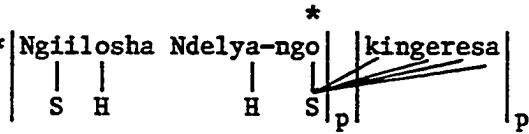
On the next cycle, there will be no accented syllables eligible to attract tone features by H Attachment or Final Raising, even though the p-boundary is at last present in the representation. The p-internal word will have lost its accent on the previous cycle, while the p-final word is toneless upon entry to the phrasal phonology.

(86) a. $\begin{array}{c} | \text{Kilesoko Ladi} \\ | \quad | \quad | \\ \text{S} \quad \text{H} \quad \text{H} \end{array} \Big|_p$	b. $\begin{array}{c} | \text{Kyasoko Ladi} \\ | \quad | \quad | \\ \text{HLH} \quad \text{H} \quad \text{H} \end{array} \Big|_p$	
n/a	n/a	H ATTACHMENT
n/a	n/a	FINAL RAISING
Kilèsókó Lādī	Kyá'sókó Lādī	

Thus with word-based cyclicity and part (a) of the Matching Convention we can achieve the effect of Accent Reduction without an extrinsically ordered rule. This allows us to reduce our inventory of p-level rules by one, and to derive the deletion of p-internal word accent from a general well-formedness condition on tone-accent correspondences.

3.5.3. S Spread's non-iteration across cycles

We have already seen in 2.4.4 that S Spread must not be allowed to iterate rightward in non-cyclic contexts such as (87):

- (87) a. 
 Ngililōshá Ndèlyā-ngo kingerēsā
 'I'm teaching Ndelya-ngo English'
- b. 
 *Ngililōshá Ndèlyā-ngo kingerēsā~

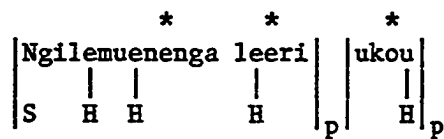
Here, the S of Ndelya-ngo is not eligible for S Spread until the last cycle, at which point it is followed by four toneless syllables -- more than enough room for S Spread to apply. After spreading to the first syllable of kingeresā, the structural description of S Spread is still met, yet the rule fails to iterate rightward, as shown by the ungrammaticality of (87b).

In 2.4.4 the reason I proposed for this was that S Spread iterates leftward, scanning the domain from right to left for strings that meet its structural description. Thus after spreading the S of Nde-lyā-ngo rightward one syllable, the rule can only look to the left of that S for additional targets. Furthermore, leftward iteration is independently needed to account for why in non-cyclic Case A of the Rival S Configuration S Spread chooses the right-hand S (cf. 3.1.2).

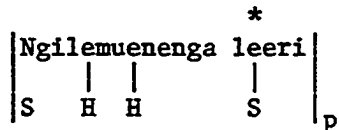
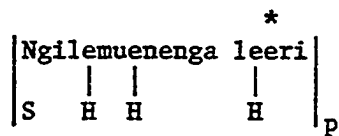
Across cycles, however, right-to-left iteration fails to rule out

successive applications of S Spread, since the rule can repeatedly scan the string on each cycle, circumventing the effects of right-to-left iteration. Yet S Spread never reapplies on a later cycle to a S that has already spread on an earlier cycle. This can be seen in the case of a HLL penultimate-accented word in p-final position followed by an additional toneless syllable in the next p-phrase.

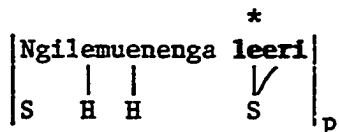
(88) Non-iteration of S Spread across cycles:



Cycle 2:



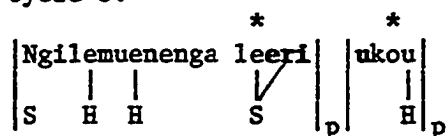
ACCENT RETRACTION,
FINAL RAISING



S SPREAD

S Spread's structural description is met by the syllables le-e-ri on Cycle 2, and so the S of leeri spreads on that cycle. On the next cycle, the rule's structural description is once again met, this time by the syllables e-ri-u:

(89) Cycle 3:



n/a

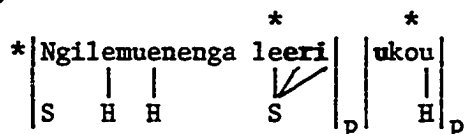
S SPREAD

Ngilēmúènéngà lèèrì ùkòŷ
 I-him-gave money yesterday
 'I gave him money yesterday'

DEFAULT, TONE SHIFT

Nonetheless, S Spread does not reapply. If it did, we would expect the incorrect outcome in (90):

(90)



S SPREAD

*Ngilēmúènéngà lèèrì ùkòŷ

DEFAULT, TONE SHIFT

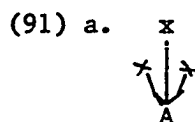
We therefore need to modify our formulation of S Spread in such a way that it can distinguish between a S that has already spread and one that has not. Strict Cyclicity is not an option, since on Cycle 3 the structural description of S Spread is met by virtue of the addition of new material on that cycle.

If we compare the input to S Spread in (88) with the rule's output in (89) and (90), there are two obvious differences: First, before spreading in (88) the S is singly linked, while in (89), after spreading, it is multiply linked. Second, the syllable from which the S spreads in (88) bears accent, while the syllable from which the S fails to spread in (89) has no accent. Thus we have two possible ways of restricting S Spread to previously unspread tones: inalterability

or reference to accent.

3.5.4. The inalterability account

Inalterability is a phenomenon observed in non-linear analyses of segmental phonology (Steriade 1982, Hayes 1986, Schein & Steriade 1986) whereby autosegments that are multiply linked to the timing tier fail to undergo rules that their singly linked counterparts routinely undergo. Thus geminates and long vowels often fail to undergo the same rules as their short counterparts. In conventional autosegmental notation, rules that discriminate against long segments would have to be written with an explicit prohibition on additional association lines. This is shown in (91), where 'x' denotes a CV slot, and A a melodic autosegment:



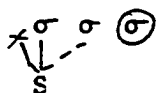
Rules that show association lines without explicit prohibitions on additional association lines such as those in (91a) have traditionally been assumed to allow any and all multiple associations in addition to those specified by the rule. Hayes (1986), however, proposed to eliminate the need for representations such as (91a) in phonological rule statements by elevating the prohibition it embodies to the status of a constraint:

(92) LINKING CONSTRAINT (Hayes 1986)

Association lines in structural descriptions are interpreted as exhaustive.

While the Linking Constraint captures a significant generalization about segmental processes, it has not generally been observed to extend to tonal rules (cf. Hyman & Pulleyblank 1988). If, however, multiple vs. single linking turned out to be the operative distinction made by S Spread, this would constitute an example of a tonal rule that respects inalterability:

(93) S SPREAD (modified to respect inalterability)



Just as with Hayes' (1986) analysis of segmental inalterability, it would be preferable to leave prohibitions on additional linkings out of the statement of S Spread, and to assume that the Linking Constraint holds for all tone rules in Kivunjo Chaga. Scanning the p-level rule inventory, though, we find that two rules violate inalterability: Accent Retraction and S Lowering. Both may be triggered by tones that are multiply linked, as shown in (94):

- (94) a. Accent Retraction triggered by a multiply linked S: leeri at strong juncture

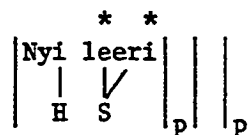
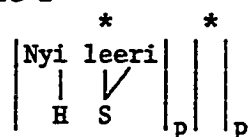


is money Ladi saw

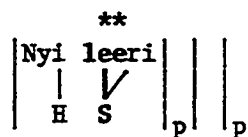
C0---C1-----C2---C3-----C4-----

'It's money that Ladi saw'

Cycle 2

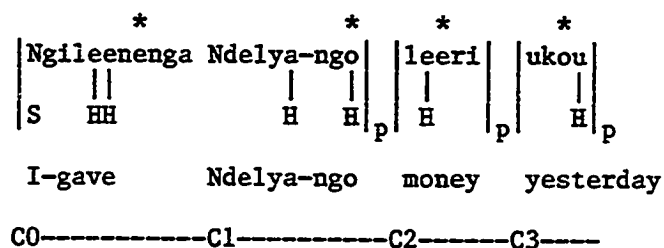


ACCENT ATTACHMENT



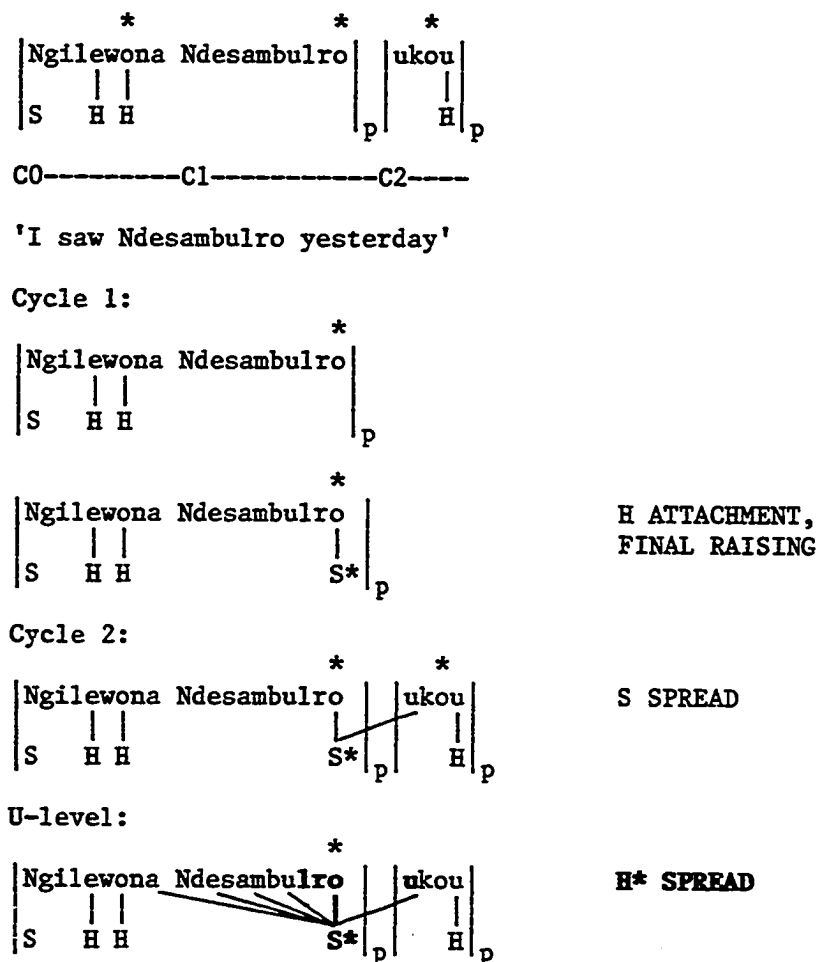
ACCENT RETRACTION

- b. S Lowering triggered by a multiply linked S: Case A of the Rival S Configuration



Yet that modification would not allow for the fact that H* Spread applies even to S* tones that have been spread rightward by S Spread:

(96) H* Spread applying to a multiply linked S*:

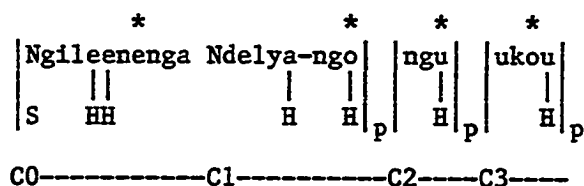


Here H* is itself the target of H* Spread, yet it disobeys (95). Rule ordering cannot be invoked, since as was shown in 2.4.5 S Spread must precede H* Spread. Thus we are unable to assume tonal rules containing association lines automatically obey the Linking Constraint, and we have no recourse but to stipulate the prohibition on additional

association lines in the statement of S Spread in (93).

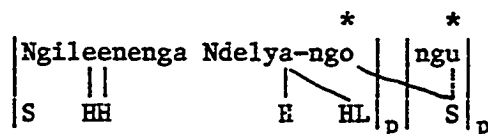
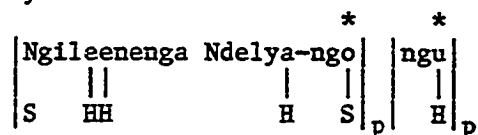
The absence of a general principle regarding inalterability in tone rules is not the only problem with (93) and the inalterability account. An empirical counterexample to (93) also exists in Case C of the Rival S Configuration:

(97) S Spread applying to a multiply linked S that results from Flop:
Case C of the Rival S Configuration.



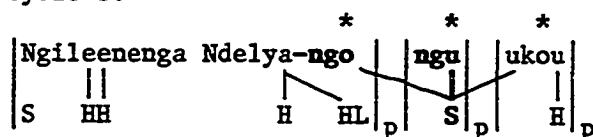
'I gave Ndelya-ngo firewood yesterday'

Cycle 2:



FINAL RAISING,
S LOWERING,
FLOP

Cycle 3:



S SPREAD

On Cycle 2 (counting the verb's own cycle as Cycle 0) the S of ngu undergoes Flop, spreading leftward onto the preceding syllable. Yet on the next cycle that same S spreads rightward one syllable by S Spread. Clearly the multiple linking that results from Flop's application does not prevent S Spread from applying.

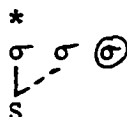
One possible way around this counterexample would be to eliminate Flop from the list of cyclic rules. Flop is crucially ordered after several cyclic rules, but does not crucially precede any as it is currently formulated. However, as I will show in section 3.7.3, retaining Flop as a cyclic rule allows for a much more natural statement of the rule with respect to (a) articulatory motivation, (b) prosodic rule typology, and (c) direction of iteration.

Thus the impossibility of making the Linking Constraint a general property of tone rules, combined with problems arising from S Spread's interaction with Flop render inalterability an unappealing reason for why S Spread does not iterate across cycles.

3.5.5. The accentual account

In an accentual analysis of S Spread's non-iteration across cycles, we need merely add an accent to the structural description of the rule, as in (98):

(98) S SPREAD (revised by addition of accent)

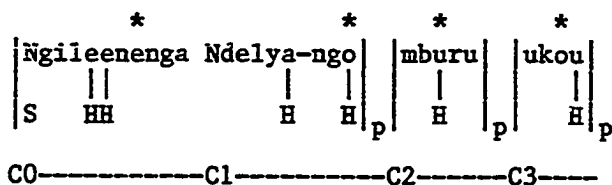


This will ensure that the S of leeri will spread once in (89), but not again to the same S in (90). This is because after spreading once, the S will no longer have an accented syllable as its rightmost linkage, and so will not meet the structural description of the rule as revised in (98).

The multiply linked S in (97) will not present a problem for an accentual account because leftward spreading of the S will not affect the accentual status of the rightmost syllable to which the S is attached. The S of ngu will still qualify for S Spread because ngu bears accent. Thus it is immaterial when Flop applies in the derivation if S Spread is an accent-triggered rule.

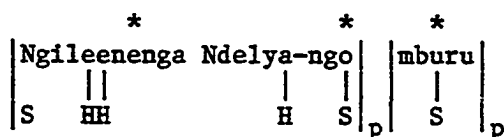
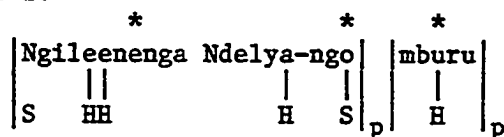
However, a different problem arises with an accentual account of S Spread's non-iteration. In Case B of the Rival S Configuration, the S of Ndelya-ngo spreads at the expense of the S of mburu on Cycle 2 (counting the verb's cycle as Cycle 0):

- (99) S Spread not applying to accented S-toned syllable: Case B of the Rival S Configuration

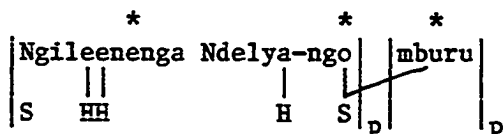


'I gave Ndelya-ngo a goat yesterday'

Cycle 2:

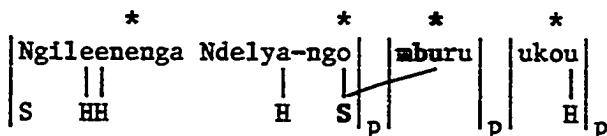


FINAL RAISING



S SPREAD,
STRAY ERASURE

Cycle 3:



The problem this example poses for an accentual analysis is that Ndelya-ngo's S has spread onto another accented syllable. We might therefore expect S Spread to reapply on Cycle 3, spreading the S of Ndelya-ngo one more syllable, but this is not the case:

(100) a. Incorrect outcome if S Spread were to reapply

Cycle 3:

*	*	*	*	
Ngileenenga	Ndelya-ngo	mburu	ukou	S SPREAD
| S |	| H |	| S |	| p |	
| H |	| H |	| p |	| p |	

*Ngilèénéngà Ndèlyà-ngo mburu ukòŷ OTHER RULES

b. Correct outcome, in which S Spread does not reapply:

n/a	S SPREAD
Ngilèénéngà Ndèlyà-ngo mburu ukòŷ	OTHER RULES

The same problem arises with leeri at strong juncture. On the first cycle, leeri's S is able to spread, since it is followed by two toneless syllables within the p-phrase:

(101)

*	*
Nyi leeri	Ladi alewona
| H |	| H|
| H |	| H|

p p p

C0---C1-----C2---C3-----C4-----

'It's money that Ladi wants'

Cycle 1:

*	
Nyi leeri	
| H |	
| H |	
p	

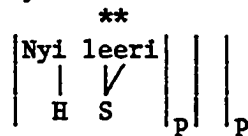
*		
Nyi leeri		
| H |	| S |	
p		

ACCENT RETRACTION,
FINAL RAISING,
S SPREAD

On the second cycle the accent associated with strong juncture is added to leeri's final syllable and moves to the penult by Accent Retraction. On the third cycle, then, we find a doubly linked S whose

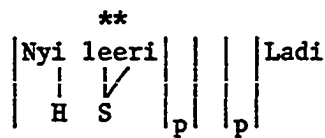
rightmost linking is to an accented syllable, and which is followed by two toneless syllables. Yet just as in (100), S Spread fails to reapply to the S of leeri:

(102) Cycle 2:



ACCENT ATTACHMENT,
ACCENT RETRACTION

Cycle 3:



n/a

S SPREAD

Nyi leeri Ladi alêwónâ
 *Nyi leeri Ladi alêwónâ

Thus if a S comes to be associated with an accented syllable either through spreading or through Accent Retraction onto the syllable it has spread to, that accent does not license S Spread. Only the accent that originally gave rise to the S may license spreading. Given that the distinction between original and acquired accents need only be made when a S is linked to two adjacent accented syllables, and that the accent is always acquired on a cycle earlier than that on which S Spread might incorrectly apply, we may account for acquired accents' invisibility to S Spread by deleting them before S Spread gets a chance to apply on the next cycle. This may be accomplished with a rule of Posttonic Deaccenting:

(103) POSTTONIC DEACCENTING

$$* \rightarrow \phi / * \begin{array}{c} | \quad | \\ \sigma \quad \sigma \end{array}$$

As long as it is ordered after S Lowering has applied on the earlier cycle in (99) and (101), Posttonic Deaccenting need not require that the two syllables in (103) be linked to the same S. Besides the structures in (99) and (101), the only other structures in which adjacent accented syllables may be found fall into two categories: (1) Cases A and C of the Rival S Configuration, and (2) the configuration yielding derived input to Accent Retraction. In both instances the adjacent accent problem is handled by other rules already in place. I discuss each briefly below.

In the first type of adjacent-accent structure, the relevant accented syllables are each linked to separate S tones, but the first S may not spread for one of the reasons seen in Cases A and C of the Rival S Configuration:

(104) a. $\begin{array}{c} * \quad * \\ \left| \begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \end{array} \right|_p \left| \begin{array}{c} \text{leeri} \\ \text{S} \end{array} \right|_p \dots$

$\begin{array}{c} * \quad * \\ \left| \begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{HL} \end{array} \right|_p \left| \begin{array}{c} \text{leeri} \\ \text{S} \end{array} \right|_p \dots \quad \text{S LOWERING}$

$\begin{array}{c} * \\ \left| \begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{HL} \end{array} \right|_p \left| \begin{array}{c} \text{leeri} \\ \text{S} \end{array} \right|_p \dots \quad \text{MATCHING CONVENTION}$

b. $\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \dots$

$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{HL} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \dots$ S LOWERING

$\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{HL} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \begin{array}{c} \text{ngu} \\ \text{S} \end{array} \begin{array}{c} * \\ | \\ \text{p} \end{array} \dots$ MATCHING CONVENTION (a)

In both cases S Lowering applies, triggering deletion of the first accent by part (a) of the Matching Convention. If Posttonic Deaccenting instead preceded S Lowering on Cycle 2 in (104), we would expect the second of the two rival S tones to lower to H by part (a) of the Matching Convention, incorrectly predicting that S_2 should never spread in any instance of the Rival S Configuration.

- (105) a. $\begin{array}{c} * \quad * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{leeri} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{S} \mid_p \end{array}$
- $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{leeri} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{S} \mid_p \end{array}$ POSTTONIC DEACCENTING
- $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{leeri} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{H} \mid_p \end{array}$ MATCHING CONVENTION (a)
- $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{leeri} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{H} \mid_p \end{array}$ S SPREAD, STRAY ERASURE
- n/a — bled by Posttonic Deaccenting S LOWERING
- *Ngilèénéngà Ndèlyà-ngo "leerî ùkòŷ
- 'I gave Ndelya-ngo money yesterday'
- OTHER RULES

- b. $\begin{array}{c} * \quad * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{ngu} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{S} \mid_p \end{array}$
- $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{ngu} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{S} \mid_p \end{array}$ POSTTONIC DEACCENTING
- $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \mid \text{ngu} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{S} \mid_p \mid \text{H} \mid_p \end{array}$ MATCHING CONVENTION (a)
- n/a — too few following syllables S SPREAD
- $\begin{array}{c} \text{Ngileenenga Ndelya-ngo} \mid \text{ngu} \mid \dots \\ \text{S} \quad \text{HH} \quad \text{H} \quad \text{HL} \mid_p \mid \text{H} \mid_p \end{array}$ S LOWERING, MATCHING CONVENTION (a), FLOP
- *Ngilèénéngà Ndèlyà-ngo 'ngú ùkòŷ
- 'I gave Ndelya-ngo a piece of firewood yesterday'
- OTHER RULES

(106) $\left| \begin{array}{c} \text{Ngilewona} \\ \text{S} \end{array} \right| \left| \begin{array}{c} \text{kipfi} \\ \text{H H} \end{array} \right| \left| \begin{array}{c} * \\ \text{S}^* \end{array} \right| \left| \begin{array}{c} * \\ \text{cu} \end{array} \right| \dots$

			*			
Ngilewona mkipfi			|	cu	...	
S	H	H	S*	|_p	|	|_p

I-saw wasp-AUG this

Ngilêwóná 'mkipfi cu ukòu

'I saw this big, ugly wasp yesterday'

Although it introduces a new rule to the p-level inventory, the

accentual analysis of S Spread's non-iteration across cycles is still to be preferred to the inalterability analysis on grounds of naturalness. The inalterability account would require an arbitrary stipulation that S Spread only apply to tones that are singly linked -- a condition that is atypical for tone rules in general, and which does not hold for any other tone rule in Kivunjo. It would also force Flop to be a non-cyclic rule, sacrificing a naturally motivated, simply stated phrasal rule.

In contrast, the accentual analysis allows S Spread to be characterized as an accent-triggered rule -- a plausible account given that S Spread has the effect of increasing the salience of the prominence feature [+raised] by increasing its duration. Furthermore, the rule of Posttonic Deaccenting that is needed for Case B is exactly the sort of rule one expects to find in languages with accentual or stress phenomena, since it resolves the clash produced by two prominences on adjacent syllables. Thus rather than complicating the grammar, the addition of Posttonic Deaccenting as part of an accentual analysis of S Spread simplifies the grammar by allowing for a less idiosyncratic analysis of the facts of Flop and S Spread.

3.6. Parameters of cyclicity: simultaneity and directionality

We have so far seen evidence for (a) the phrasal cycle, (b) the phonological word as basic cyclic domain, and (c) certain refinements of the p-level rule system brought about by cyclicity. The next question to be addressed concerns the order in which basic cyclic domains are created and added to the representation, with respect to both time (simultaneity) and location in the utterance (directionality).

Regarding simultaneity, the issue is the following: Does the entire utterance undergo rules on every cycle, but within domains that increase progressively with each cycle? If so, then what we have is a compounding-style cycle:

(107) w w w w

On the first cycle of a compounding-style derivation, each basic cyclic domain undergoes rules separately, but concurrently with every other domain.

If, on the other hand, the entire utterance does not undergo rules on each cycle, then we have two fundamental possibilities. The first is an affixation-style cycle, in which no domain undergoes rules until it is added to material from previous cycles (if any), as in (108). With affixation-style cyclicity, separate domains do not undergo cyclic rules simultaneously.

(108) w w w w

—
—
—
—

The other possibility is a hybrid cycle in which the entire utterance is not exhaustively parsed on each cycle, but in which some domains have simultaneous, yet separate cycles:

(109) w w w w

— —
— —
— —
— —

In section 3.6.1 we will consider which of these three models for cyclicity handles the cyclic facts presented in 3.1-4. We will find that none of the data allow for a strictly compounding-style analysis, and taken together they favor an affixation-style cycle. Additional data will also be seen to confirm that conclusion.

Concerning directionality, the issue is where in the utterance phrase construction begins, a question that in turn determines where the cyclic derivation begins. Up until now I have simply assumed that prosodic domain construction proceeds from left to right, and that in all cases the first cycle operates on the leftmost word in the utterance. However, Chen (1986) and Shih (1986) in their analyses of Mandarin Tone Sandhi have assumed an inside-out cycle that starts with the most nested constituents, regardless of their position in the utterance.

In section 3.6.2 I will show that the cyclic examples from

sections 3.1-4 do not point to the existence of an inside-out cycle in Kivunjo Chaga. I will also consider other syntactic structures in which the Rival S Configuration may arise, demonstrating that cyclicity appears to proceed from left to right regardless of where the most nested portion of the syntactic tree is located. Finally, in 3.6.3 I will show that apparent cases of inside-out cyclicity involving verbs reflect, on closer examination, the application of a Clash Resolution rule that deletes a stem accent when it immediately precedes a verbal accent.

3.6.1. Simultaneity: the compounding-style, affixation-style, and hybrid models

In order to decide between the compounding-style, affixation-style and hybrid models of cyclicity in Kivunjo, we must examine the data so far presented in support of cyclicity with a view to identifying the key orderings among basic cyclic domains in each example. In (110) I diagram each case, indicating crucial orderings graphically with solid lines, as well as to the right of each example in terms of cyclic domains: C1, C2, etc. Dotted lines indicate the left-to-right, affixation-style cyclic orderings that I assume to hold but which are not crucially required to derive the correct results. Thus in (110), for example, rules must apply to the combination of domains C1 and C2 before they apply to the combination of domains C1, C2 and C3.

(110) Crucial and non-crucial cyclic orderings in examples from 3.1-4:

Cyclic domain:		C0	C1	C2	C3
a. Rival S Configuration, Cases B & C (section 3.1):		[V	N] _p	[N] _p	[Adv] _p [C1+C2] > [C1+C2+C3]
				
				
				
				
	(9B)	Ngilëénéngà Ndèlyà-ngo "mburu ukòŷ			
		'I gave Ndelya-ngo a goat yesterday'			
	(9C)	Ngilëénéngà Ndèlyà-ngo 'ngu ukòŷ			
		'I gave Ndelya-ngo firewood yesterday'			
	(13)	Ngeciénéngà Ndèlyà-ngo 'ngu ngamà			
		'I'll give Ndelya-ngo firewood tomorrow'			
b. Word Cycle (section 3.4):		[V	N] _p	[N Adj] _p	[C1+C2] > [C1+C2+C3]
				
				
				
				
	(61b)	Ngilëénéngà Ndèlyà-ngo 'ngú tsítùŷ			
		'I gave Ndelya-ngo a little firewood'			
c. Reduced Demonstratives: (section 3.2):		[V	N] _p	[Dem] _p	[Adv] _p C1 > C2
				
				
				
				
	(28)	Ngilèwónà 'mkipfi cù ukòŷ			
		'I saw this big, ugly wasp yesterday'			
d. Strong Juncture: (section 3.3):		[V	N] _p	[*] _p	[N... C1 > C2
				
				
				
				
	(50a)	Nyì m' "sulrì Ladi àlèmbônâ			
		'It's a nobleman who Ladi saw'			
	(50b)	Nyì leerì Ladi àlèwónâ			
		'It's money that Ladi saw'			

In (110a-b), C1 must be joined with C2 before C3 is added to the

derivation. This is because C1 provides S_1 , while C2 provides S_2 of the Rival S Configuration (in 110a), or H_2 of the Word Cycle configuration (in 110b). Both tones must be present in the same cumulative cyclic domain for S_1 to undergo S Spread in Case B or S Lowering in the other cases. In each instance, however, the extra toneless syllables provided by C3 must not be made available until the next cycle.

The key ordering of [C1+C2] before [C1+C2+C3] is compatible with an affixation-style model of cyclicity, as shown by the dotted lines in (110a-b). However, a strict affixation-style cycle is not the only way to derive this ordering. C3 could also have its own separate cycle concurrently with C1 and C2, as long as it was added to C2 only after C2 was added to C1. This would be possible in a hybrid type of cycle:

(111) A hybrid cycle in (110a-b):

a. Rival S Configuration (110a):

C0	C1	C2	C3
[V	N] _p	[N] _p	[Adv] _p
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

b. Word Cycle (110b): [V N]_p[N Adj]_p

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The data in (110a-b) would also be amenable to a strict compounding-style cycle in which C1 and C2 combined with each other before combin-

ing with C3:

(112) A multiple-step compounding-style cycle in (110a-b):

a. Rival S Configuration (110a):

C0	C1	C2	C3
[V	N] _p	[N] _p	[Adv] _p
_____	_____	_____	_____
_____	_____	_____	_____

b. Word Cycle (110b):

[V	N] _p	N	Adj] _p
_____	_____	_____	_____
_____	_____	_____	_____

However, (110a-b) would not permit a compounding-style cycle in which C1, C2 and C3 combined into a single domain simultaneously, or in which the pairs C0 and C1, and C2 and C3 combined together first before C1 and C2 came together on the last cycle:

(113) Other compounding-style cycles in (110a-b):

a. Rival S Configuration (110a):

C0	C1	C2	C3	C0	C1	C2	C3
*[V	N] _p	[N] _p	[Adv] _p	*[V	N] _p	[N] _p	[Adv] _p
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

*Ngilèénégà Ndèlyà-ngo mbu'ru ukòŋ 'I gave N. a goat yesterday'

b. Word Cycle (110b):

*[V	N] _p	N	Adj] _p	*[V	N] _p	N	Adj] _p
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

*Ngilèénégà Ndèlyà-ngo ngu tsitùŋ 'I gave N. a little firewood'

Turning now to examples (110c-d), we find a more restrictive situation: The noun that constitutes C1 must undergo rules on its own cycle before the reduced demonstrative or strong juncture of C2 is added to C1. This gives H Attachment and S Spread a chance to supply the relevant syllable of C1 with the [+H] tone it needs to retract the accent introduced by C2.

Unlike C3 in (110a-b), C2 in (110c-d) must not have its own separate cycle at the same time that C1 does:

(114) a. Reduced Demonstratives (110c):

C0	C1	C2	C3
*[V	N] _p	[Dem] _p	[Adv] _p
....	_____	_____
....	_____	_____

*Ngilèwóná 'mkipfí 'cu ukou
'I saw this big, ugly wasp yesterday'

b. Strong juncture (110d):

C0	C1	C2	C3
*[V	N] _p	[*] _p	[N...
....	_____	_____
....	_____	_____

*Nyî mcàkà Lādî àlèmbônâ
'It's a Chaga person who Ladi saw'
(bad on cleft reading, not relative clause)

In the Reduced Demonstrative case this is because the demonstrative would receive its own H* by H Attachment, bleeding Accent Retraction onto the final syllable of C1.

a. Affixation-style: b. Compounding-style:

*
...mkipfi |
 | p

*
...mkipfi |
 |
 S* |
 | p

$$\begin{array}{ccccc} & * & & * & \\ \dots \text{mkipfi} & | & \dots & | & \text{cu} \\ & | & & | & | \\ & p & & & p \end{array}$$

$$\begin{array}{ccccc} & * & & * & \\ \dots \text{mkipfi} & | & \dots & | & \text{cu} \\ & | & & | & | \\ & S^* & & S^* & p \end{array}$$

H ATTACHMENT,
FINAL RAISING

$$\begin{array}{ccccccc} & & * & & & * & \\ \dots & \text{mkipfi} & | & | & | & \text{cu} & | \\ & | & & & & & \\ & S^* & | & p & & & p \end{array}$$

$$\begin{array}{ccccccc} & & * & & & & \\ \dots & \text{mkipfi} & | & | & | & \text{cu} & | \\ & | & & & & & \\ & S^* & | & p & & & p \end{array}$$

$$\begin{array}{ccccc} & * & & * & \\ \dots \text{mkipfi} & | & & | & \text{cu} \\ & | & & | & | \\ & S^* & | & S^* & | \\ & & p & & p \end{array}$$

n/a

**ACCENT
RETRACTION**

$$\begin{array}{c} \dots \text{kipfi} \quad \left| \begin{array}{c} * \\ \text{cu} \end{array} \right| \\ \swarrow \quad \searrow \quad \downarrow \\ \text{H}^* \text{L} \quad \text{p} \quad \text{S}^* \quad \text{p} \end{array}$$

S LOWERING,
MATCHING CONV.,
FLOP

Ngilêwóná 'mkipfi cu ukòŷ *Ngilêwóná 'mkipfi 'cu ukòŷ OTHER RULES

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(114'') C0 C1 C2 C3
 |nyi mcaka| | | |Ladi...
 | H | | |
 | p | p |

a. Affixation-style: b. Compounding-style:

Cycle 1:

...mcaka|
 | p

n/a

n/a

...mcaka| ... | |
 | p | p

n/a

n/a

*
 | |
 | p

n/a

H ATTACHMENT,
 FINAL RAISING

MATCHING
 CONVENTION

Cycle 2:

...mcaka| | |
 | p | p

*
 ...mcaka| | |
 | S* | p | p

...mcaka| | |
 | p | p

n/a

ACCENT ATT.,
 H ATTACHMENT,
 FINAL RAISING

Later cycles and u-level:

Nyĩ m'càkà Ladi àlèmbònâ *Nyĩ mcàkà Ladi àlèmbònâ

OTHER
 RULES

Examples (110c-d) are therefore incompatible with any sort of compounding-style or hybrid derivation in which each basic cyclic domain, before undergoing rules together with other domains, has its own individual cycle:

(115) Compounding-style and hybrid cycles for (110c-d):

a. Reduced Demonstratives (110c):

C0	C1	C2	C3	C0	C1	C2	C3
*[V	N] _p	[Dem] _p	[Adv] _p	*[V	N] _p	[Dem] _p	[Adv] _p
()				
()				

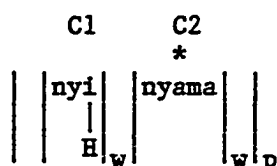
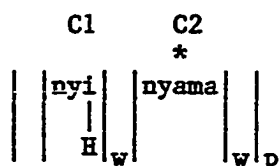
b. Strong Juncture (110d):

C0	C1	C2	C3	C0	C1	C2	C3
*[V	N] _p	[*] _p	[N...	*[V	N] _p	[*] _p	[N...
()				
()				

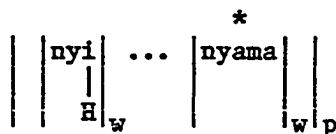
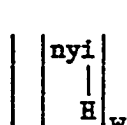
In all the examples presented in (110), the initial verb's own word cycle (C0) has been ignored as irrelevant to crucially cyclic rule orderings, since it is not in p-final position. Yet now that we have converted to a word-based cycle, we have new instances of phrasal cyclicity to consider. One such instance corroborates the evidence for affixation-style cyclicity seen above. In example (116) below, the utterance nyi nyama 'it's meat' is clearly made up of two phonological words, since as was shown in 3.4, the copula nyi does not cliticize to a following noun.

The affixation-style model for cyclicity predicts that nyi will first have its own cycle, undergoing no rules. Then on the next cycle nyama will be added, its accent will retract onto nyi, and the H of nyi will raise and spread, producing the correct output in (116a).

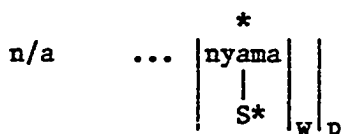
(116) a. Affixation-style: b. Compounding-style:



Cycle 1:

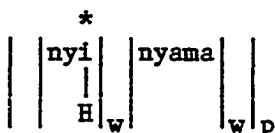
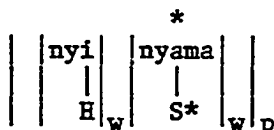
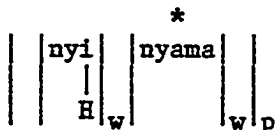


n/a



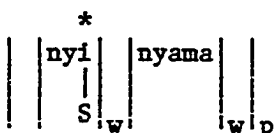
H ATTACHMENT,
FINAL RAISING

Cycle 2:



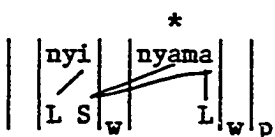
n/a

ACCENT
RETRACTION

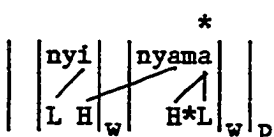


n/a

FINAL RAISING,
S SPREAD



Nyĩ nyama[~]



*Nyĩ nyámâ

DEFAULT &
TONE SHIFT;
(b) only:
DEMOTION

However, a compounding-style model would predict that both nyi and nyama should simultaneously but separately undergo rules on the first cycle, before joining together on the second. This would not allow Accent Retraction to apply until Cycle 2, since nyi and nyama must

both be in the same domain for the rule to apply. In the meantime, however, the toneless accented syllable of nyama would be eligible to receive a H* tone by H Attachment on Cycle 1. After receiving the H*, nyama would no longer have a toneless accented syllable, and so Accent Retraction would be blocked on Cycle 2. This would yield the incorrect outcome in (116b).

Example (116) can be expanded to create a three-cycle structure in which C1 must precede C2 and C2 must also precede C3. Such a structure is possible because nyi nyama, once combined, forms the same tone-accent pattern as leeri, one of the nouns used in the Strong Juncture argument for Cyclicity (Argument #3).

If we place nyi nyama before a strong juncture, we obtain an utterance whose first three basic cyclic domains must form a strict affixation-style cycle. C1 will consist of nyi, C2 of nyama, and C3 will comprise nothing more than the accent that marks strong juncture (cf. example (110d) above). The reason why this forms a strict affixation-style cycle is, first, that nyi (C1) and nyama (C2) may not undergo separate cycles simultaneously, as was just shown in (116). Secondly, nyama (C2) and the strong juncture accent (C3) may not undergo separate, concurrent cycles since if the strong juncture accent had its own cycle it would delete, predicting no raising in unaccented members of the tone-accent paradigm.

	C1	C2	C3	C4	C5
		*	*		*
(117)	| Nyi |	| nyama |	| |	| Ladi |	| akundi |
	| H |		| p |	| p |	| H H H | p

Cycle 1:

| Nyi |
| H |
no rules

Cycle 2:

	*
| Nyi |	| nyama |
| H |	
	p

	*
| Nyi |	| nyama |
| S |	
	p

ACCENT RETRACTION,
FINAL RAISING,
S SPREAD

Cycle 3:

	*		*
| Nyi |	| nyama |	| |	| |
| S |			
	p	p	

	*	*
| Nyi |	| nyama |	| |
| S |		
	p	p

ACCENT ATTACHMENT,
ACCENT RETRACTION

	*
| Nyi |	| nyama |
| S |	
	p

POSTTONIC
DEACCENTING

Later cycles and u-level:

Nyi nyama Ladi akundi

'It's meat that Ladi wants'

Thus along the parameter of simultaneity, the only model of cyclicity that accounts for all the data in (110), (116) and (117) is the affixation-style model.

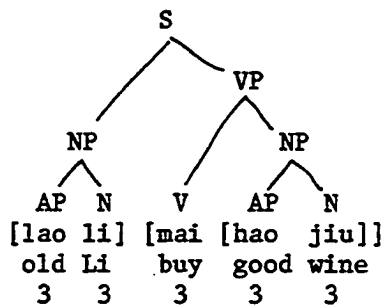
3.6.2. Directionality: Left-to-right vs. inside-out cyclicity

Chen (1986) and Shih (1986) have shown that to derive Mandarin tone sandhi facts it is sometimes necessary to start the derivation with the most nested cyclic domains rather than proceeding in a strict linear order:

(118) Mandarin inside-out cyclicity

(adapted from Chen 1986: section 5, examples 1a, 4, 14)

Tone Sandhi rule: 3 → 2 / ____ 3



Underlying Representation

2 F

2 F

F formation: Immediate Constituency

n/a F'

F' formation: Triple Meter
(stray adjunction)

In Mandarin the domain of Tone Sandhi at slower speech rates is the foot (F), which is constructed by means of a pair of algorithms that Chen refers to as Immediate Constituency and Duple Meter:

(119) Foot Formation Rule (section 5, example 11).

- a. IC (Immediate Constituency): link immediate constituents into disyllabic feet.
- b. DM (Duple Meter): Scanning from left to right, string together unpaired syllables into binary feet.

By "immediate constituents", Chen appears to mean simple binary-

branching structures. Items that miss inclusion in feet by these algorithms are then incorporated into superfeet (F') by a stray adjunction process that Chen calls Triple Meter:

(120) Foot Formation Rule (continued)

- c. TM (Triple Meter): Join any leftover monosyllable to a neighboring binary foot according to the direction of syntactic branching.

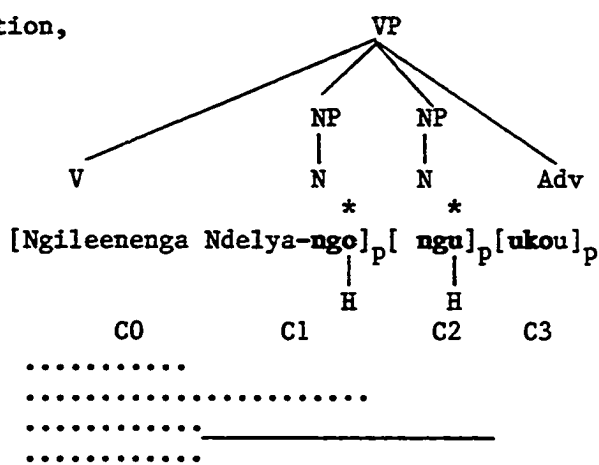
Cyclicity derives from intercalating Tone Sandhi between foot formation and superfoot formation (in other derivations the rule can be seen to apply after superfoot formation as well).

In Kivunjo Chaga, there is only one algorithm for phonological word formation, and only one for p-phrase formation. These algorithms apply equally to all structures in the utterance, and as I will argue more explicitly in 3.7, apply concurrently as part of a single, unified process of prosodic domain formation. Therefore we have no special reason to expect inside-out cyclic cases such as (118) to occur in Kivunjo.

To determine whether this prediction is borne out by the facts, we need to examine structures with different patterns of nestedness to see whether they exhibit distinct phonological behavior in crucially cyclic tonal configurations. If distinctions can be found that are predictable from the nesting patterns of sentences, then we may have evidence for an inside-out cycle. If, however, the crucial ordering of cycles remains invariant regardless of differences in syntactic bracketing, then we have no reason to posit an inside-out mode of cyclic domain construction.

Starting with the familiar Rival S Configuration (9) and the Word Cycle diagnostic (61b), I once again diagram the key orderings of cycles for these examples, adding syntactic trees above the sentences to allow easy identification of their most nested constituents. As in example (110) from section 3.6.1, solid lines indicate crucial orderings, and dotted lines indicate the left-to-right cyclic orderings that I assume to hold but which are not crucially required to derive the correct results.

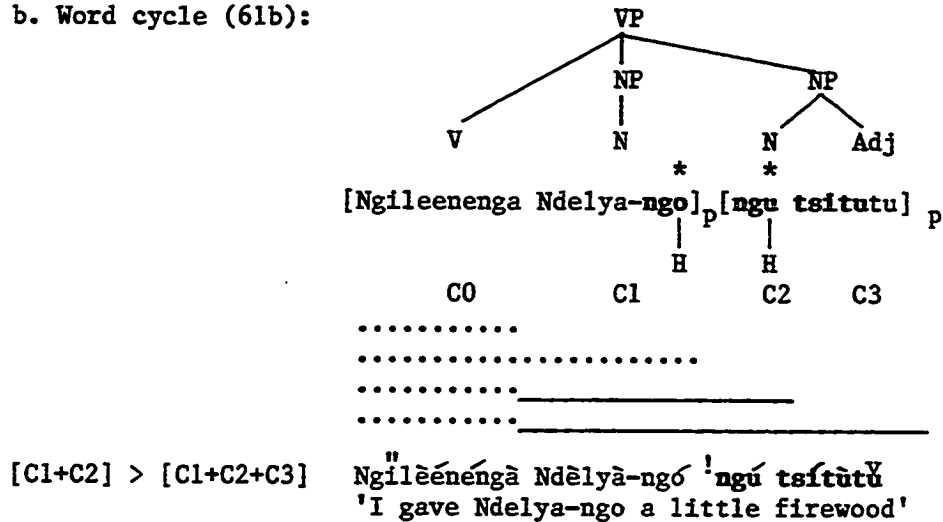
(121) a. Rival S Configuration,
Case C (9, 13):



[C1+C2] > [C1+C2+C3] Ngilëénéngà Ndèlyà-ngo 'ngu' 'ukou'

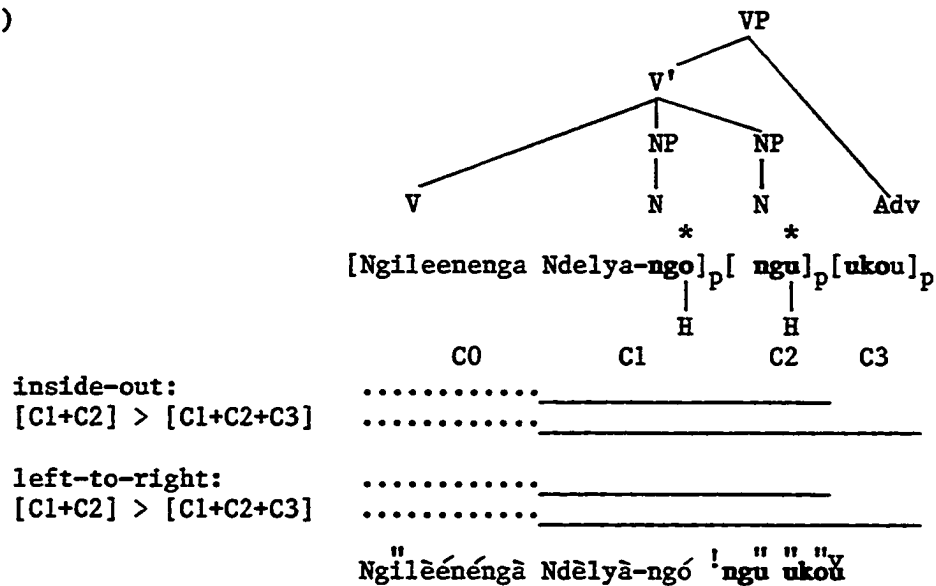
'I gave Ndelya-ngo firewood yesterday'

b. Word cycle (61b):



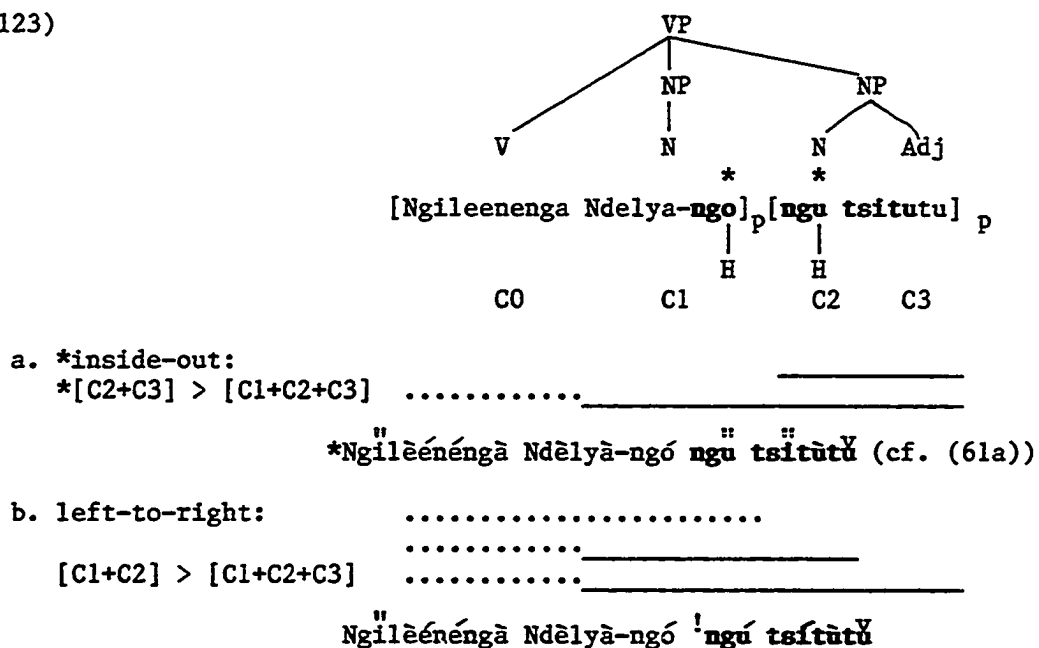
If Kivunjo had an inside-out cycle along the lines of what Chen proposes for Mandarin, it is not clear which cyclic domain would undergo rule application first in (121a). Assuming Kivunjo had an Immediate Constituency principle that caused p-phrases to be built out of maximally nested binary-branching constituents before all others, we would have no clear basis for applying rules in one cyclic domain before another, since on the one hand the VP in (121a) is quadruply-branching, while on the other hand none of the VP's complements branch at all. At best, we might expect the verb and its two following objects to be more closely bound to one another than to the final adverb, in which case an inside-out cycle would make the same prediction as a left-to-right cycle regarding the order of C2 and C3:

(122)



Turning to (121b), the C2 and C3 domains form a nested binary constituent that on an inside-out cycle would be expected to undergo rules before the rest of the utterance:

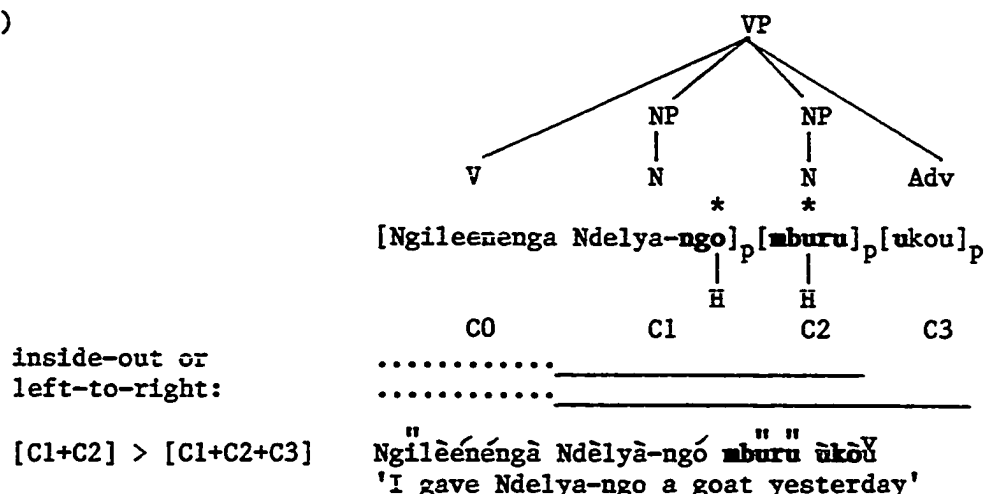
(123)



Yet the attested outcome of (121b) requires the same ordering of cycles as in (121a): C1 (Ndelya-ngo) must combine with C2 (ngu) before C3 (ukou/tsitutu) is added to the representation. If, as in an inside-out cycle, C2 combined with C3 before C1 was made available to cyclic rules, we would expect Ndelya-ngo's S to spread at the expense of ngu's H, since tsitutu (C3) would already be present, providing the second following toneless syllable needed by S Spread. This, as was shown in section 3.4.1, example (61a), would yield the ungrammatical tone pattern in (123a) above.

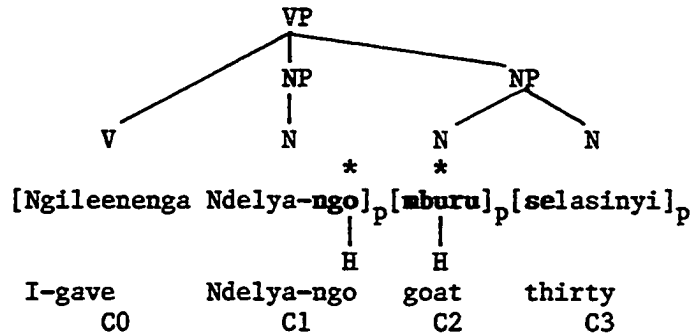
The fact that (121b) follows the same ordering of cycles as does (121a) suggests that nestedness is irrelevant to the prosodic domain construction algorithms, and that Kivunjo does not have an inside-out cycle. This finding is corroborated by other data in the language. Thus we obtain the same ordering of cycles in two distinct instantiations of Case B of the Rival S Configuration. The first is the familiar example (9B):

(124)



The second instantiation of Case B replaces the adverb ukou in C3 with the indeclinable noun modifier selasinyi 'thirty', which for reasons discussed in Appendix C fails to phrase with the noun it modifies:

(124')



inside-out:

.....
 *[C2+C3] > [C1+C2+C3] *Ngilëénéngà Ndèlyà-ngo' mbú' ru selàsinyî

left-to-right:

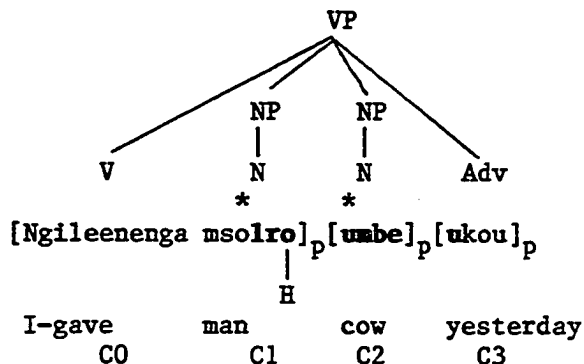
.....
 [C1+C2] > [C1+C2+C3] Ngilëénéngà Ndèlyà-ngo' mburu selàsinyî
 'I gave Ndelya-ngo thirty goats'

If mburu (C2) joined with selasinyi (C3) before joining with Ndelya-ngo (C1), we would expect mburu's S (S₂ of the Rival S Configuration) to spread first (selasinyi provides enough following toneless syllables for S Spread to apply), thereby bleeding Ndelya-ngo's S (S₁) of its opportunity to spread on the next cycle:

	C0		C1		C2		C3
	*		*		*		*
(124'')	Ngileenenga	Ndelya-ngo	mburu	selasinyi			

Demonstrative construction (28) admits no variation in its syntactic phrasing, I instead use two variants of the new cyclic case involving Accent Retraction given in example (116) of section 3.6.1. The structures and predicted cyclic orderings of these two sentences are identical with their counterparts in (124) and (124'):

(125) a.

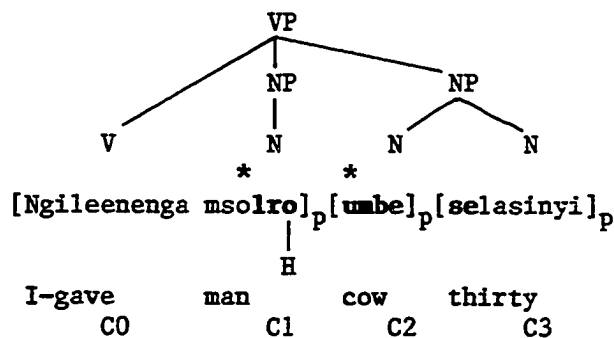


inside-out or
left-to-right:

[C1+C2] > [C1+C2+C3]

Ngilëénéngà msòlrò umbe ukòù
'I gave the man a cow yesterday'

b.



inside-out:

*[C2+C3] > [C1+C2+C3]

*Ngilëénéngà msòlrò u'umbe selàsinyî

left-to-right:

[C1+C2] >
[C1+C2+C3]

Ngilëénéngà msòlrò umbe selàsinyî
'I gave the man thirty cows'

As with the Rival S cases, the combination of C2 (umbe) with C3 (selasinyi) before C1 (msolro) comes on the scene leads to an ungrammatical outcome:

(125') C0 C1 C2 C3
 * * *
Ngileenenga	umbe		selasinyi
S HH	p	H	p
a. Inside-out

Cycle 1 (C2+C3):

 * *
umbe		selasinyi
p	H	p

 * *
umbe		selasinyi
S S	p	

H ATTACHMENT,
FINAL RAISING,
S SPREAD

Cycle 2 (C1+C2+C3):

 * * *
msolro		umbe		selasinyi
H S S	p			

no relevant rules

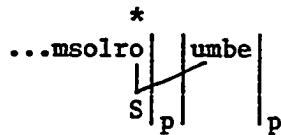
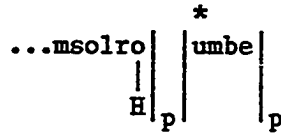
Later cycles, u-level:

*Ngilëénégã msòlrò "umbe" selàsinyî

R SPREAD, DEMOTION,
OTHER RULES

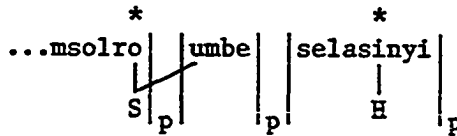
b. Left-to-right

Cycle 2:



ACCENT RETRACTION,
FINAL RAISING,
S SPREAD

Cycle 3:



no relevant rules apply

Later rules:

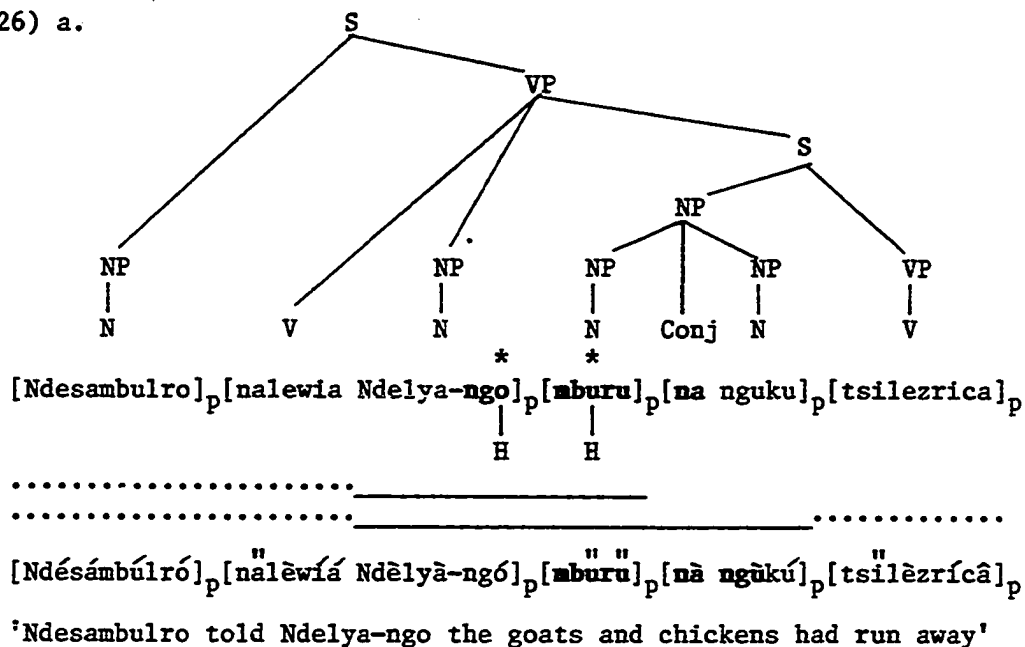
Ngilèénéngà msòlrò "umbe" sèlāsinyĩ

'I gave the man thirty cows'

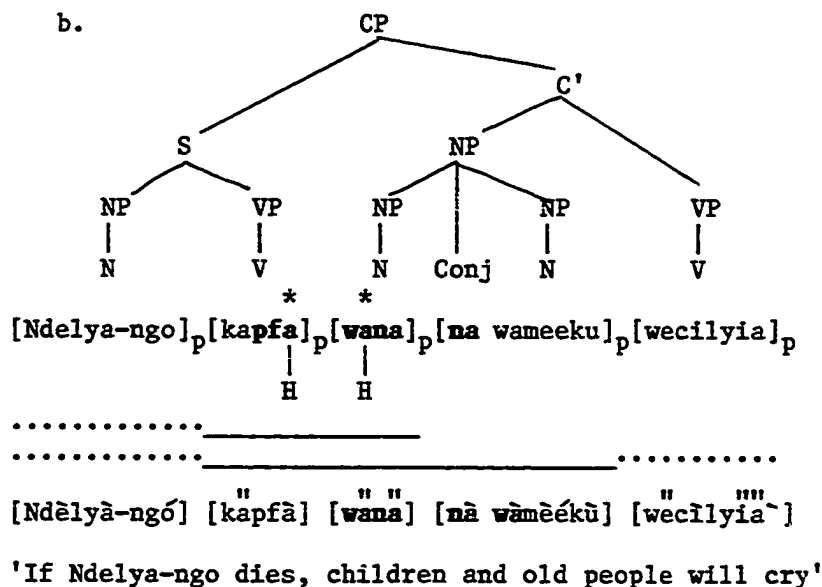
This example lends further support to the case against inside-out cyclicity in Kivunjo.

Finally, in the event that the examples of nesting differences so far seen might be too subtle to be relevant to the Kivunjo P-phrase Construction Algorithm, I provide some examples of left-to-right cyclic ordering across major phrase breaks that would undoubtedly require the two constituents on either edge of the break to be combined with one another before the second constituent combines with its much more closely related following members of the lower clause:

(126) a.



b.



As the examples in (126) show, not even a major phrase break deters the Kivunjo prosodic domain algorithms from pursuing a strict left-to-right course through the utterance. We may therefore conclude that cyclic domains are formed strictly from left to right in Kivunjo.

3.6.3. Verbal Accent in the Rival S Configuration

In the preceding sections of this chapter, I have omitted examples of verbal S. This is because in certain contexts verbal S behaves anomalously, in a manner that at first glance might suggest a counterexample to left-to-right cyclicity. In this section, however, I will show that the exceptional behavior of verbal S is entirely consistent with the left-to-right, affixation-style model of cyclicity developed so far, and instead reflects the difference in degree of accent between verbal S and phrasal S.

To begin with, in S_1 position of the Rival S Configuration verbal S behaves just as phrasal S does. Thus in Cases A and C S_2 spreads, causing S_1 to lower, and in Case C causing S_1 both to lower and to flop backwards one syllable. In Case B it is S_1 that spreads at the expense of S_2 :

(127) Rival S Configuration with verbal S₁

CASE A:

	C1	C2	C3	C4
*				
* *				
	|aolonga|	|kaenda kanyi|	|pfo|	
	SH	H	H	
	1-pointed _p	and-go home _p	NEG _p	

Cycle 1:

$$\begin{array}{c} * \\ * \quad * \\ | \text{aolonga} | \\ || \\ | \text{SH} | \end{array} \quad \text{p}$$

*
**
|aolonga|
||
SS|p

ACCENT RETRACTION,
FINAL RAISING
S SPREAD

*
| a longa |
| | ✓ |
| HLS |
| p

S LOWERING, MATCHING CONVENTION

Later cycles, u-level:

ʔo! "longa" kàèndà kànyí pʔò (cf. ...Ndèlyè-ngó le! "eri" àkòù)
 '(S)he didn't point and then go home'

CASE B: C1 C2 C3 C4

 *
 * *

alrunda	kaenda kanyi	pfo
|S|H|	|H|	|H|
l-worked ^p	and-go home ^p	NEG ^p

Cycle 1:

 *
 * *

alrunda
|S|H|
^p

 *
 * *

alrunda
|S|S|
^p

FINAL RAISING

 *
 *

alrunda
|S|
^p

S SPREAD,
POSTTONIC DEACCENTING

Later cycles and u-level:

Alrunda["] kàendà kanyi^í pfô^ŷ (cf. ...Ndèlyà-ngo["] mburu["] ùkô^ŷ)
'(S)he didn't work and then go home'

CASE C:

C1	C2	C3	C4
*			
* *			
| aly a |	| kaenda kanyi |	| pfo |	
| S H |	| H |	| H |	
l-ate _P	and-go home	_P	NEG _P

Cycle 1:

*
* *
| aly a |
| | |
| S H | p

$$\begin{array}{c} * \\ | \text{alya} | \\ \swarrow \quad \downarrow \\ | \text{HL S} |_p \end{array}$$

FINAL RAISING, S LOWERING,
MATCHING CONVENTION,
FLOP (see 3.7.4)

Cycle 2:

$$\begin{array}{c} * \\ \left| \begin{array}{c} \text{alya} \\ \diagdown \\ \text{HL S} \end{array} \right| \left| \text{kaenda} \right|_p \end{array}$$

*

alya	kaenda
↓	
HL S	p

S SPREAD

Later cycles and u-level:

¹ ² ³ ⁴ ⁵ ⁶ ⁷ ⁸ ⁹ ¹⁰ ¹¹ ¹² ¹³ ¹⁴ ¹⁵ ¹⁶ ¹⁷ ¹⁸ ¹⁹ ²⁰ ²¹ ²² ²³ ²⁴ ²⁵ ²⁶ ²⁷ ²⁸ ²⁹ ³⁰ ³¹ ³² ³³ ³⁴ ³⁵ ³⁶ ³⁷ ³⁸ ³⁹ ⁴⁰ ⁴¹ ⁴² ⁴³ ⁴⁴ ⁴⁵ ⁴⁶ ⁴⁷ ⁴⁸ ⁴⁹ ⁵⁰ ⁵¹ ⁵² ⁵³ ⁵⁴ ⁵⁵ ⁵⁶ ⁵⁷ ⁵⁸ ⁵⁹ ⁶⁰ ⁶¹ ⁶² ⁶³ ⁶⁴ ⁶⁵ ⁶⁶ ⁶⁷ ⁶⁸ ⁶⁹ ⁷⁰ ⁷¹ ⁷² ⁷³ ⁷⁴ ⁷⁵ ⁷⁶ ⁷⁷ ⁷⁸ ⁷⁹ ⁸⁰ ⁸¹ ⁸² ⁸³ ⁸⁴ ⁸⁵ ⁸⁶ ⁸⁷ ⁸⁸ ⁸⁹ ⁹⁰ ⁹¹ ⁹² ⁹³ ⁹⁴ ⁹⁵ ⁹⁶ ⁹⁷ ⁹⁸ ⁹⁹ ¹⁰⁰ ¹⁰¹ ¹⁰² ¹⁰³ ¹⁰⁴ ¹⁰⁵ ¹⁰⁶ ¹⁰⁷ ¹⁰⁸ ¹⁰⁹ ¹¹⁰ ¹¹¹ ¹¹² ¹¹³ ¹¹⁴ ¹¹⁵ ¹¹⁶ ¹¹⁷ ¹¹⁸ ¹¹⁹ ¹²⁰ ¹²¹ ¹²² ¹²³ ¹²⁴ ¹²⁵ ¹²⁶ ¹²⁷ ¹²⁸ ¹²⁹ ¹³⁰ ¹³¹ ¹³² ¹³³ ¹³⁴ ¹³⁵ ¹³⁶ ¹³⁷ ¹³⁸ ¹³⁹ ¹⁴⁰ ¹⁴¹ ¹⁴² ¹⁴³ ¹⁴⁴ ¹⁴⁵ ¹⁴⁶ ¹⁴⁷ ¹⁴⁸ ¹⁴⁹ ¹⁵⁰ ¹⁵¹ ¹⁵² ¹⁵³ ¹⁵⁴ ¹⁵⁵ ¹⁵⁶ ¹⁵⁷ ¹⁵⁸ ¹⁵⁹ ¹⁶⁰ ¹⁶¹ ¹⁶² ¹⁶³ ¹⁶⁴ ¹⁶⁵ ¹⁶⁶ ¹⁶⁷ ¹⁶⁸ ¹⁶⁹ ¹⁷⁰ ¹⁷¹ ¹⁷² ¹⁷³ ¹⁷⁴ ¹⁷⁵ ¹⁷⁶ ¹⁷⁷ ¹⁷⁸ ¹⁷⁹ ¹⁸⁰ ¹⁸¹ ¹⁸² ¹⁸³ ¹⁸⁴ ¹⁸⁵ ¹⁸⁶ ¹⁸⁷ ¹⁸⁸ ¹⁸⁹ ¹⁹⁰ ¹⁹¹ ¹⁹² ¹⁹³ ¹⁹⁴ ¹⁹⁵ ¹⁹⁶ ¹⁹⁷ ¹⁹⁸ ¹⁹⁹ ²⁰⁰ ²⁰¹ ²⁰² ²⁰³ ²⁰⁴ ²⁰⁵ ²⁰⁶ ²⁰⁷ ²⁰⁸ ²⁰⁹ ²¹⁰ ²¹¹ ²¹² ²¹³ ²¹⁴ ²¹⁵ ²¹⁶ ²¹⁷ ²¹⁸ ²¹⁹ ²²⁰ ²²¹ ²²² ²²³ ²²⁴ ²²⁵ ²²⁶ ²²⁷ ²²⁸ ²²⁹ ²³⁰ ²³¹ ²³² ²³³ ²³⁴ ²³⁵ ²³⁶ ²³⁷ ²³⁸ ²³⁹ ²⁴⁰ ²⁴¹ ²⁴² ²⁴³ ²⁴⁴ ²⁴⁵ ²⁴⁶ ²⁴⁷ ²⁴⁸ ²⁴⁹ ²⁵⁰ ²⁵¹ ²⁵² ²⁵³ ²⁵⁴ ²⁵⁵ ²⁵⁶ ²⁵⁷ ²⁵⁸ ²⁵⁹ ²⁶⁰ ²⁶¹ ²⁶² ²⁶³ ²⁶⁴ ²⁶⁵ ²⁶⁶ ²⁶⁷ ²⁶⁸ ²⁶⁹ ²⁷⁰ ²⁷¹ ²⁷² ²⁷³ ²⁷⁴ ²⁷⁵ ²⁷⁶ ²⁷⁷ ²⁷⁸ ²⁷⁹ ²⁸⁰ ²⁸¹ ²⁸² ²⁸³ ²⁸⁴ ²⁸⁵ ²⁸⁶ ²⁸⁷ ²⁸⁸ ²⁸⁹ ²⁹⁰ ²⁹¹ ²⁹² ²⁹³ ²⁹⁴ ²⁹⁵ ²⁹⁶ ²⁹⁷ ²⁹⁸ ²⁹⁹ ³⁰⁰ ³⁰¹ ³⁰² ³⁰³ ³⁰⁴ ³⁰⁵ ³⁰⁶ ³⁰⁷ ³⁰⁸ ³⁰⁹ ³¹⁰ ³¹¹ ³¹² ³¹³ ³¹⁴ ³¹⁵ ³¹⁶ ³¹⁷ ³¹⁸ ³¹⁹ ³²⁰ ³²¹ ³²² ³²³ ³²⁴ ³²⁵ ³²⁶ ³²⁷ ³²⁸ ³²⁹ ³³⁰ ³³¹ ³³² ³³³ ³³⁴ ³³⁵ ³³⁶ ³³⁷ ³³⁸ ³³⁹ ³⁴⁰ ³⁴¹ ³⁴² ³⁴³ ³⁴⁴ ³⁴⁵ ³⁴⁶ ³⁴⁷ ³⁴⁸ ³⁴⁹ ³⁵⁰ ³⁵¹ ³⁵² ³⁵³ ³⁵⁴ ³⁵⁵ ³⁵⁶ ³⁵⁷ ³⁵⁸ ³⁵⁹ ³⁶⁰ ³⁶¹ ³⁶² ³⁶³ ³⁶⁴ ³⁶⁵ ³⁶⁶ ³⁶⁷ ³⁶⁸ ³⁶⁹ ³⁷⁰ ³⁷¹ ³⁷² ³⁷³ ³⁷⁴ ³⁷⁵ ³⁷⁶ ³⁷⁷ ³⁷⁸ ³⁷⁹ ³⁸⁰ ³⁸¹ ³⁸² ³⁸³ ³⁸⁴ ³⁸⁵ ³⁸⁶ ³⁸⁷ ³⁸⁸ ³⁸⁹ ³⁹⁰ ³⁹¹ ³⁹² ³⁹³ ³⁹⁴ ³⁹⁵ ³⁹⁶ ³⁹⁷ ³⁹⁸ ³⁹⁹ ⁴⁰⁰ ⁴⁰¹ ⁴⁰² ⁴⁰³ ⁴⁰⁴ ⁴⁰⁵ ⁴⁰⁶ ⁴⁰⁷ ⁴⁰⁸ ⁴⁰⁹ ⁴¹⁰ ⁴¹¹ ⁴¹² ⁴¹³ ⁴¹⁴ ⁴¹⁵ ⁴¹⁶ ⁴¹⁷ ⁴¹⁸ ⁴¹⁹ ⁴²⁰ ⁴²¹ ⁴²² ⁴²³ ⁴²⁴ ⁴²⁵ ⁴²⁶ ⁴²⁷ ⁴²⁸ ⁴²⁹ ⁴³⁰ ⁴³¹ ⁴³² ⁴³³ ⁴³⁴ ⁴³⁵ ⁴³⁶ ⁴³⁷ ⁴³⁸ ⁴³⁹ ⁴⁴⁰ ⁴⁴¹ ⁴⁴² ⁴⁴³ ⁴⁴⁴ ⁴⁴⁵ ⁴⁴⁶ ⁴⁴⁷ ⁴⁴⁸ ⁴⁴⁹ ⁴⁵⁰ ⁴⁵¹ ⁴⁵² ⁴⁵³ ⁴⁵⁴ ⁴⁵⁵ ⁴⁵⁶ ⁴⁵⁷ ⁴⁵⁸ ⁴⁵⁹ ⁴⁶⁰ ⁴⁶¹ ⁴⁶² ⁴⁶³ ⁴⁶⁴ ⁴⁶⁵ ⁴⁶⁶ ^{467</}

(In Case C, Flop applies to alya even though no syllable precedes for the verb's first H to Flop back onto. Although this is a problem for Flop as stated so far, it will not present a problem for an analysis in which Flop follows Tone Shift, an analysis defended in section 3.7.3.)

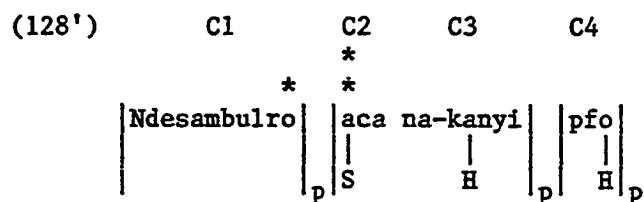
However, when a verbal S occupies the S_2 position, we get surprising results. In Cases A and C, S_2 spreads as expected, but no

(128) Rival S Configuration with verbal S_2

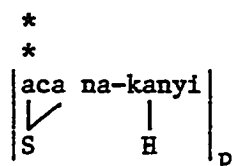
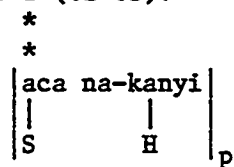
Case C: [Ndesambulro]_p[ci njama]_p[pfo]_p
 *
 *
 S
 N. COP rich NEG
 Case C: Ndəsəmbulrō ci njama pfo
 'Ndesambulro isn't a rich man'
 (*Ndəsəmbulrō ci njama pfo)

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inside-out cycle in which the verb first combines with its sisters in the VP, before the subject is added to the representation. Such an analysis would correctly allow S_2 to spread first, before S_1 had a chance to spread:



Cycle 1 (C2+C3):



S SPREAD

*
* *

| Ndesambulro | | aca na-kanyi |

| S H |

p p

$$\begin{array}{c}
 \begin{array}{|c|} \hline \text{Ndesambulro} \\ \hline \end{array}
 \begin{array}{|c|} \hline \text{aca} \\ \hline \end{array}
 \begin{array}{|c|} \hline \text{na-kanyi} \\ \hline \end{array}
 \end{array}$$

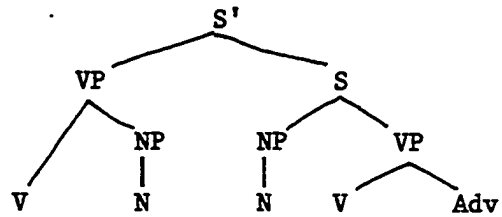
*
*

Ndesambulro				aca na-kanyi			
		H*L	p	S		H	p

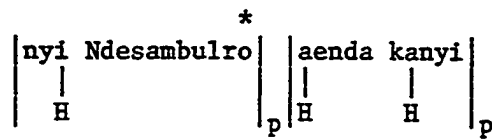
*Ndésámúró a!cà nà kànyí pfò

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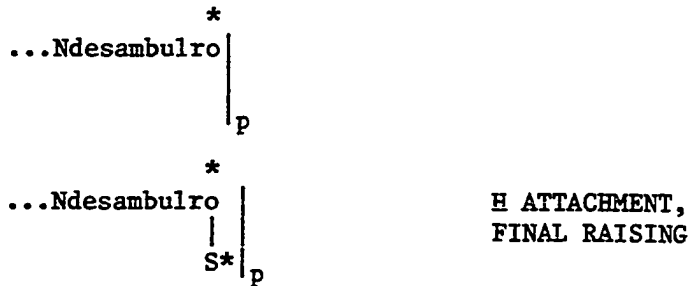
(129) S Spread and S Lowering across VP boundaries:



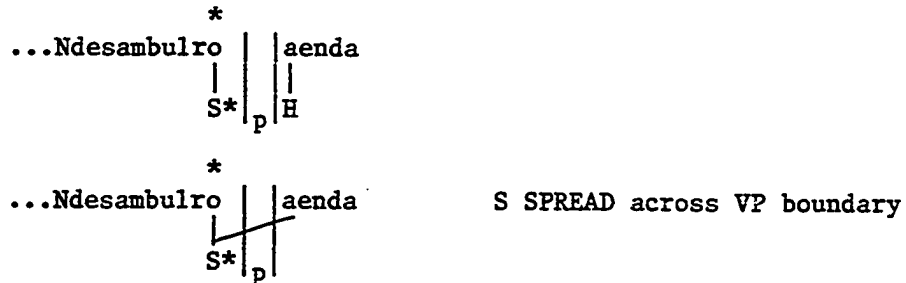
- a. Nyi Ndesambulro [e] aenda kanyi
 is N. who-went home
- C0 C1 C2 C3



Cycle 1:



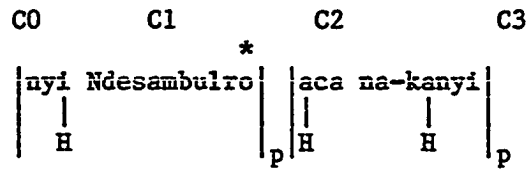
Cycle 2:



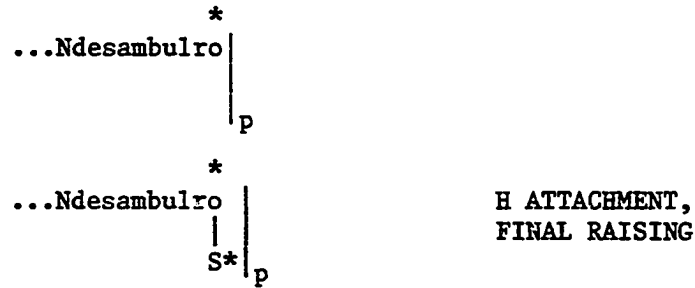
Later cycles and u-level:

Nyi Ndé' " " " " aenda kanyi (*Nyi Ndé' " " " " aenda kanyi)
 'It's Ndesambulro who went home'

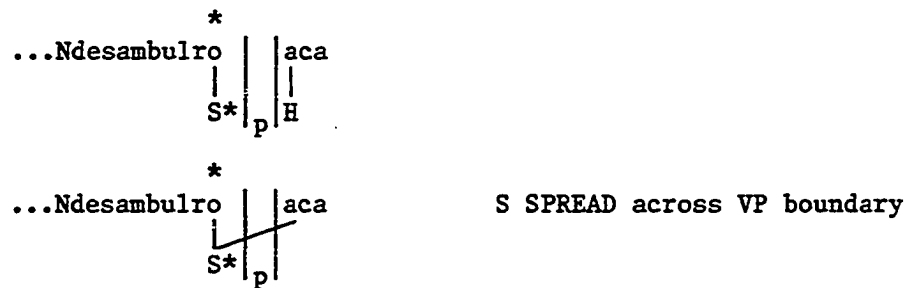
- b. Nyi Ndesambulro [e] aca na kanyi
 is N. who-came to home



Cycle 1:



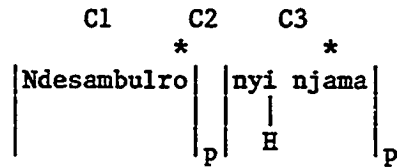
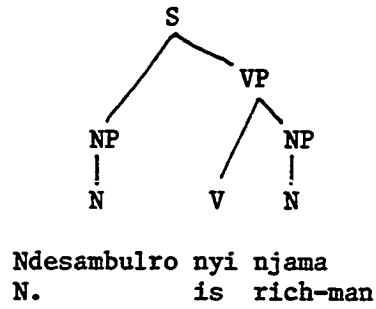
Cycle 2:



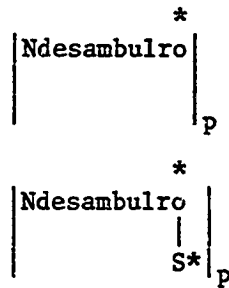
Later cycles and U-level:

Nyi Ndé' " " " " na kanyi (*Nyi Ndé' " " " " na kanyi)
 'It's Ndesambulro who came home'

c.

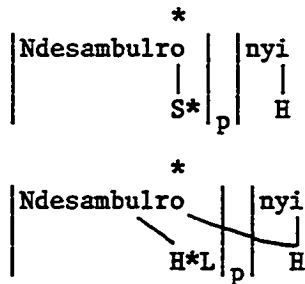


Cycle 1:



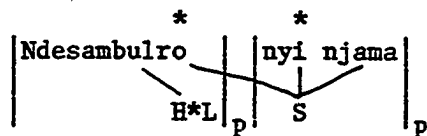
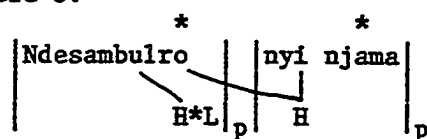
H ATTACHMENT,
FINAL RAISING

Cycle 2:



S LOWERING across VP boundary,
MATCHING CONVENTION,
FLOP

Cycle 3:



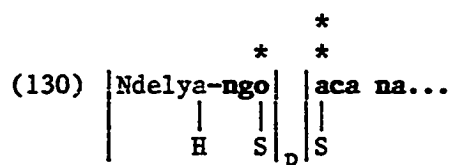
ACCENT RETRACTION,
FINAL RAISING,
S SPREAD

U-level:

Ndesambulró 'nyi njama' (*Ndesambulró nyi njama~)
'Ndesambulro is a rich man'

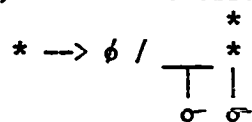
One way around the facts in (129) might be to propose that it is not in fact the VP boundary but rather an intonational phrase boundary that blocks S Spread and S Lowering in (128). Intonational phrase boundaries typically appear between the subject and verb of main clauses, but might be less likely to appear in the middle of relative clauses. However, the difference between the negative copula ci, which bears a verbal S, and the affirmative copula nyi, which bears a H, is not that between a main and a relative verb, and it is not clear why one should obligatorily be preceded by an intonational phrase boundary (128c) while the other is not (129c). Furthermore, intonational phrase boundaries are typically variable in their distribution, especially with changes in speech rate. Yet I have observed no rate-dependent variability in the data given in (128) and (129). Finally, the examples of nesting given in section 3.6.2, example (126) would be prime candidates for insertion of an intonational phrase boundary between the two S tones, yet S Spread and S Lowering apply unhindered in those cases.

Ultimately, the only thing that consistently distinguishes examples such as (128) from ones such as (129) is that in (128) the verbs all begin with verbal S, while those in (129) do not. Thus it appears that a purely phonological solution to the tone patterns in (128) is called for. Such a solution is readily available if we assume, as argued on independent grounds in 2.2.5, that verbal S is not only associated with an accent, but is associated with a stronger degree of accent than is phrasal S. Under such an analysis, an instance of the Rival S Configuration in which S_2 is of verbal origin will exhibit an accent clash:



We can account for the fact that in S_2 position verbal S always wins out by positing a rule of Clash Resolution, which deletes an accent that immediately precedes a grid column of height two:

(131) CLASH RESOLUTION



Once the accent is deleted, the S tone formerly attached to it violates the Matching Convention (part b) and lowers to H automatically, without the insertion of a floating L. R Spread then takes care of spreading [+raised] to the preceding H from the verbal S.

(131')

a. * *
 * *
 |Ndesambulro| |aenda kanyi| |pfo|
 | | |
 p | S H p | H | p

Cycle 1:

 *
 |Ndesambulro|
 |
 p

 *
 |Ndesambulro|
 |
 S* | p

H ATTACHMENT,
 FINAL RAISING

Cycle 2:

 * *
 * *
 |Ndesambulro| |aenda|
 | |
 S* | p | S

 * *
 * *
 |Ndesambulro| |aenda|
 | |
 H* | p | S

CLASH RESOLUTION,
 MATCHING CONVENTION

 * *
 * *
 |Ndesambulro| |aenda|
 | |
 H* | p | S

S SPREAD

n/a

S LOWERING

Later cycles, U-level:

" " " " " " aenda kanyi pfö
 Ndesambulro

R SPREAD,
 OTHER RULES

b.

			*	*	
		*	*		
|	Ndesambulro	|	aca na-kanyi	|	pfo
			S		H
		p		p	H
					p

Cycle 1:

		*
|	Ndesambulro	|
		p

		*
|	Ndesambulro	|
		S*
		p

Cycle 2:

		*	*
|	Ndesambulro	|	aca
		S*	S
		p	

		*	*
|	Ndesambulro	|	aca
		H*	S
		p	

CLASH RESOLUTION,
MATCHING CONVENTION

Cycle 3:

		*	*
|	Ndesambulro	|	aca na-kanyi
		H*	S
		p	H
			p

		*	*
|	Ndesambulro	|	aca na-kanyi
		H*	S
		p	H
			p

S SPREAD

Later cycles, U-level:

" " " " " " " " kanyi pf^v

R SPREAD,
OTHER RULES

In this way Clash Resolution easily accounts for the failure of both S Spread and S Lowering to apply across the left edge of a verb that begins with S. In addition, Clash Resolution is a very ordinary

rule — the sort of rule we expect to see in languages with accentual or stress-related phenomena. Finally, the fact that it is the stem-penultimate accent, not the verb-initial accent that deletes in Clash Resolution is consistent with the notion that verb-initial accent is stronger than stem-penultimate accent. It may in fact be a universal that in a stress clash situation it is always the weaker of the two stresses that deletes (Hayes, p.c.).

3.6.4. Conclusion

In this section, I have considered various models of cyclic domain construction, varying along two parameters: simultaneity and directionality. From the data examined, I have concluded that cyclic domains must be created from left to right in an affixation-style cycle, such that no domain undergoes rules separately before it is combined with any preceding domains. Cases involving verbal S in S₂ position of the Rival S Configuration were seen not to be counterexamples, but rather to reflect a typologically ordinary rule of Clash Resolution.

The left-to-right affixation-style cycle corresponds to the way in which the phonological word and phonological phrase formation algorithms of Kivunjo Chaga parse the utterance into prosodic domains: by considering each successive pair of words throughout the utterance. This contrasts with the way in which prosodic structure is created in Mandarin where, according to Chen (1986) and Shih (1986), not all of the utterance is parsed as a result of the first foot formation rule's application.

Given a strict linear, affixation-style progression of domain creation in Kivunjo, the question remains whether the choice of a left-to-right direction is arbitrary, or whether it follows from the fact that speech is produced and processed from left to right. If the latter, then we would predict that no language with phrasal cyclicity has a strict right-to-left linear ordering of cycles.

3.7. Cyclicity's implications for Prosodic Hierarchy theory

In her original paper on the Prosodic Hierarchy, Selkirk (1980) suggests a tentative ordering principle, whereby a rule's place in the derivation may be predicted from its domain. For ease of reference I will call this the Domain Ordering Hypothesis.

(132) Domain Ordering Hypothesis (my term for Selkirk 1980, ex. 41)

A rule with a domain D_i will apply before a rule with a domain D_j , if D_j includes D_i .

This hypothesis follows logically from a particular vision of how prosodic domains are created — one in which the utterance is first parsed into prosodic domains at the lowest level, is then reparsed into domains of the next-higher level, and so on until the u-level is reached. Such a scenario is also consistent with the Strict Layer Hypothesis, which assumes that domains of a particular level may always be analyzed into a whole number of domains on the next-lower level — in effect, that the algorithm for creating domains on a given level has access only to domains of the immediately preceding level. However, it is not the only scenario that is compatible with the Strict Layer Hypothesis.

The word-based cycle that operates in Kivunjo phrasal phonology calls the Domain Ordering Hypothesis into question, since it assumes that rules operating within a domain larger than the word are interleaved with the stepwise creation of prosodic domains on the level of the phonological word. The Domain Ordering Hypothesis would instead predict a derivation in which all w-span rules applied in a block

before all p-span rules, and in which p-span rules had as their basic cyclic domain the entire p-phrase. Likewise, it would predict that rules operating within a domain larger than the p-phrase should apply only after all p-level rules have applied, and should not cycle on smaller prosodic constituents. Bickmore (1989) gives compelling evidence that the Domain Ordering Hypothesis is untenable for the phrasal phonology of Kinyambo, another Tanzanian Bantu language. Nespor & Vogel (1986) have also abandoned the hypothesis on the basis of a cross-linguistic survey. In this section I will present further evidence from Kivunjo against the Domain Ordering Hypothesis.

In addition to the Domain Ordering Hypothesis, Selkirk (1980) also proposed a typology of prosodic rules that limits the ways in which rules can make reference to prosodic information:

(133) Prosodic Rule Typology (adapted from Nespor & Vogel 1986:15-16)

Where A and B are segments, one of which may be null;
 X, Y and Z are strings of segments, all possibly null;
 and i and j are prosodic categories ($i > j$),
 any well-formed prosodic rule must belong to one of the three
 following formal types:

a. Domain span:

$A \rightarrow B / [...X_Y...]_i$

b. Domain juncture:

i) $A \rightarrow B / [...[...X_Y]_j[Z...]_j...]_i$

ii) $A \rightarrow B / [...[...X]_j[Y_Z...]_j...]_i$

c. Domain limit:

i) $A \rightarrow B / [...X_Y]_i$

ii) $A \rightarrow B / [X_Y...]_i$

(135) Domains of p-level rule application in Kivunjo:

a. H Attachment and Final Raising:

$u[\dots__]_p$

b. Flop:

$u[\dots X __ Y]_w$

c. Other p-level rules:

$u[\dots X __ Y \dots]_w$

In sections 3.7.2-4 I will show that H Attachment, Final Raising and Flop can be restated so that they do not crucially refer to the right edge of a p-phrase or word, leaving us with only the domain in (135c) for all p-level rules. We are then confronted with the task of reconciling (135c) with the typology given in (133). I therefore propose that the p-level cyclic rules of Kivunjo be left unspecified as to the particular prosodic domain in which they apply, and instead be reframed as applying within any (cumulative) cyclic domain.

(136) Revised domain of p-level cyclic rule application:

$c[\dots X __ Y \dots]_c$

c = cumulative cyclic domain

I use the notation in (136) only as an ad hoc way of encoding the notion of a cumulative cyclic domain, which in itself is not a prosodic entity, but rather the sum total of all the material that has been parsed into prosodic domains at a particular point in the derivation. It will therefore include all material from previous cycles along with the material just added on the current cycle, but will exclude anything that has not yet been added.

This will allow p-level rules to be distinguished from noncyclic, u-level rules such as Demotion, which applies at the right edge of the utterance:

(137) Demotion:

$$u[\dots___]_u \quad (u\text{-limit})$$

It may be that all crucially u-level rules are in fact u-limit rules, rather than u-span rules. If this is so, there is no reason to specify any domain whatsoever for cyclic rules.

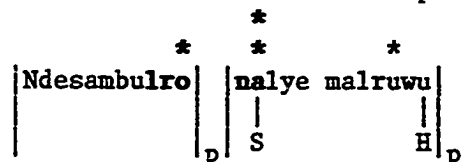
If we leave cycle rules unspecified for domain and assume they automatically reapply each time new structure is created, then we can accommodate the facts of Kivunjo phrasal cyclicity into the Prosodic Hierarchy without decreasing the predictive power of its rule typology. In this way we can avoid having to stipulate that certain rules apply cyclically, while others do not. This is because u-level rules must all specifically mention the u-domain in their formulation, and so their structural descriptions will not be met until the last cycle. Finally, a weak version of the Domain Ordering Hypothesis may still be retained, to the effect that cyclic rules all appear to follow the one true p-domain rule of Phrasal Tone Insertion. Whether this is merely fortuitous or the result of a general principle ultimately requires examination of cross-linguistic evidence to be determined.

3.7.1. P-level rules cross boundaries

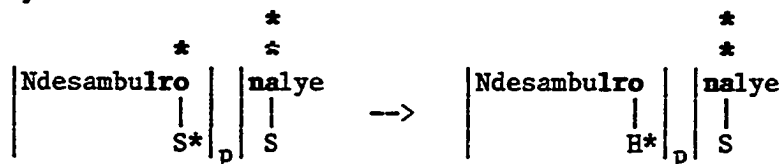
The rules we have been referring to as "p-level" actually cross p-boundaries freely to the left. In fact, two of these rules -- Clash

Resolution and Accent Attachment — always apply across p-boundaries:

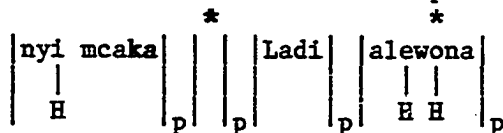
(138) Clash Resolution across a p-boundary:



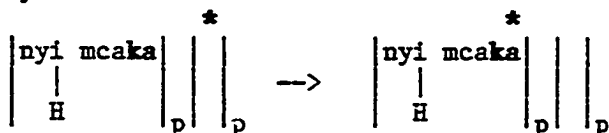
Cycle 2:



(139) Accent Attachment across a p-boundary:



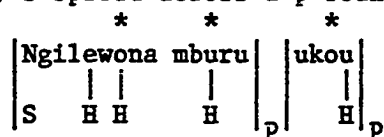
Cycle 3:



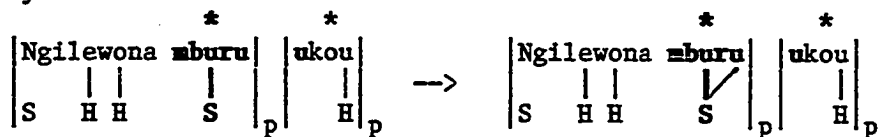
The only time the first of the two accents in (138) will survive until the verb's cycle is when that accent becomes attached to a S by virtue of being p-final. In (139) the floating accent associated with strong juncture always occurs in its own p-phrase, so that Accent Attachment will always cross a p-boundary.

Most other p-level rules quite commonly cross p-boundaries to the left of the current cyclic domain. To begin with, S Spread regularly finds its structural description met across a p-boundary, as we saw in section 3.1:

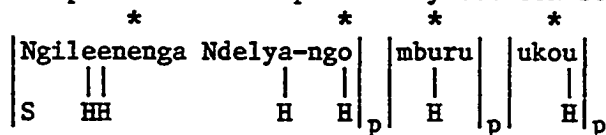
(140) S Spread across a p-boundary between first and second syllables:



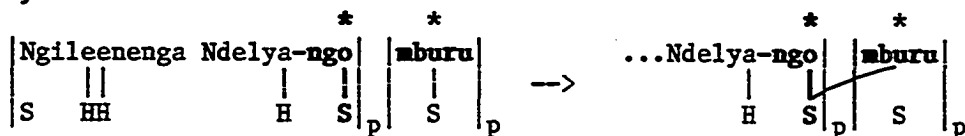
Cycle 3:



(141) S Spread across a p-boundary between second and third syllables:

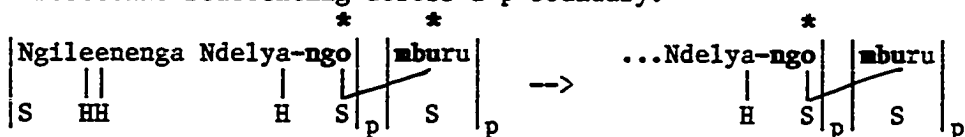


Cycle 3:



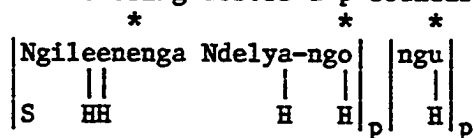
The construction in (141) also illustrates the application of Posttonic Deaccenting across p-boundaries:

(142) Posttonic Deaccenting across a p-boundary:

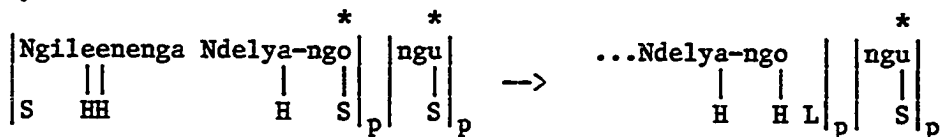


S Lowering and Flop likewise routinely cross p-boundaries:

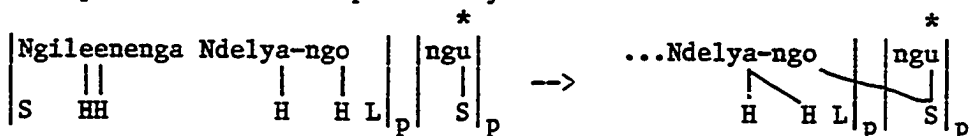
(143) S Lowering across a p-boundary:



Cycle 3:

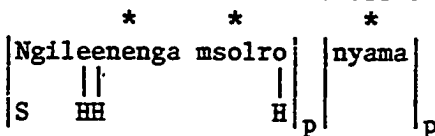


(144) Flop across the same p-boundary:

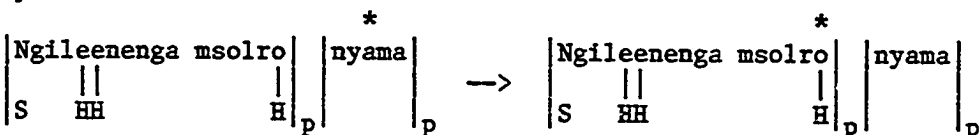


Accent Retraction may shift an accent into a preceding p-phrase:

(145) Accent Retraction across a p-boundary:

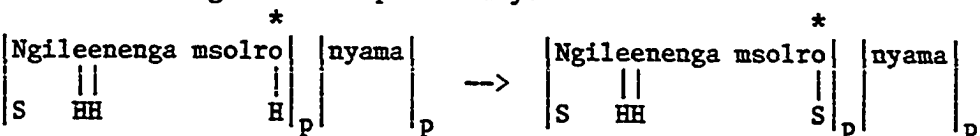


Cycle 3:



In the same example Final Raising applies, conditioned by either the first or the second p-boundary.

(146) Final Raising across a p-boundary?



If we determine that it is the second p-boundary that conditions Final Raising, then (146) constitutes yet another example of a p-level rule

crossing a p-boundary. That it is in fact the second p-boundary may be seen in the following example, in which nyama is not p-final, and the H of msolro, though it receives an accent as in (146), does not raise. (On the third cycle nyama's accent retracts onto msolro's final syllable before the Matching Convention has a chance to delete it.)

(147) $\begin{array}{c} * \quad * \quad * \quad * \\ \left| \begin{array}{c} \text{Ngileenenga msolro} \\ \text{S} \quad \text{HH} \end{array} \right| \left| \begin{array}{c} \text{nyama ngitututu} \\ \text{H} \quad \text{H} \end{array} \right| \\ \text{p} \quad \text{p} \end{array}$

Cycle 3:

$\begin{array}{c} * \\ \left| \begin{array}{c} \text{Ngileenenga msolro} \\ \text{S} \quad \text{HH} \end{array} \right| \left| \begin{array}{c} \text{nyama} \\ \text{H} \end{array} \right| \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \left| \begin{array}{c} \text{Ngileenenga msolro} \\ \text{S} \quad \text{HH} \end{array} \right| \left| \begin{array}{c} \text{nyama} \\ \text{H} \end{array} \right| \\ \text{p} \end{array}$

ACCENT RETRACTION

n/a

FINAL RAISING

*Ngilēénéngā msōlrō nyama ngitūtũ

OTHER RULES

'I gave the man a little meat'

If the H of msolro did raise, we would expect the unattested outcome below:

(148) $\begin{array}{c} * \\ \left| \begin{array}{c} \text{Ngileenenga msolro} \\ \text{S} \quad \text{HH} \end{array} \right| \left| \begin{array}{c} \text{nyama} \\ \text{S} \end{array} \right| \\ \text{p} \end{array}$

FINAL RAISING

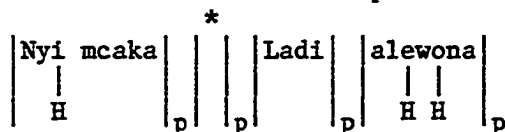
*Ngilēénéngā msōlrō nyama ngitūtũ

OTHER RULES

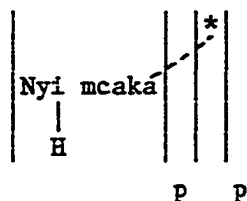
I will show in 3.7.3 why Final Raising is inapplicable in this case. For the present argument, the ungrammaticality of (148) allows us to conclude that a p-boundary may indeed intervene between the trigger p-boundary and the target H of Final Raising.

The only rule that remains to be discussed is H Attachment. The only environment in which this rule's structural description arises from the combination of two p-phrases is at strong juncture. In (149) below I represent accent on an autosegmental tier with association lines to demonstrate that it remains in the second p-phrase even after it attaches to mcaka:

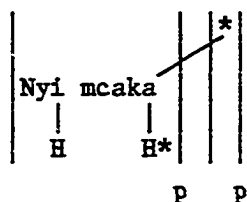
(149) H Attachment across a p-boundary:



Cycle 3:



ACCENT ATTACHMENT



H ATTACHMENT

Although we can never get a strong-juncture accent in anything other than p-final position, I will show in the next section that H Attachment in (149) is in fact triggered by the second p-boundary, just as

Final Raising is in (146). Thus at strong juncture H Attachment's structural description crosses a p-boundary on two counts.

This survey of the p-level rule inventory has revealed that on any given cycle, each p-level rule must be allowed to cross p-junctures to the left of the most recently added word. Yet we know from previous sections that p-level rules may not cross p-junctures to the right of the current cycle's domain, since following p-phrases have not yet been added to the representation. The domain of application of p-level rules is thus not statable using standard prosodic categories alone, unless we allow the domain to be delimited by one category's left edge and another category's right edge:

(150)_u[...__...]_w

I therefore propose that the notation in (150) be eliminated, and that cyclic rules be stated without reference to domain, or in terms of the rule typology in (133), in the following unspecified domain:

(151) [...__:] (maximal at current stage of derivation)

As currently stated, however, H Attachment, Final Raising and Flop must be written so that they are triggered by a p-boundary or w-boundary on the right. They therefore cannot be revised in terms of a cyclic domain as in (151), and present a more serious problem for prosodic rule typology. In the next three sections, though, I will show that each of these rules in fact need not refer to a specific prosodic domain's right edge, and that certain independently motivated

enhancements reveal that each rule is triggered by a domain boundary only indirectly, through the intercession of another rule. As a result, H Attachment, Final Raising and Flop may be stated as in (151), and present no more of a challenge to Prosodic Hierarchy typology than do the other cyclic rules.

3.7.2. H Attachment without p-boundary as trigger

In 2.2.1 I considered two equally workable analyses of H Attachment, one in which the rule first inserted and then attached a H* tone, and one in which the rule simply attached an already preexisting phrasal H* tone to the relevant syllable. I adopted the insertion account for ease of notation and exposition, since the choice of analysis would not affect rule interactions with H Attachment in any significant way. However, in this section I will show that the choice of analysis does bear crucially on the issue of whether H Attachment (and by extension, also Final Raising) must refer to a p-boundary in its structural description, and in process I will opt for an attachment analysis.

In the insertion analysis, H Attachment must mention a p-boundary because it is the presence of a p-boundary that triggers the rule. Given that the basic domain of cyclicity is the word, not the p-phrase, we cannot simply assume H Attachment applies at the right edge of each successive cyclic domain -- the rule must somehow distinguish between p-boundaries and w-boundaries. Yet explicit reference to the right-hand p-boundary creates problems with the prosodic rule typology discussed in the preceding section. It would therefore be advantageous if we could arrive at an alternative formulation of H Attachment in which the p-boundary is not the trigger.

This turns out to be possible with the simple attachment account of H Attachment. On this analysis, the H* is automatically inserted at the end of each p-phrase as it is constructed:

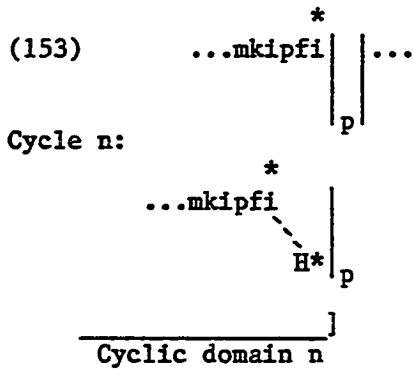
(152) PHRASAL TONE INSERTION (preliminary statement)

$$\phi \rightarrow H^* / [\dots __]_p$$

Phrasal Tone Insertion assumes responsibility for inserting H^* at the end of each p-phrase. Although it mentions a right-hand p-boundary, Phrasal Tone Insertion does not present a problem for prosodic rule typology because it never has to cross a left-hand p-boundary in the way that H Attachment must. Thus it fits neatly into our prosodic rule typology as a domain-limit rule.

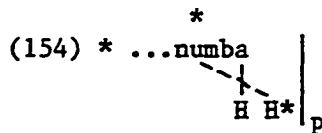
Phrasal Tone Insertion's reference to p-boundaries leaves H Attachment free to link any H^* to any eligible syllable subject to certain straightforward conditions to be discussed below. As a result, H Attachment is triggered not by the presence of a p-boundary, but by the presence of a H^* tone, and so it need not refer to a p-boundary in its statement. This allows H Attachment to be stated as a cumulative cyclic domain-span rule like most other p-level rules.

The assumptions that must be made to prevent the H^* from attaching to ineligible syllables are simple and well-motivated. To begin with, we need not worry that the H^* will attach rightward to an accented syllable in a following p-phrase, because left-to-right cyclicity ensures no following material will be added to the representation until a subsequent cycle. Thus in (153) the H^* will have nowhere to link but leftward:

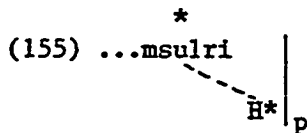


Likewise, the word cycle and Matching Convention will ensure that no accents from preceding words will remain as potential targets, as was shown in 3.5.2.

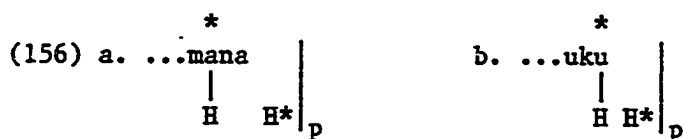
Next, the standard Well-Formedness Condition on crossing association lines ensures that the H* will be unable to attach to a toneless accented syllable if a H tone intervenes between that syllable and the p-boundary:



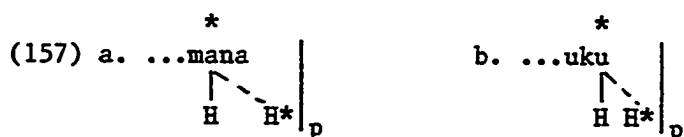
Underspecification sees to it that an intervening toneless syllable does not similarly block attachment:



The only remaining cases are those in which an accented syllable is not blocked by an intervening H tone, but is itself already attached to a lexical H tone:



The Well-Formedness Condition does not prevent the H* from attaching to the accented syllable and creating a "contour" that consists of two H tones, one of which is marked with the diacritic "*" feature:



In general, at this stage of the derivation contour tones are disallowed, since Vowel Coalescence and Tone Shift have not yet applied. The Delinking Convention (Halle & Vergnaud 1982, ex. 12d) therefore predicts that the violations in (157) would be resolved by delinking the lexical H tones, which were already present when the H* tones were added:



The lexical H tones, once delinked, would then delete by Stray Erasure, leaving only the H* tones. Yet if this were the case, we would expect the H tones of mana and uku in p-final position to spread leftward by H* Spread just as the H* tones of p-final toneless words do. As was shown in 2.2.1, this is not what happens. In fact, the failure of a p-final word's lexical H to spread leftward is precisely

what originally motivated the use of an intonational diacritic to mark H* as distinct from lexical H.

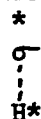
We must therefore instead prevent the H* from ever attaching to the H-toned accented syllable in the first place. This may be done by requiring the target syllable to be toneless in the statement of H Attachment:

(159) H ATTACHMENT (first revision)



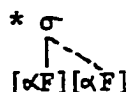
However, we will see shortly that it is preferable to eliminate all specific requirements from the target syllable other than the presence of accent. To that end I propose that H Attachment be written as a simple accentual melody assignment rule, as in (160):

(160) H ATTACHMENT (final revision)



In order to prevent the H* from attaching to lexically H-toned syllables, then, I assume a convention to the effect that a given feature may not spread leftward onto a syllable already specified for the same value of that feature:

(161) VACUOUS SPREADING CONSTRAINT



The Vacuous Spreading Constraint not only simplifies our statement of H Attachment, but also simplifies rules such as H* Spread and R Spread, so that they need not mention the feature specifications of the syllables or tones to which they spread:

(162) Other rules simplified by the Vacuous Spreading Constraint:

a. H* Spread



(cf. Ch. 2, ex. (31))

b. R Spread



(cf. Ch. 2, ex. (52))

In the case of H* Spread, when the H* spreads to a L-toned syllable, the L will automatically delink by the Delinking Convention, so the delinking of the L need not be stipulated by rule. In this case I assume that Stray Erasure will not delete the resultant floating L because floating L, unlike floating H, receives a phonetic interpretation as downstep in Kivunjo.

(162') Stray Erasure

If, in a given language L, a feature value [α F] may only receive a phonetic interpretation if it is attached to the timing tier, then floating instances of that same feature value [α F] in L are automatically deleted whenever they arise in a derivation.

The Vacuous Spreading Constraint appears to pertain only to leftward spread — it is not mirror-image. The only rightward tone spreading rule in the language — S Spread — clearly is not subject to the constraint, as it may spread a S at the expense of another S. The possible universality of the Vacuous Spreading Constraint and the

source of its right-left asymmetry is a subject for further study.

Wherever H Attachment is unable to attach the H* to an accented syllable, whether because of an intervening association line or the Vacuous Spreading Constraint, the H* deletes by Stray Erasure. Deletion of stray H* tones is needed to prevent them from attaching to an accented syllable on the next cycle. If the next cyclic domain contains a p-internal word, attachment of the H* would incorrectly predict raising:

(163) $\begin{array}{c} * \\ \text{Ngileenenga mcaka} \\ \text{S} \quad \text{HH} \end{array} \Big| \begin{array}{c} * \quad * \\ \text{kipfi kitutu} \\ \text{p} \quad \text{H} \end{array} \Big| \text{p}$

Cycle 2:

$\begin{array}{c} \text{Ngileenenga mcaka} \\ \text{S} \quad \text{HH} \end{array} \Big| \text{p}$

$\begin{array}{c} \text{Ngileenenga mcaka} \\ \text{H} \quad \text{HH} \end{array} \Big| \text{H}^* \Big| \text{p}$

PHRASAL TONE INSERTION

n/a

H ATTACHMENT

$\begin{array}{c} \text{Ngileenenga mcaka} \\ \text{H} \quad \text{HH} \end{array} \Big| \text{p}$

STRAY ERASURE

"Ngilēenengā mcākā kīpfī kītūtū

OTHER RULES

'I gave a Chaga person a small wasp'

Cycle 3, assuming no Stray Erasure on Cycle 2:

$\begin{array}{c} * \\ \text{Ngileenenga mcaka} \\ \text{H} \quad \text{HH} \end{array} \Big| \begin{array}{c} * \\ \text{kipfi} \\ \text{H}^* \end{array} \Big| \text{p}$

H ATTACHMENT

*Ngilēene!nga "mcaka kīpfī kītūtū

OTHER RULES

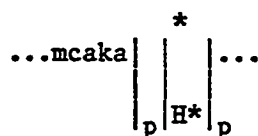
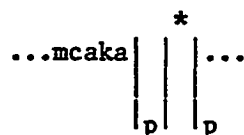
Finally, I mentioned in 3.7.1 that at strong juncture H Attachment may be viewed as crossing a p-juncture on the tonal tier as well as the accentual tier. This is true with a simple attachment analysis because it is no longer the p-phrase itself, but its final boundary tone that triggers H Attachment. At strong juncture, however, the first p-phrase's H*, if not attached on the first cycle, disappears by Stray Erasure, in which case it can only be the H* of the next p-phrase (that of the strong-juncture accent) that attaches to the noun's final syllable:

(163') ...mcaka | | | ...
 | | |
 p p

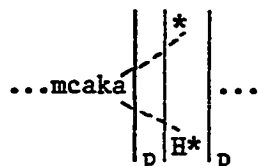
Cycle 1:

...mcaka	|		PHRASAL TONE INSERTION
	H*	|	
		p	
n/a			H ATTACHMENT, etc.
...mcaka	|		STRAY ERASURE
		p	

Cycle 2:



PHRASAL TONE INSERTION



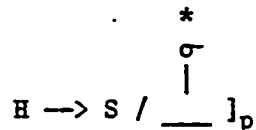
ACCENT ATTACHMENT,
H ATTACHMENT

In summary, we have seen that the correct distribution of H Attachment may be accounted for by a simple attachment analysis of H Attachment, fed by an intonationally natural rule of Phrasal Tone Insertion, and constrained by a plausible Vacuous Spreading Constraint as well as well-motivated assumptions such as the Well-Formedness Condition, underspecification, and Stray Erasure. While the insertion-and-attachment analysis of H Attachment also derives the correct distribution within p-phrases, in order to do so it must refer to a p-boundary, and must specify that its target be toneless. As we will see in the next section, this will prevent consolidation with Final Raising into a single rule.

3.7.3. Final Raising without p-boundary as trigger

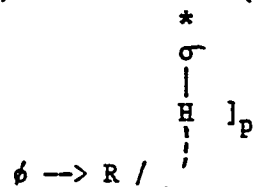
Like H Attachment, Final Raising can be reanalyzed so that it need not refer to a p-boundary in its structural description. As originally stated in 2.2.2, Final Raising appears to be a feature-changing rule:

(164) FINAL RAISING



However, as we have seen, S tone is actually a shorthand for the feature matrix [+high,+raised]. Final Raising can therefore be recast as a feature attachment rule along the lines of H Attachment:

(165) FINAL RAISING (stated as feature insertion-and-attachment rule)



If we then assume that in addition to a floating H* tone, each p-phrase also automatically ends with a floating [+raised] feature, we can then transform Final Raising into a tone attachment rule that is not directly triggered by a p-boundary:

(166) PHRASAL TONE INSERTION

- a. $\phi \rightarrow H^* / [... \text{---}]_p$
- b. $\phi \rightarrow R^* / [... \text{---}]_p$

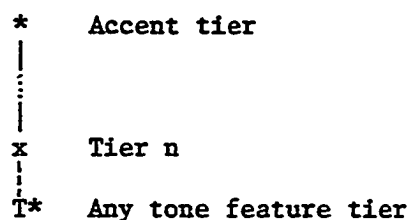
(167) FINAL RAISING (stated as a simple feature attachment rule)



In fact, as stated in (167), Final Raising can be collapsed into a

single rule with H Attachment as revised in (160):

(168) PHRASAL TONE ATTACHMENT



The consolidated rule of Phrasal Tone Attachment presupposes a tone feature hierarchy in which [raised] is dependent on [high], and [high] attaches directly to the timing tier. Further, it presumes H autosegments to be the only specified values for the feature [high] at this stage of the derivation. Both of these are well-motivated presuppositions, as was shown in 2.2.2 and 2.3. Given underspecification and a feature hierarchy, we need not say anything about the node to which the phrasal tone attaches other than that it is non-null and ultimately linked to an accent.

It now remains to ensure that the phrasal R* will attach only to eligible H tones. The blocking effects for Final Raising are slightly different from those observed with H Attachment, and require a refinement in our underspecified analysis of the feature [raised]. So far we have assumed that normal H tones are unspecified for the feature [raised], while S is specified as [+raised]. L tone, lacking specification on the [high] tier, is incapable of supporting a value for the feature [+raised]:

$$(169) \quad S = \begin{array}{c} \sigma \\ | \\ H \\ | \\ R \end{array} \quad H = \begin{array}{c} \sigma \\ | \\ H \end{array} \quad L = \textcircled{\sigma}$$

On this analysis, then, neither H nor L should be expected to serve as a barrier to spreading on the [raised] tier, since neither H nor L has a feature specification on that tier:

$$(170) \quad \begin{array}{ll} \text{a. } \begin{array}{c} * \\ \text{mburu} \\ | \quad | \\ H \quad H^* \\ \quad \quad | \\ \quad \quad R^* \end{array} & \text{b. } \begin{array}{c} * \\ \text{*nguku} \\ | \quad | \quad | \\ H \quad H \quad H^* \\ \quad \quad \quad | \\ \quad \quad \quad R^* \end{array} \end{array} \quad \begin{array}{c} | \\ p \end{array}$$

Yet, as (170b) shows, this inappropriately predicts raising in penultimate-accented H-final words. We must therefore find a principled reason why unraised H, but not L, should act as a barrier to R attachment.

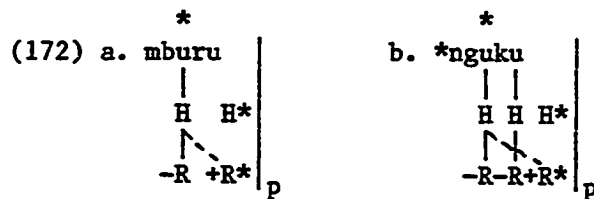
Normally, it has been assumed in the literature that if the default value for a feature comes to be specified at a certain point in the derivation, then from that point on it must be specified in all contexts, regardless of whether or not its value is entirely predictable from its surroundings. Steriade (1987), however, has advanced a principled way of allowing the same value for a given feature to be specified in some contexts while remaining unspecified in others. Her criterion is that if an unmarked feature value is "redundant", or predictable from the other features to which it is attached, then it need never be specified at any point in the derivation. However, in contexts where an unmarked feature value is "distinctive", or unpre-

dictable from the other features it is attached to, then it must be specified.

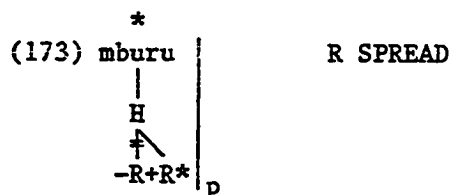
Steriade's proposal is too strong in the case of the feature [high], whose values are always distinctive in Kivunjo, but for which there is compelling evidence of underspecification, as shown in 2.3. This may reflect the extent to which tones function as autonomous autosegments compared with segmental features, or have nodal status in feature-geometric terms (Clements 1985, Sagey 1986). Nonetheless, with respect to the subsidiary tonal feature [raised], Steriade's proposal furnishes exactly the natural class we need for blocking effects on Final Raising. Since L tone lacks a [+raised] counterpart, it is redundantly [-raised] and need not be specified for the feature. However, H tone may bear either value for [raised], and so by Steriade's prediction unraised H should be specified as [-raised]. I use the symbols -R and +R for these feature values below:

$$(171) \begin{array}{ccc} S = \sigma^- & H = \sigma^- & L = \textcircled{\sigma} \\ | & | & \\ H & H & \\ | & | & \\ +R & -R & \end{array}$$

With H specified as [-raised], we obtain the desired blocking effect for an intervening H while allowing a L to remain transparent to Phrasal Tone Feature Spread:



Delinking of [-raised] from the H of mburu can be handled either by the Delinking Convention or by R Spread, which will now spread [+raised] leftward at the expense of [-raised] values, much as H* Spread spreads H* at the expense of specified L:



However, it is unnecessary to change the statement of R Spread for this purpose, since the preexisting [-raised] autosegment will detach and delete by the Delinking and Stray Erasure Conventions, having no phonetic interpretation when floating. The Vacuous Spreading Constraint will also harmlessly prevent the R* from vacuously attaching to an already raised H tone.

As with H Attachment, any +R* that fails to attach to a syllable will delete by Stray Erasure, thereby preventing unwanted attachment of stray +R* to a following word's accented syllable:

(174) $\begin{array}{c} * \\ \text{Ngileenenga mkiwoso} \\ \text{S} \quad \text{HH} \quad \text{H} \\ \text{p} \end{array} \quad \begin{array}{c} * \quad * \\ \text{mburu ngitutu} \\ \text{H} \quad \text{H} \\ \text{p} \end{array}$

Cycle 2:

$\begin{array}{c} * \\ \text{Ngileenenga mkiwoso} \\ \text{H} \quad \text{HH} \quad \text{H} \\ \text{R} \quad \text{NN} \quad \text{N} \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \text{Ngileenenga mkiwoso} \\ \text{H} \quad \text{HH} \quad \text{H} \quad \text{H}^* \\ \text{R} \quad \text{NN} \quad \text{N} \quad \text{R}^* \\ \text{p} \end{array}$

PHRASAL TONE INSERTION

n/a

PHRASAL TONE ATTACHMENT

$\begin{array}{c} * \\ \text{Ngileenenga mkiwoso} \\ \text{H} \quad \text{HH} \quad \text{H} \\ \text{R} \quad \text{NN} \quad \text{N} \\ \text{p} \end{array}$

STRAY ERASURE

"Ngilëenengà mkìwòso mbùru ngitùtŭ

OTHER RULES

Cycle 3, assuming no Stray Erasure on Cycle 2:

$\begin{array}{c} * \quad * \quad * \\ \text{Ngileenenga mkiwoso} \quad \text{mburu ngitutu} \\ \text{H} \quad \text{HH} \quad \text{H} \quad \text{H}^* \quad \text{H} \quad \text{H} \\ \text{R} \quad \text{NN} \quad \text{N} \quad \text{R}^* \quad \text{N} \quad \text{N} \\ \text{p} \quad \text{p} \end{array}$

PHRASAL TONE
ATTACHMENT

*Ngilëenengà mkìwòso mbùru ngitùtŭ

OTHER RULES

Finally, the Phrasal Tone Attachment analysis of Final Raising, along with Stray Erasure, allows for a simple account of the absence of raising in cases like (147) in 3.7.1, where Accent Retraction applies backwards across a p-boundary, creating a structure that would seem to meet the structural description of Final Raising, only at an

earlier p-boundary:

(175) $\begin{array}{c} * \quad * \quad * \quad * \\ \text{Ngileenenga msolro} \quad \text{nyama ngitutu} \\ \begin{array}{|c|c|c|c|} \hline S & HH & H & H \\ \hline \end{array} \\ \text{p} \end{array}$

Cycle 2:

$\begin{array}{c} * \\ \text{Ngileenenga msolro} \\ \begin{array}{|c|c|c|} \hline H & HH & H \\ \hline \end{array} \\ \begin{array}{|c|c|c|} \hline R & NN & N \\ \hline \end{array} \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \text{Ngileenenga msolro} \\ \begin{array}{|c|c|c|} \hline H & HH & H \text{ H}^* \\ \hline \end{array} \\ \begin{array}{|c|c|c|} \hline R & NN & N \text{ R}^* \\ \hline \end{array} \\ \text{p} \end{array}$

PHRASAL TONE INSERTION

n/a

PHRASAL TONE ATTACHMENT

$\begin{array}{c} \text{Ngileenenga msolro} \\ \begin{array}{|c|c|c|} \hline H & HH & H \\ \hline \end{array} \\ \begin{array}{|c|c|c|} \hline R & NN & N \\ \hline \end{array} \\ \text{p} \end{array}$

STRAY ERASURE,
MATCHING CONVENTION

Cycle 3:

$\begin{array}{c} * \\ \text{Ngileenenga msolro} \quad \text{nyama} \\ \begin{array}{|c|c|c|} \hline H & HH & H \\ \hline \end{array} \\ \begin{array}{|c|c|c|} \hline R & NN & N \\ \hline \end{array} \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \text{Ngileenenga msolro} \quad \text{nyama} \\ \begin{array}{|c|c|c|} \hline H & HH & H \\ \hline \end{array} \\ \begin{array}{|c|c|c|} \hline R & NN & N \\ \hline \end{array} \\ \text{p} \end{array}$

ACCENT RETRACTION

n/a — no phrasal tones

PHRASAL TONE ATTACHMENT

$\begin{array}{c} \text{Ngilèénéngà msòlrò nyámà ngitùtù} \end{array}$

OTHER RULES

While this structure meets the description of the old, boundary-triggered rule of Final Raising, it does not satisfy the new, tonally triggered rule of Phrasal Tone Attachment, because that rule requires the presence of a phrasal boundary tone to apply. In (175), the boundary tone associated with the p-boundary after msolro has been deleted on the preceding cycle by Stray Erasure.

In order to prevent Final Raising as originally formulated from applying in (175) we would have to further complicate the rule's domain specification, to the effect that the rule may only apply at a p-boundary which forms the right edge of the current cyclic domain:

(176)_c[...____...]_p]_c

The environment shown in (176) violates our typology of prosodic rules. As a result, Final Raising compares unfavorably with Phrasal Tone Attachment as an account of p-final raising phenomena.

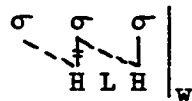
In sum, then, I have shown that it is not only possible, but much preferable to analyze H Attachment and Final Raising as non-boundary-conditioned rules. In their place we may posit a simple and typologically ordinary rule of Phrasal Tone Insertion, followed by an equally simple and commonplace rule of Phrasal Tone Attachment. In order to consolidate H Attachment and Final Raising into the single rule of Phrasal Tone Attachment, we need merely make two plausible changes to our analysis: First, we must assume the existence of a Vacuous Spreading Constraint, which not only aids consolidation of H Attachment and Final Raising, but also simplifies the statements of H*

Spread and R Spread. Secondly, we must assume the feature [raised] is contextually underspecified, along the same lines as Steriade's (1987) proposal regarding segmental features. Finally, we will see in Appendix B that Phrasal Tone Insertion and Phrasal Tone Attachment are nearly identical to the rules that insert and attach u-final intonational boundary tones.

3.7.4. Flop without w-boundary as trigger

As formulated so far, Flop has been characterized as a rule that eliminates the sequence H!H on the last two syllables of a cyclic domain.

(177) Flop (restated from (82))



This is an odd rule for two reasons: First, its phonetic motivation is unclear: why should the sequence H!H be disfavored, and why only in domain-final position? Secondly, the generalization it would seem to capture is not surface-true: After Tone Shift and the addition of u-final intonational boundary tones, various members of the tone-accent paradigm surface with a final H!H sequence:

- (177') a. nyì Lá[!]dí? b. nyì kí[!]pfí?
 'Is it Ladi?' 'Is it a wasp?'

(The derivation of these surface tone patterns and others will be addressed in Appendix B.)

In this section I will show that Flop can be recast as a surface-true, phonetically motivated rule if we order it after Tone Shift and make Tone Shift a cyclic process. In so doing, we will also be able to eliminate the rule's reference to a w-boundary. Now that H Attachment and Final Raising no longer require p-boundary reference, Flop as originally written remains the only p-level rule that fails to fit into Selkirk's prosodic rule typology. Thus restating Flop as a non-

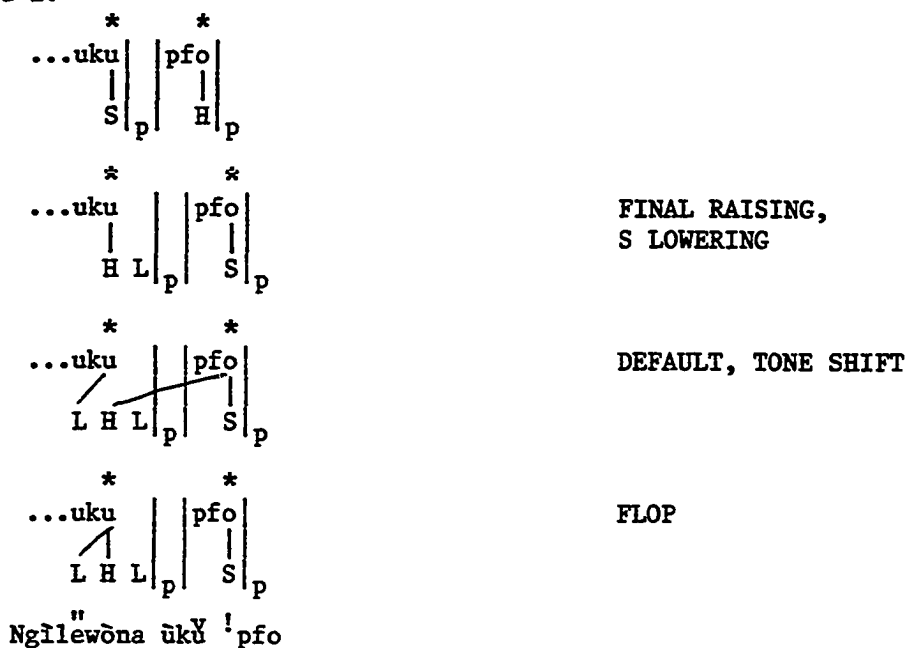
boundary-triggered rule will allow us to generalize that all p-level, cyclic rules other than Phrasal Tone Insertion need not mention any domain information in their structural descriptions.

Let us begin by assuming Tone Shift applies cyclically. The exact mechanics of Tone Shift, cyclic or noncyclic, will be discussed in Appendix A. For now, we may simply assume the Strict Cycle Condition will prevent Tone Shift from reapplying to material already shifted on previous cycles.

On any given cycle, if the last two syllables bear (before Tone Shift) the sequence H!H, we know Flop will apply. If Tone Shift precedes Flop on each cycle, however, the sequence H!H will no longer be heterosyllabic, but will end up as a contour on the domain-final syllable, since the final H tone will have no following syllable to shift to:

(178) Sentence frame: Ngilewona uku pfo 'I didn't see the firewood'
NEG

Cycle 2:



If Flop is to apply to the form in (178) after Tone Shift, then the structural description of Flop must be revised accordingly:

(179) FLOP (revised to follow Tone Shift)



As revised in (179), Flop now performs a very different, and much more natural operation: It eliminates an unwieldy H!H contour by shifting the first member of the contour backward to a preceding syllable. Although the L intervening between the two H tones is not linked, its position between them requires its downstepping effect to be realized on the same syllable as the H tones. Thus the HLH sequence on the final syllable of (179) is equivalent to a three-tone

contour in that it compresses a sequence of three separate glottal gestures into the space of a single syllable. The rarity of three-tone contours across languages attests to the markedness of such configurations, or in any event to the markedness of contrasts between falls of different sizes (H!H vs. HL). Pressure to eliminate marked configurations therefore provides phonetic motivation for Flop as stated in (179). The way in which Flop resolves the H!H contour without deleting any information is quite natural: it flops the association line of the leftmost tone back onto the preceding syllable, leaving the domain-final syllable with !H, a much less marked tonal specification.

The fact that Flop applies only at the end of a cyclic domain falls out from the fact that Tone Shift only creates contour tones on the domain-final syllable. Thus it is no longer an arbitrary stipulation that Flop applies only in domain-final position, but rather a consequence of its feeding relationship with Tone Shift. As a result, Flop need not refer to a w-boundary, since it is the H!H's linking to a single syllable, not their w-final position, that directly triggers the rule.

As restated in (179), Flop is also surface-true: After u-final intonational boundary tones have been attached and u-final rules have applied, there are no H!H contours on the surface in Kivunjo. In fact, in situations where the interrogative H boundary tone creates a H!H contour on the u-final syllable, Flop also applies there:

(180) Uléwôná mbŭ́'ru? (<*Uléwôná mbürú'/?)

'Did you see a goat?'

(The addition of boundary tones is dealt with in Appendix B.)

To allow for this, we may presume that Flop is listed as both a p-level and a u-level rule. The alternative is to analyze Flop as a strictly u-level rule, which applies to all relevant structures only after cyclic rules have applied. Such an analysis would not require Tone Shift to apply cyclically. Yet as we will see in Appendix A, it is not problematic to analyze Tone Shift as a cyclic rule. The disadvantages of noncyclic Flop are much more compelling: To begin with, the rule would have to revert to its heterosyllabic structural description and word-boundary trigger, sacrificing both phonetic motivation and typological naturalness as a prosodic rule.

In addition, we would have to stipulate that Flop must iterate from left to right in order to prevent leftward bleeding iteration in cases of overlapping inputs to Flop.

(181) $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{H} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

$\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{S} \\ | \quad | \\ \text{H} \quad \text{S} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{S} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

n/a

FINAL RAISING

S SPREAD

$\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

S LOWERING

a. $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

FLOP -- LEFT-TO-RIGHT ITERATIVE

$\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

Ngileenenga Ndelya-ngo 'ngu' pfo

OTHER RULES

'I didn't give Ndelya-ngo any firewood'

b. $\begin{array}{c} * \\ \text{Ngileenenga Ndelya-ngo} \\ | \quad | \\ \text{S} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{ngu} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} * \\ \text{pfo} \\ | \\ \text{L} \quad \text{H} \end{array} \quad \begin{array}{c} | \\ \text{p} \end{array}$

FLOP -- RIGHT-TO-LEFT ITERATIVE

*Ngileenenga Ndelya-ngo ngu' pfo

OTHER RULES

The ungrammaticality of (181b) shows that Flop must scan from left to right for possible targets so that it does not bleed itself through iteration. Cyclicity gets us rightward iteration for free, without stipulation. Further, if we do not have to stipulate direction of iteration for Flop, then we can maintain the generalization that all spreading rules in Kivunjo (S Spread, H* Spread, R Spread) iterate

leftward. This will hold even for Flop, which will vacuously iterate leftward on each cycle, since its structural description will only be met in one place on each cycle.

Thus Flop, the last remaining exception to Selkirk's prosodic rule typology, submits favorably to a reanalysis without reference to w-boundaries, and joins the ranks of cumulative-cyclic-domain-span rules along with all other p-level rules.

3.7.5. Conclusions: a revised prosodic rule typology

To sum up, we have seen in this section that although the word is the basic building block for the construction of cyclic domains, the domain of phrasal cyclic rule application is neither the word nor the p-phrase, nor even the utterance, but rather the cumulative cyclic domain. I have designated this domain with a subscript "c" to conform to the formalism of prosodic rule typology. However, since the c-domain never corresponds consistently to any particular prosodic domains, and does not fit into the Prosodic Hierarchy as such, I have proposed that we simply leave the domain label unspecified in the case of cyclic rules.

(182) Domain of cyclic rule application

[...__...] (maximal)

This will ensure that cyclic rules apply within the span of the entire phonologically phrased representation at each given step in the p-phrase-building process, without referring to any particular prosodic categories, and without adding a new prosodic category to the

hierarchy.

True p-level rules such as Phrasal Tone Insertion will be able to apply whenever a complete p-phrase has been constructed, while u-level rules like Demotion will not have their domain requirement met until the entire utterance has been parsed. The only true p-level rule we have considered, Phrasal Tone Insertion, must precede one of the earlier cyclic rules, Phrasal Tone Attachment, but it is not clear whether this represents an ordering between true p-level rules and domain-nonspecific cyclic rules. The model proposed here does, however, predict that cyclic rules will always precede u-level rules, since the complete u-domain is the last to be created. This parallels Booij and Rubach's (1987) and Kiparsky's (1984) proposal that the lexical phonology contains a final, non-cyclic stratum whose domain of application is the entire word.

In the process of accommodating the domain of cyclic rule application within Prosodic Hierarchy theory, we have also seen that H Attachment and Final Raising can be rewritten so as not to refer to p-boundaries as triggers, and that this has the added advantage of collapsing the two rules into a single rule of Phrasal Tone Attachment. Similarly, Flop can be restated without a crucial boundary reference if we assume that Tone Shift is cyclic, an assumption that I defend in Appendix A.

3.8. Summary

In this chapter I have argued for the cyclicity of a class of phrasal rules in Kivunjo Chaga. The evidence for cyclicity consists

of four ordering paradoxes that may be resolved elegantly if we assume a phrasal cycle in which the entire utterance is not made available to phrasal rules all at once, but is only gradually fed to the rule system. The alternatives to cyclicity consistently involve baroque complications of rule statements that result from the attempt to incorporate the subtle pattern of sensitivity to domain length exhibited by rules in crucially cyclic configurations.

After confronting the initial evidence for cyclicity in 3.1-3, I argued in 3.4 that the basic cyclic domain -- the domain that is incrementally added with each successive cycle -- is in fact not the p-phrase, but the phonological word. If prosodic domains such as the phonological word and the p-phrase are created by algorithms that scan the utterance word by word, as I have suggested, we can easily obtain phrasal cyclicity by assuming that all applicable phonological rules apply whenever new structure is created.

In discussing the word as basic cyclic domain, I have also taken the position that there is no basis in Kivunjo for distinguishing the word and the clitic group as distinct phrasal domains. The phonological word of Kivunjo in fact matches standard descriptions of clitic groups in the literature in that it includes certain function words that cliticize to the following content word. My use of the term "word" for this domain embodies the claim that this domain is the minimal phrasal domain in Kivunjo Chaga, and that rules whose domain is the "word" in the more restricted sense are in fact noncyclic lexical rules. Zec (1988) and Inkelas (1989) adopt a similar stance with regard to facts of Bulgarian and other languages. The facts of

Kivunjo Chaga add further support to the cross-linguistic validity of that claim.

The importance of the claim of minimality for the phonological word/clitic group lies in the fact that this domain is not simply the domain of cyclicity for phonological-word-level rules, but for rules of larger domains as well. If, according to the standard Prosodic Hierarchy, we said that the clitic group was the basic domain of phrasal cyclicity, it would in essence be an arbitrary stipulation: Why not the word, or the p-phrase? With the phonological word as our minimal prosodic domain, however, we are saying that it is not accidental that this domain is the basic building block for cyclicity, because it is also the basic building block of the Prosodic Hierarchy.

In ascertaining what counts as a word for purposes of cyclicity, I introduced two new rules: a lexical rule of Vowel Assimilation and a w-juncture (on u-domain) rule of Vowel Coalescence. In the course of arguing for cyclicity and for the word as cyclic domain, certain minor modifications of cyclic rules became necessary and were presented in 3.5: Accent Reduction can now be replaced by cyclic application of the Matching Convention, and Flop was seen to apply even at the end of a word. We also discovered S Spread to have an accent requirement that easily accounts for the rule's non-iteration across cycles. Further support for the accentual nature of tone raising and S Spread in Kivunjo came from the additional rules of Posttonic Deaccenting and Clash Resolution (introduced in 3.6), which perform the natural function of eliminating accent clashes.

Next, in 3.6 I discussed several possible modes of cyclicity, which vary along the parameters of simultaneity and directionality. The options with respect to simultaneity are a compounding-style cycle, an affixation-style cycle, and a hybrid cycle. In the compounding-style cycle, the entire utterance is available to the phonology on every cycle: Each basic cyclic domain undergoes rules separately and simultaneously on the first cycle, then in combination with other domains on subsequent cycles until the entire utterance is included in a single cyclic domain. With an affixation-style cycle, a given domain undergoes rules for the first time when it is added to other material from previous cycles. On a hybrid cycle, separate domains may have separate cycles simultaneously, but the entire utterance is not necessarily in on the action from the very start of the derivation. Taken together, the evidence considered was compatible only with a strict affixation-style cycle.

With respect to directionality, I considered two options: inside-out and left-to-right cyclicity. Chen (1986) and Shih have shown evidence for an inside-out cycle in Mandarin, but this derives from the fact the first step in Mandarin foot formation does not exhaustively parse the utterance into prosodic domains. The Kivunjo p-word and p-phrase construction algorithms traverse the entire utterance, word by word, from left to right. We therefore do not expect to see inside-out cyclic effects in Kivunjo, and this expectation is confirmed by the data: Minimal pairs for syntactic nestedness showed no differences in the ordering of crucially ordered cyclic domains. One apparent exception to this uniformity I showed to reflect instead

the interaction between S tones linked to adjacent syllables of different degrees of accent, via a natural rule of Clash Resolution. Finally, I speculated that the choice of left-to-right over right-to-left ordering of cycles was not arbitrary, but follows the direction in which speech is produced.

In the last section I considered how phrasal cyclicity might fit into Prosodic Hierarchy theory. I showed that every p-level rule of Kivunjo appears at first to violate the typology of prosodic rules advanced by Selkirk (1980) and confirmed by Nespor and Vogel's (1986) cross-linguistic survey. The domain-span of cyclic rule application is in fact the cumulative cyclic domain on any given cycle -- a domain that is delimited on the left by an u-boundary, but on the right by a w-boundary. Three of these rules previously supposed to be p- or w-limit rules -- H Attachment, Final Raising and Flop -- may each be reanalyzed as cyclic domain-span rules only indirectly triggered by prosodic domain right edges. A fortunate by-product of this reanalysis is that H Attachment and Final Raising can be consolidated into a single, natural rule of boundary tone attachment; and that Flop can be characterized as a phonetically motivated rule that eliminates the crowding of three tone gestures onto a single syllable. It should be noted, however, that the cumulative cyclic domain does not represent an addition to the Prosodic Hierarchy, since rules that apply within this domain need not specify this or any other domain in their structural descriptions.

I conclude with an updated listing of rules and conventions

introduced and revised in Chapters 2 and 3, along with their current orderings. Where unmarked, example numbers are from Chapter 2. A full listing of these rules and their statements, along with the u-level rules assumed to apply throughout, appears in Appendix B.

(183) Rule Inventory:

Lexical:

- Stem Accent Rule (11)
- Verb-Initial Raising (65)
- Lexical S Accent Rule (69)
- Lexical Vowel Coalescence (17)
- Vowel Assimilation (3:71)

Phrasal:

P-word Formation Algorithm (3:81')

P-phrase Formation Algorithm (6, 3:1, 3:81'')

P-limit: Phrasal Tone Insertion (3:166)

Cyclic: Accent Attachment (3:44)

Accent Retraction (106)

Phrasal Tone Attachment (3:168)

triggers Matching Convention (72, 3:83)

Clash Resolution (3:131)

S Spread (3:98)

S Lowering (84)

triggers Default (5)

Tone Shift (section 2.1.1, Appendix A)

Flop (3:179)

Posttonic Deaccenting (3:103)

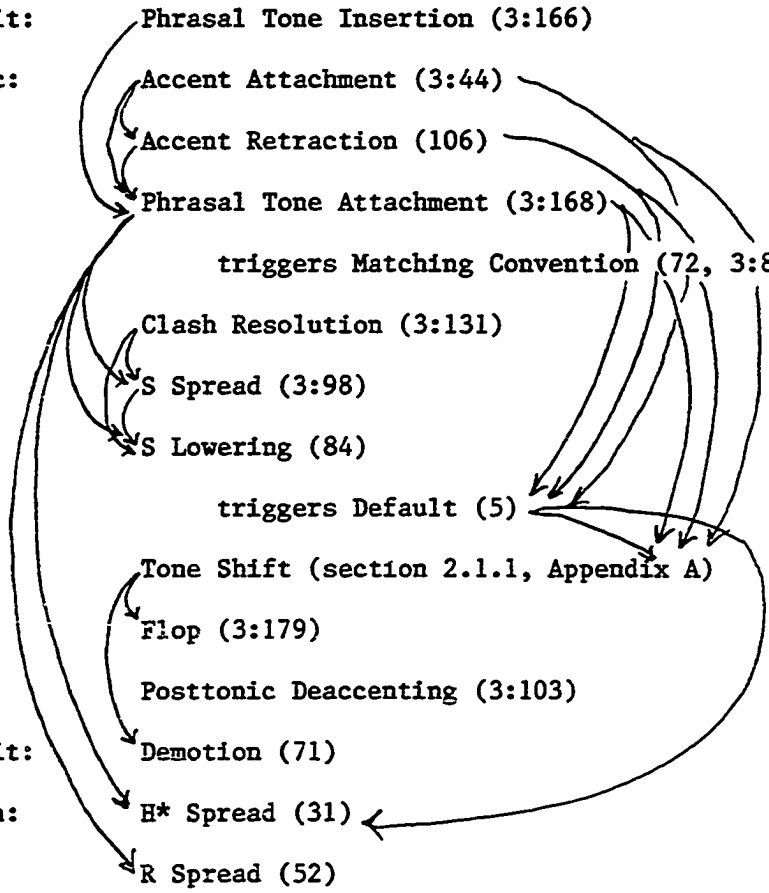
U-limit: Demotion (71)

U-span: H* Spread (31)

R Spread (52)

W-juncture

on u-domain: Phrasal Vowel Coalescence (3:72)



Conventions and constraints:

Well-Formedness Condition

Stray Erasure (3:162')

Delinking Convention (73)

Vacuous Spreading Constraint (3:161)

Matching Convention (72, 3:83)

Default Timing Convention (91)

[high] underspecified until S Lowering

[raised] fully specified on H tone only

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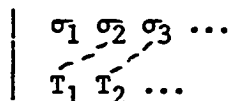
APPENDIX A: THE SUPRASEGMENTAL TIER AND THE MECHANICS OF TONE SHIFT

The purpose of this appendix is to sketch out answers to the following questions that have arisen in the body of the dissertation: (1) How should the rule of Tone Shift be formulated? (2) When in the derivation does Tone Shift apply? (3) What gets shifted by Tone Shift? In the process of answering the first two questions, I will propose that the tone and accent tiers be hierarchically grouped under a single suprasegmental root tier, and that Tone Shift is in fact a subcase of a more general rule of Prosody Shift, which shifts association lines between the suprasegmental tier and the CV skeleton (or its equivalent in mora- and x-based theories).

A.1. How Tone Shift works

To my knowledge there are three basic ways in which the rule of Tone Shift can be written. The first, modeled after Clements and Ford's (1979) analysis of the Kikuyu tone shift, is a Mapping Approach. In this approach, tones are underlyingly unassociated with tone-bearing units, and the effect of a tone shift results from the fact that the first tone is mapped not onto the first syllable, as in most tone-mapping languages (cf. Leben 1978, Haraguchi 1976), but onto the second:

- (1) Mapping Approach to Tone Shift
(cf. Clements & Ford 1979, Haraguchi 1976 for Kikuyu)



Such an analysis presupposes that before Tone Shift, tones are not

associated with syllables. While this may be the case for Kikuyu, it is clearly not the case for Kivunjo Chaga: As seen in Chapter 2, many of the rules of Kivunjo phrasal phonology crucially refer to pre-Tone Shift linkings between tones and tone-bearing units, mostly in order to distinguish between penultimate-accented and final-accented words.

The second possible way to write Tone Shift would be as a "Domino-Effect" shift. Under such an analysis, a floating L tone would first be added to the beginning of the utterance. Such a tone must be supplied at some point in any analysis, whether by Default or by a special rule, to provide the utterance-initial syllable with a tone. In this case the inserted floating L would serve the added function of triggering Tone Shift, a left-to-right iterative rule that attaches a floating tone to a syllable, displacing that syllable's original tone to produce another floating tone that feeds the rule's own iteration throughout the utterance:

(2) Domino-Effect Approach to Tone Shift

a. U-initial Tone Insertion

$$\phi \rightarrow L / u[\text{---}$$

b. Tone Shift (iterative $L \rightarrow R$)



Some convention or minor rule will be needed to reattach the u-final tone to the u-final syllable (cf. Clements & Ford 1979).

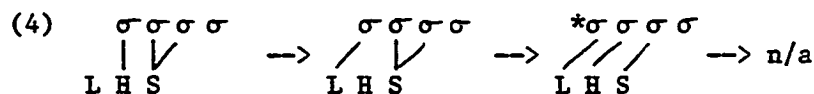
A Domino-Effect approach will only work if tone is fully speci-

fied by the time Tone Shift applies. Otherwise we would erroneously expect only H tone to shift:



There would also be a theoretical problem with ordering U-initial Tone Insertion, which inserts a L tone, before L tones are supplied by Default to the rest of the representation. Thus on this analysis Tone Shift must follow Default. Yet we will see below that there is other evidence indicating Tone Shift must precede Default, because it must precede S Spread.

In addition to only being applicable to tonally specified representations, the Tone Shift rule in (2b) has another weakness: it ceases iteration when it encounters a multiply linked tone:



A multiply linked tone will not become floating as a result of the attachment of the preceding floating tone to its leftmost syllable. Thus the Domino-Effect approach predicts that Tone Shift should stop whenever it encounters a tone that has spread. The surface tones of forms that have undergone S Spread disconfirm this prediction, and may be found in many derivations throughout Chapters 2 and 3.

In order to avoid this pitfall, Tone Shift must be ordered before S Spread, the first tone-spreading rule in the derivation. Yet since S Spread precedes Default, we are faced with an ordering paradox:

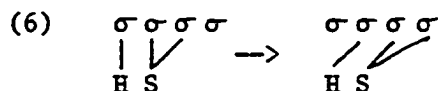
Because of the rule's application to both H and L tone, Tone Shift on this analysis must also follow Default. In this case, however, cyclicity offers no solution to the ordering paradox. We must therefore reject the Domino-Effect Approach to Tone Shift.

A third option is what I will refer to as the Brute-Force Approach to Tone Shift. On this analysis, Tone Shift is not a rule iteratively triggered by a floating tone, but rather one that simultaneously shifts each tone in the utterance rightward one syllable, provided a following syllable exists:

(5) Brute-Force Approach



Unlike the Domino-Effect approach, this analysis can handle multiply linked tones, since the shifting of association lines is not triggered by the presence of a floating tone:



Like the Domino-Effect version, however, the Brute-Force Tone Shift rule must apply to fully specified representations. In this case this is because on the u-final syllable Tone Shift produces contour tones:

- (7)
- | | | |
|---|---|---|
| a. mburu | b. numba | c. nguku |
| $\begin{array}{c} \text{H} \text{ L} \\ \text{H} \text{ L} \end{array}$ | $\begin{array}{c} \text{L} \text{ H} \\ \text{L} \text{ H} \end{array}$ | $\begin{array}{c} \text{H} \text{ H} \\ \text{H} \text{ H} \end{array}$ |
| result: mburû
'goat' | numbā ^Y
'house' | ngukú
'chicken' |

If Tone Shift applied to an underspecified representation, we would expect instead a neutralization of the contrast between utterances ending in a final H, in a penultimate H and in both a penultimate and a final H:

- (8)
- | | | |
|---|---|---|
| a. mburu | b. numba | c. nguku |
| $\begin{array}{c} \text{H} \\ \text{H} \end{array}$ | $\begin{array}{c} \text{H} \\ \text{H} \end{array}$ | $\begin{array}{c} \text{H} \text{ H} \\ \text{H} \text{ H} \end{array}$ |
| result: *mburú
'goat' | *numbā ^Y
'house' | ngukú
'chicken' |

Thus on the Brute-Force analysis as well, Tone Shift must follow Default. Yet Default must also reapply after Tone Shift to supply the u-initial syllable with a tone:

- (9)
- | | | |
|---|---|---|
| a. mburu | b. numba | c. nguku |
| $\begin{array}{c} \text{L} \text{ H} \text{ L} \\ \text{L} \text{ H} \text{ L} \end{array}$ | $\begin{array}{c} \text{L} \text{ L} \text{ H} \\ \text{L} \text{ L} \text{ H} \end{array}$ | $\begin{array}{c} \text{L} \text{ H} \text{ H} \\ \text{L} \text{ H} \text{ H} \end{array}$ |
| result: mbûrû
'goat' | nûmbā ^Y
'house' | ngûkú
'chicken' |

If we were to view Default as a global convention that automatically reapplies whenever it is needed, this would present no problem. Yet the common assumption (cf. Pulleyblank 1983) seems to be that Default is a rule that applies only once in the derivation for a given feature. Thus the Brute-Force Approach also leads to an ordering

paradox.

One possible way to salvage the Brute-Force Approach is to eliminate the need to order Tone Shift after Default by adding some sort of tone-bearing unit to the final syllable before Tone Shift applies:

(10) Final Lengthening

$\emptyset \rightarrow V / \text{ ____ } l_u$

Tone Shift would then shift the final syllable's tone (if any) onto this added tone-bearing unit, while the penultimate syllable's tone (if any) would shift onto the final syllable's original tone-bearing unit, thus preserving the distinction between HL, LH and HH:

(11)	a. mburuV	b. numbaV	c. ngukuV
	$\begin{array}{c} \text{t}^{\prime} \\ \text{H} \end{array}$	$\begin{array}{c} \text{t}^{\prime} \\ \text{H} \end{array}$	$\begin{array}{c} \text{t}^{\prime} \text{t}^{\prime} \\ \text{H H} \end{array}$
result:	mburû	numbā	ngukú
	'goat'	'house'	'chicken'

The problem with this revised analysis, though, is with the identity of the added tone-bearing unit. If it were a V-slot, we would expect phonetic lengthening on final syllables. Yet preliminary phonetic evidence suggests u-final syllables do not lengthen in Kivunjo. We will return to the issue of added tone-bearing units in section A.4.

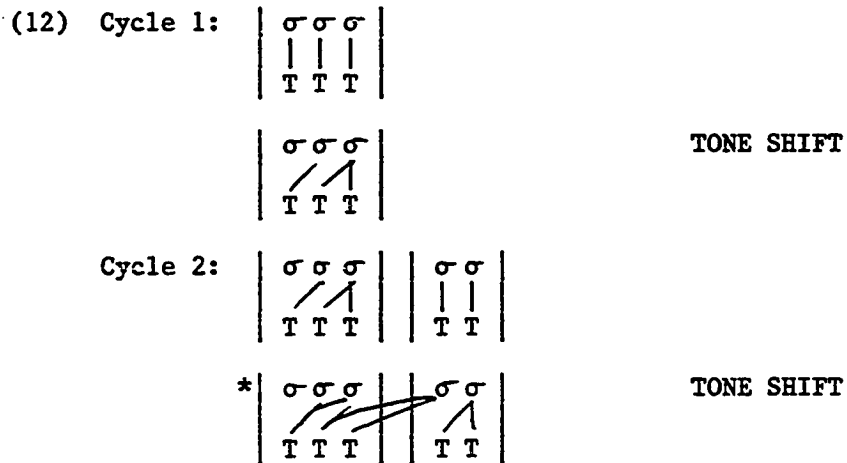
A.2. When Tone Shift Applies

In discussing how Tone Shift applies, we have already begun to touch on the question of when it applies. Thus on either of the non-mapping analyses considered above -- the Domino-Effect Approach and

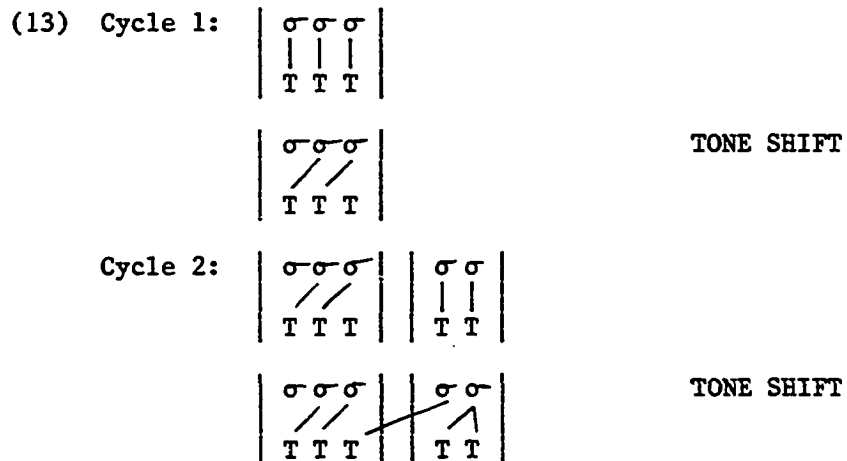
the Brute-Force Approach -- serious problems arise from ordering paradoxes with Default.

Another ordering question involves Tone Shift's application as a cyclic rule. As we saw in 3.7.4, Flop reveals itself as a much more natural rule if Tone Shift precedes it. Flop is also a cyclic rule. Tone Shift must at the same time follow other cyclic rules, such as Accent Retraction, H Attachment and Final Raising, that crucially refer to pre-Tone Shift association lines. Sandwiched thus between cyclic rules, Tone Shift must itself be a cyclic rule.

Yet on the only even marginally viable analysis of Tone Shift, the Brute-Force analysis supplemented with Final Lengthening, it is difficult to imagine how Tone Shift could apply cyclically without incorrectly reapplying to its own output. Since on the Brute-Force analysis Tone Shift is not triggered by any item in the environment, it has no way of determining which tones it has already applied to. Thus we might expect the following derivation, in which the more nested the cyclic domain, the more syllables rightward tones get shifted:



The Domino-Effect Approach, despite its ordering problems with Default, would not encounter this sort of problem with cyclicity. Here Tone Shift could only be triggered by the presence of a floating tone to the left. In a cyclic derivation, the final tone of a previous cyclic domain would have been delinked by the attachment of the preceding tone, and on the next cycle would trigger Tone Shift only from that point rightward in the new cyclic domain:



What we need, then, is a single analysis of Tone Shift that circum-

vents both the ordering paradox with Default and the problem with cyclicity. I will propose such an analysis in A.4.

A.3. What Tone Shift applies to

The third question that an analysis of Tone Shift must answer is that of what gets shifted. In 2.2.4 we observed that Demotion can be much more simply stated if we assume that accent shifts rightward along with tone. In addition, there is a u-level rule, Post-S Spread, that cannot be stated without reference to accent. Yet it is crucially ordered after the u-level rule of Tone Absorption (see Appendix B) and hence must apply after Tone Shift.

(14) Post-S Spread

*
 $\sigma \sigma \sigma$
 $\begin{array}{c} | \quad \wedge \quad | \\ S \quad L \quad H \end{array}$

Like Demotion, Post-S Spread refers to the co-occurrence of tone and accent on the same unit, and even though Tone Shift has applied, the same tones co-occur with accent as do for the purposes of pre-Tone Shift rules such as S Spread and Phrasal Tone Attachment. Thus we must conclude that accent shifts along with tone.

Besides accent and prelinked tone, there is at least one case of a floating tone that shifts as well, despite the fact that underlyingly it is unattached to segmental material. This is the preverbal focus morpheme, mentioned in example (66) of section 2.2.5:

*
 *
 (15) naleenda kanyĩ --> nalēéndā kanyĩ
 S H H

With the Domino-Effect analysis, this floating tone would simply supplant the floating tone to its left, and attach itself instead to the next syllable. However, this would not work as easily in the Brute-Force Approach, where Tone Shift is written so as to require the target tone to be attached to a syllable in its structural description.

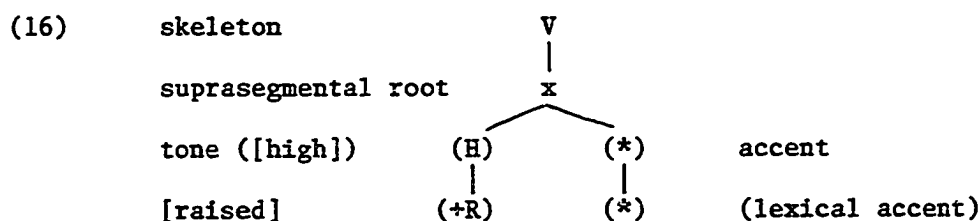
The floating tone in question also "bears" a lexical double accent, which after Tone Shift surfaces on the same syllable on which the tone surfaces. If the floating tone were underlyingly unattached to a syllable in the lexicon, it is difficult to imagine how it would acquire this accent by rule unless the tone was in some way connected to the accent independently of any tone-bearing unit. In addition, this floating S tone spreads by S Spread, which crucially refers to the spreading S tone's linking to an accented syllable.

Thus we have two types of evidence that Tone Shift shifts not only tones, but also accents, and that tones must be associated with accents independently of their linking to syllables. This suggests that on some level of representation tone and accent behave as a unit, and that these suprasegmental features do not attach directly to the segmental tier or CV skeleton.

A.4. The Prosody Shift Proposal

To circumvent all of the problems that have arisen in each of the

preceding sections, I propose an rule of Prosody Shift that takes place not between tones and tone-bearing units, but between tone-bearing units and the CV skeleton (or its equivalent in moraic or x-based theories of timing). This analysis requires that we posit a tier of representation intermediate between the CV skeleton and the tonal tier, to which both tones and accent attach rather than attaching directly to the skeleton. This tier could be regarded as a suprasegmental root tier on analogy with the segmental root tier commonly assumed to exist in current work on feature geometry:



Regardless of whether a given syllable is specified for tone or accent, it will always be linked to a node on the suprasegmental root tier, which will in effect hold a place for specified or unspecified tone and accent features. Units on the suprasegmental root tier will serve a dual function as tone-bearing units for tone features and as baseline marks for the accentual grid.

A Prosody Shift analysis will allow us to sidestep the issue of Tone Shift's ordering with respect to Default and most other rules, because those rules will continue to manipulate linkings between the tonal tier and the suprasegmental root tier. Since Prosody Shift instead affects linkings between the skeleton and the tonal tier, it

will treat unspecified L tone as an entity, while at the same time rules involving the tonal and suprasegmental tiers will continue to treat L as if it is absent. A similar analysis of the unspecified high front vowel /i/ in Yoruba appears in Pulleyblank (1988): There, a rule that anomalously treats /i/ on a par with other vowels is analyzed as manipulating vowels at the segmental root node level rather than at the melodic level.

Prosody Shift will still have to precede Flop and Demotion, since both these rules in their final form crucially refer to contour tones produced by Tone Shift on u-final syllables. But having eliminated crucial orderings with other rules, these ordering no longer lead to paradoxes.

Prosody Shift will naturally shift both tone and accent without added machinery, since the suprasegmental root tier dominates both the tonal and accentual tiers. Assuming the existence of a suprasegmental tier also allows the preverbal floating S morpheme to bear accent through the root node it is attached to, without having to be attached to segmental material underlyingly. Likewise, this floating S will be able to undergo purely tonal rules such as S Spread as if it is attached to a tone-bearing unit, since those rules make no reference to linkings between the tonal and segmental tiers, only to the tonal and suprasegmental tiers.

Now that we have reanalyzed Tone Shift as Prosody Shift, we must reopen the question of how and when it applies. To begin with, the Mapping Approach is still ruled out, since in the lexicon Vowel Coalescence facts (discussed in 2.1.4) indicate we need to refer to

linkings between tones and syllables earlier in the grammar.

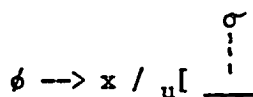
The Brute-Force Approach can simply be restated as in (17), so that it shifts units on the suprasegmental tier:

(17) Brute-Force Approach to Prosody Shift:



While the Brute-Force Approach to Tone Shift requires the independently motivated rule of Default to supply the u-initial syllable with a L tone, the comparable analysis of Prosody Shift requires the introduction of a new rule that supplies not a default L tone, but a tone-bearing unit for the u-initial syllable after it has lost its original tone-bearing unit to the following syllable by Tone Shift:

(18) U-Initial X Attachment



Another problem is shared by the Brute-Force analyses of both Tone Shift and Prosody Shift: Because neither rule has a floating element as trigger, it is not clear how the rules can apply cyclically without reapplying to their own output.

In contrast, the Domino-Effect Approach, when applied to Prosody Shift, encounters no problems with cyclicity. In this case, a rule of U-Initial X Insertion will apply first, inserting but not attaching a floating tone-bearing unit at the beginning of the utterance. Then

Prosody Shift can be written as a rule triggered by the presence of a floating tone-bearing unit:

(19) Domino-Effect Approach to Prosody Shift

a. U-Initial X Insertion

$\emptyset \rightarrow (\textcircled{x}) / u[\text{ ____ }$

b. Prosody Shift (iterative $L \rightarrow R$)



The X Insertion rule serves a clearer function than its counterpart in the Brute-Force analysis, in that its output triggers the progressive rightward shift of tone-bearing units as well as supplying the u-initial syllable with tone. Further, with a floating x as its trigger as in (19b), Prosody Shift encounters no problems with cyclicity, just as with the Domino-Effect version of Tone Shift discussed earlier.

To conclude, then, I have outlined an analysis of Tone Shift that will allow the rule to be ordered as a cyclic rule, crucially preceding Flop and Demotion, while resolving the questions that arise concerning its ordering with respect to Default and other cyclic rules. Reanalyzed as Prosody Shift, the rule may apply as early in the battery of cyclic rules as is desired, but it must not apply any later in the derivation than Flop. The suprasegmental root tier whose existence is presupposed by Prosody Shift allows us to correctly shift accent along with tone without adding a rule to the grammar. It also provides a rationale for the fact that the floating S tone verbal focus morpheme escapes Stray Erasure and behaves as if attached for

the purposes of rules like S Spread.

APPENDIX B: LIST OF P-LEVEL AND U-LEVEL RULES AND SURFACE FORMS

In this appendix I list for reference the final statements of each of the rules and conventions introduced in the body of the dissertation, along with the rules of U-Initial X Insertion and Prosody Shift from Appendix A. To that inventory I then add the u-level rules that were alluded to but not discussed in the main text. For each of those rules I provide some commentary on its ordering and function.

In the rule statements that follow, numbers in parentheses refer to Chapter and example number.

CONVENTIONS:

STRAY ERASURE (3:162')

If, in a given language L, a feature value [\propto F] may only receive a phonetic interpretation if it is attached to the timing tier, then floating instances of [\propto F] in L are automatically deleted whenever they arise in a derivation.

MATCHING CONVENTION (2:72, 3:83)

- a. Every accent must be attached to a [+raised] autosegment, and
- b. Every [+raised] autosegment must be attached to an accent.

DELINKING CONVENTION (2:73) (from Halle & Vergnaud 1982)

If the application of a rule results in a violation of the conditions -- either universal or language-specific -- which must be met by well-formed representations in the language in question, the violation is removed by deleting links between autosegments and core phonemes established by earlier rules or conventions.

DEFAULT TIMING CONVENTION (2:91)

The application of the first rule to insert the default value for a given feature triggers the automatic application of that feature's Default rule throughout the current domain at that point in the derivation.

VACUOUS SPREADING CONSTRAINT (3:161)

$$\begin{array}{c} * \sigma \\ | \\ [\neq F][\neq F] \end{array}$$

LEXICAL RULES:

STEM ACCENT RULE (2:11)

Construct a left-headed binary foot at a domain's right edge.

DOMAIN: lexical stem

VERB-INITIAL RAISING (2:65)

$$H \rightarrow S / [\text{ ____ }]$$

DOMAIN: non-relative finite verb

LEXICAL S ACCENT RULE (2:69)

Assign a grid mark on line 2 to a syllable that bears S tone.

LEXICAL VOWEL COALESCENCE (2:17)

$$u + a \rightarrow o$$

VOWEL ASSIMILATION (3:71) (optional across word boundaries, strongly preferred within words)

a. $\begin{array}{cc} V & V \\ \vdash & \vdash \\ | & | \\ \text{back} & \text{back} \\ | & | \\ \text{low} & \text{low} \end{array}$ b. $\begin{array}{cc} V & V \\ | & \vdash \\ \text{[-high]} & \text{[+high]} \end{array}$
(mirror image)

PHRASAL RULES:

PHONOLOGICAL WORD FORMATION (3:81')

For each pair of consecutive morphosyntactic words X and Y,
(a) if X does not belong to a lexical class (N, A, V), and
(b) if X shares more category memberships with Y than
it shares with any morphosyntactic word Z that may
immediately precede X,
then X and Y form part of a single phonological word;
otherwise, they belong to separate words.

Definition of shared category membership:

X and Y share category membership in C if C dominates
both X and Y.

PHONOLOGICAL PHRASE FORMATION (1:10, 2:6, 3:1, 3:81'')

For each pair of consecutive phonological words X and Y,
if X p-governs Y,
then X and Y form part of a single phonological phrase;
otherwise, they are phrased separately.

Definition of p-government:

X p-governs Y if X is the head of a maximal projection
that dominates Y.

PHRASAL TONE INSERTION (3:166)

a. $\phi \rightarrow H^* / [\dots __]_p$

b. $\phi \rightarrow R^* / [\dots __]_p$

U-INITIAL X INSERTION (A:19a)

$\phi \rightarrow x / _u [__]$ Suprasegmental root tier

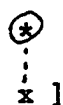
tone shift (A:19b)



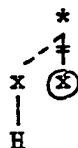
Skeleton

Suprasegmental root tier

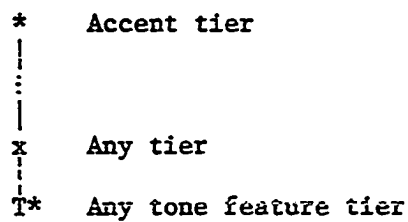
ACCENT ATTACHMENT (3:44)



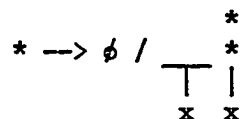
ACCENT RETRACTION (2:106)



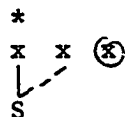
PHRASAL TONE ATTACHMENT (3:168)



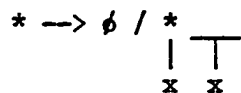
CLASH RESOLUTION (3:131)



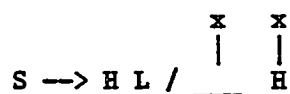
S SPREAD (3:98)



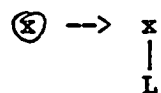
POSTTONIC DEACCENTING (3:103)



S LOWERING (2:84)



DEFAULT (2:5)



FLOP (3:179)



DEMOTION (2:71)

Reduce the grid column of the u-final syllable by one.

OR: Conflate tiers 1 and 2 on the u-final syllable
(in the sense of Halle & Vergnaud 1987).

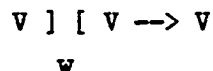
H* SPREAD (3:162a)



R SPREAD (3:162b)

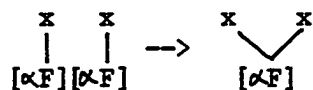


PHRASAL VOWEL COALESCENCE (3:73) (optional)



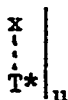
U-LEVEL RULES NOT INTRODUCED IN MAIN TEXT:

(1) CONSOLIDATION (OBLIGATORY CONTOUR RULE)



Consolidation has the effect of bringing tonal representations into conformity with the Obligatory Contour Principle, which prohibits sequences of identical autosegments. This rule is needed to account for the fact that a sequence of H-toned syllables will undergo Tone Absorption (rule (4) below) or Mitosis (5) regardless of whether the two syllables are linked to a single H autosegment or to separate H autosegments.

(2) BOUNDARY TONE ATTACHMENT



There are two u-final boundary tones: L*, which marks declarative intonation, and H*, which marks interrogative intonation. These are presumably not inserted by rule, but simply intonational morphemes that are added to the representation after the last p-phrase undergoes its round of cyclic rules. U-final boundary tones may in fact turn out to be examples of u-level clitics according to Inkelas's (1989) analysis of cliticization.

Since it attaches a specified L tone, Boundary Tone Attachment may be presumed to follow Default. Even when it attaches the H* tone, we must assume the rule follows Default. This is because when H*

attaches to an underlyingly toneless syllable, the result is not simply H, but downstepped H. This suggests that when H* is attached to syllables default L tones have already been added to the representation. Boundary Tone Attachment also feeds H* Spread, a fact which motivates our marking the u-final boundary tone with the same "*" feature as the phrasal H* tone. Finally, the Vacuous Spreading Constraint will prevent boundary tones from attaching to syllables that already bear that tone. Stray Erasure will then delete any unattached boundary tones.

In addition to feeding H* Spread, Boundary Tone Attachment also indirectly (through H* Spread) feeds Flop when it attaches to a u-final syllable that bears a phonological HL contour. This suggests either that Boundary Tone Attachment, though a u-level rule, is ordered before some of the later cyclic rules. Since its structural description explicitly mentions a u-boundary, we are in no danger of having it incorrectly apply utterance-medially if we order it between cyclic rules.

(3) !H DELETION

$$H \rightarrow \emptyset / \overset{\sigma}{\underset{|}{H}} \ L \quad \overset{\sigma}{\underset{\diagup}{\quad}} \ L$$

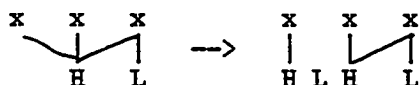
This rule accounts for the fact that the u-final bisyllabic sequence H!H is realized identically with HL in declarative intonation. Since this rule applies only in declarative contexts, we may conclude it is fed by Boundary Tone Attachment.

(4) TONE ABSORPTION



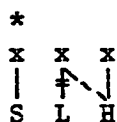
This rule, since it mentions a specified L tone, clearly follows Default. Its effect is to realize the sequence H-HL as H-L on the last two syllables of the utterance in declarative intonation. Flop achieves the comparable effect of realizing H-HL as H-!H in interrogative intonation. Tone Absorption must follow Tone Consolidation, since it applies equally to H-HL sequences that result from two separate H tones and to H-HL sequences that result from the spreading of a H* tone. Tone Absorption also applies to spread S tones, providing additional evidence that S is a H tone with an added [+raised] feature.

(5) MITOSIS



This rule reverses the effect of Consolidation (1) by inserting a downstep between a u-final sequence of two H-toned syllables in declarative intonation. Consolidation nonetheless feeds this rule, since it treats H-H sequences alike regardless of whether they arise from separate H autosegments or from spread H* tones.

(6) POST-S SPREAD

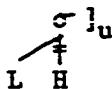


Post-S Spread is only triggered by a S whose final attachment is to an accented tone-bearing unit. A S that has spread rightward one syllable by S Spread will not trigger the rule.

The ordering of !H Deletion with respect to Mitosis, and of Tone Absorption with respect to Post-S Spread appears to be variable among speakers and/or subdialects within Kivunjo. For two speakers from the village of Kirua (Ladi Semali and Lioba Moshi), !H Deletion precedes Mitosis in a bleeding relationship, while for a speaker from Mamba (Eliawonyi Meena) Mitosis precedes !H Deletion in a feeding relationship. Likewise, for the Kirua speakers Tone Absorption precedes Post-S Spread in a counterfeeding relationship, while in the Mamba speaker's grammar Post-S Spread feeds Tone Absorption.

(7) PHONETIC INTERPRETATION RULES:

- a. The contours \widehat{LHL} and \widehat{LH} on the u-final syllable (the declarative and interrogative versions of phonological LH after Prosody Shift) are phonetically interpreted as unreleased L (phonetically non-falling) or superlow tone. This presumably reflects a rule of ~~H~~-Delinking:



In this position presumably the delinked H is not subject to Stray Erasure because its presence after a L has a phonetic interpretation.

- b. Floating H on the u-final syllable has the effect of preventing a preceding L from falling to the bottom of the speaker's pitch range.
- c. Floating L between two H tones has the effect of lowering the pitch of the second H relative to the first.
- d. A stretch of syllables all of which bear phonological S tone is phonetically realized with a gradual cline from H to S pitch.
- e. A H tone is raised in pitch somewhat, but not to the level of S, before a downstepped H or S tone.

APPENDIX C: SYNTACTIC STRUCTURE AND PHONOLOGICAL PHRASING IN KIVUNJO

The purpose of this appendix is to give empirical backing to the claims made in 1.1, 1.5, 2.1.3 and 3.4.2 about the mapping of syntax to phonological phrasing. To begin with, I will show that rules of the p-level do not refer directly to syntactic structure, but rather refer to phonological phrases (p-phrases) which are derived by rule from, but not isomorphic with, syntactic phrases. This is not a novel claim: Although there are proponents of direct reference to syntax in phrasal phonology (e.g. Odden 1987, Rotenberg 1978, Kaisse 1985, Clements 1978), the indirect reference view has tended to prevail (cf. Hayes 1989, Nespor & Vogel 1982, 1986, Selkirk 1980, 1984, 1986, etc.). Moreover, it has recently been suggested (Hayes forthcoming) that all apparent cases of direct reference to syntax at the p-level are in fact not p-level rules, but lexical rules that "precompile" phrasal allomorphs: These rules realize certain (typically inflectional) morphosyntactic features in the lexical phonology, and the resultant forms are then inserted in syntactic strings, subject to a morphosyntactic feature-matching filter.

In addition to arguing for indirect reference to syntax, I will also address the question of what sort of syntactic information is available to the p-level, and according to what principles syntactic structure is reinterpreted as phonological phrasing. This will require a description of Kivunjo phrase structure. Using the Prosodic Hierarchy theory of Selkirk (1980), Nespor & Vogel (1982) and Hayes (1989), I will formulate an algorithm by which syntactic strings are

parsed into p-phrases. The p-phrase parsing algorithm for Kivunjo requires that two words, in order to be phrased together, must stand in a simple head government relationship that I will call p-government (thanks to Tim Stowell for help in coining this term, which stands for both potential gov't and phonological gov't). Applying this algorithm to the phrasing of more complex syntactic structures will provide support for certain syntactic analyses, such as the claim that WH-fronted elements occupy the Spec position of CP, not its head position.

Another issue that has been discussed in the literature on phonology-syntax interaction is the question of whether empty categories are visible to the p-level phonology. I will argue here (following McHugh 1987) that empty categories are not treated like overt words by the rules which transform syntactic structure into p-phrases.

Finally, I will discuss certain apparent exceptions to the p-phrase parsing algorithm developed here. The first such case involves the failure of imperative verbs to phrase with their following objects or subjects. Next, I will discuss the failure of nouns to phrase with their following demonstratives. I will then explore the distribution of strong juncture, whose phonological characteristics were discussed in 3.3. I will also attempt to characterize the syntactic contexts in which choices in phrasing strategy are possible, and to identify the emphatic functions that variant phrasings perform.

C.1. Sketch of the structure of maximal projections in Kivunjo

In order to discuss the relationship between syntax and phrasing

in Kivunjo, it is necessary to begin with a sketch of the phrase structure of the language. I will start by identifying the grammatical categories found in Kivunjo, and then illustrate the X-bar structure of maximal projections. As will be seen in section C.2, the phrase parsing algorithm for Kivunjo Chaga makes crucial reference to distinctions made possible by X-bar theory. Since p-phrases are made up of phonological words, it is also necessary to address the question of what counts as a word for phonological purposes. The distinction between open-class, or lexical categories and closed-class, or function-word categories is relevant to this question.

C.1.1. Open-class or lexical grammatical categories

Kivunjo has two clearly open-class morphosyntactic categories -- N and V -- and two marginally open-class categories -- Adj and Adv. The first two classes are distinguishable from one another by their morphological behavior and marking as well as by their syntactic behavior. Every noun in Kivunjo belongs to one of 11 noun classes (or 16, if singular and plural forms are counted as separate classes following Bantuist practice). A noun's membership in one of these classes is in most cases marked by overt prefixes, singular and plural.

(1) Kivunjo Chaga noun classes

1/2	m-ndu 'person'	wa-ndu 'people'
3/4	m-zri 'tree'	m-zri 'trees'
5/6	soka 'axe'	ma-soka 'axes'
7/8	ki-ndo 'thing'	shi-ndo 'things'
9/10	n-guku 'chicken'	n-guku 'chickens'
11/10	u-ku 'piece of firewood'	n-gu 'firewood'
12 (or 13)	ka-ndo 'party food'	
14	(w)u-ki 'honey'	
15/6	ku-zru 'ear'	ma-zru 'ears'
16	ha-ndu 'place'	
17	ku-ndu 'place'	

(2) Noun prefixes

1	m(u)-	2	wa-	11	u-
3	m(u)-	4	m(u)-	12	ka-
5	0-/i-	6	ma-	14	(w)u-
7	ki-	8	shi-	15	ku-
9	0-/n-	10	0-/n-/ngi-	16	ha-
				17	ku-

Verbs are inflected for subject agreement and tense/aspect/mood, and may also host object clitics. First, second and third person are distinguished in Classes 1 and 2, which are reserved for nouns that denote humans.

(3) a. Verbal subject prefixes

1-1	ngi-/n-	2-1	lu-	11	lu-
1-2	u-	2-2	m(u)-	12	ka-
1-3	a-	2-3	wa-	14	(w)u-
3	u-	4	i-	15	ku-
5	lyi-	6	gha-	16	ha-
7	ki-	8	shi-	17	ku-
9	i-	10	tsi-		

b. Verbal object clitics

1-1	ngi-/n-	2-1	lu-	11	lu-
1-2	ku-	2-2	m(u)-	12	ka-
1-3	m(u)-	2-3	wa-	14	(w)u-
3	u-	4	i-	15	ku-
5	lyi-	6	gha-	16	ha-
7	ki-	8	shi-	17	ku-
9	i-	10	tsi-		

Kivunjo, like other varieties of Chaga (cf. Raum 1909, Augustiny 1914), has a large number of tenses. These involve the following tense markers and final vowels used either singly or in combination, as indicated by the lines in (4a):

(4) a. Tense/aspect/mood prefixes and suffixes

TM1 (tense marker)	TM2 (second tense marker)	FV (final vowel)
a- recent past	m- perfect	-a indicative
le- remote past	nde- neg. perfect	-e subjunctive
we- basic past	(keri)i- progressive	-ie stative/past
(0- present)	eke- habitual	-i stative/aorist
	eci- future	
	ee- future	

b. Verb morphology template:

(FOC)-SM-(NEG)-TM1-(TM2)-(OC)₀-ROOT-(EXT)₀-FV

FOC = focus marker OC = object clitic
 SM = subject marker EXT = extension (derivational)
 NEG = negative morpheme /la/ FV = final vowel
 TM = tense marker

m-ndu cu n-a-we-(e)ci-ngi-wa-ki-sok-i-a
 person this FOC-SM-TM1-TM2-OM-OM-OM-snatch-EXT-FV
 'This person would snatch it from them for me'

a-la-we-nde-c-e pfo
 SM-NEG-TM1-TM2-come-FV NEG
 'he had not come yet'

Unlike in English, the category Adj in Kivunjo is a fairly

limited class, with perhaps twenty to thirty members. Below is a list of twenty adjectives attested in my data:

(5) Lexical adjectives

a. -iu 'black'	k. -wishi '(un)ripe'
b. -ili 'white'	l. -leshi 'long, tall'
c. -noru 'fat'	m. -lehi 'tall'
d. -tutu 'small'	n. -suse 'thin'
e. -ca 'good'	o. -fui 'short'
f. -wico 'bad'	p. -angu 'light (in weight)'
g. -poru 'spoiled, rotten'	q. -fu 'dead'
h. -koho 'young'	r. -kari 'hard, brave'
i. -wiri '(un)ripe'	s. -umu 'hard, difficult, stern'
j. -wiito 'clumsy'	t. -sulri 'noble'

On the basis of this, we might classify adjectives as a closed class. However, there is a productive deverbal adjective-formation process used predicatively to express a kind of passive participial meaning:

- (6) a. n-a mu-alyik-e 'he is married'
 b. wa wa-alyik-e 'they are married'
 FOC-SM AGR-marry-PART

Aside from this one case, Kivunjo appears to have no productive adjective-formation processes. Rather, nouns in the associative (or genitive) construction (to be discussed in the next section) and relative verbs or clauses are used to modify nouns instead:

- (7) a. numba ya kimalramalra 'a green (lit. 'of grass-color') house'
 house of grass-deriv.
 b. mndu a-shimb-i 'a fat (lit. 'who is swollen') person'
 person SM-swell-FV

True adjectives are morphologically distinct from nouns only in a few noun classes. Compare the prefixes in (8) below with those in

(2) above. I have highlighted in boldface those that differ from noun prefixes.

(8) Adjective prefixes

1	m(u)-	2	wa-	11	lu-
3	m(u)-	4	ngi-	12	ka-
5	lyi-	6	ma-	14	(w)u-
7	ki-	8	shi-	15	ku-
9	ngi-	10	ngi-/tsi-	16	ha-
				17	ku-

Thus on morphological grounds alone Adj might best be considered a subtype of the lexical class N. However, on syntactic grounds we may distinguish the two classes because nouns and adjectives behave distinctly when used as predicates, NP heads, and NP modifiers. First, nouns require a form of the copula to function as predicates, while adjectives may take limited subject agreement and tense markers directly:

- (9) a. n-a m-leshi '(S)he is tall'
FOC-SM AGR-tall
- b. n-a-i malyimu '(S)he is a teacher'
FOC-SM-be teacher
- c. o nyi malyimu '(S)he is a teacher'
(s)he COP teacher

Secondly, as we will see in section C.2, nouns used as NP modifiers phrase differently from adjectives so used. Also, adjectives may not head NPs unless they have been reanalyzed as zero-derived deadjectival nouns.

In addition to adjectives, relative clauses and associative (or genitive) phrases, Kivunjo also has a limited number of noun modifiers

that fail to pattern morphologically, and in some cases syntactically, with adjectives. These modifiers agree with the noun, but take a set of agreement prefixes (or in some cases suffixes) distinct from both nominal and verbal agreement prefixes.

(10) Non-adjectival modifier agreement affixes

1	u/cu	2	wa	11	lu
3	u/cu	4	i	12	ka
5	lyi	6	lyi	14	(w)u
7	ki	8	shi	15	ku
9	i	10	tsi	16	ha
				17	ku/pf

On the basis of phrasing evidence, most of these modifiers appear to be syntactically identical to adjectives; however, a small subgroup of these modifiers show distinct syntactic status by virtue of their phonological phrasing: the three demonstratives and -ose 'all, any'. One possible reason for this may be that these items are in fact nouns. This will be discussed in greater detail in section C.X.

Two other minor classes of noun modifiers exist: quantifiers that precede the noun they quantify, with no agreement on the quantifier and no associative marker linking the quantifier to the noun; and appositive nominal modifiers, which follow the noun they modify, but phrase separately and fail to agree with them. Among these appositive modifiers are numerals higher than 'six'. These may be analyzed as nouns that have special subcategorization properties.

Kivunjo also has a small number of lexical adverbs, all of which appear to be analyzable as either nouns or adjectives. The nominal adverbs may be viewed as nouns which, by virtue of their meaning, are

typically used adverbially without the mediation of a preposition, such as inu 'today', ulalu 'now', ofio 'carelessly'. The adjectival adverbs are generally adjectives or other noun modifiers that have been inflected for agreement with Classes 14, 16 or 17, or with the prefix na-, possibly related to the preposition na 'with'.

- (11) a. ku-leshi 'far'
i7-long
- b. ku-ca 'well'
17-good
- c. ne-ca 'well' (<na-ica)
NA-good
- d. u-wico 'badly, terribly'
14-bad
- e. ha-lya 'there'
16-yon

An additional class of adverbs may be constructed by adding Class 5 (singular) and Class 12 (plural) agreement to declinable numeral stems:

- (12) a. lyi-mu 'once'
5-one
- b. ka-wi 'twice'
12-two

Words that belong to lexical grammatical categories may stand alone as phonological words in Kivunjo, and receive stem-penultimate accent in the lexicon, as was shown in 3.4.2.

C.1.2. Closed-class or functional grammatical categories

The nonlexical morphosyntactic categories of Kivunjo — prepositions, nonlexical adverbs, complementizers and simple conjunctions — may be distinguished from lexical categories by their failure to receive stem-penultimate accent, and in most cases by their failure to stand alone as phonological words.

As in many Bantu languages, the category P in Kivunjo is a closed class consisting of at most two lexical items: na and the "associative marker" (AM) -a. The preposition na generally means 'with', but can sometimes mark other oblique argument relationships in the VP.

(13) Syntactic uses of na:

- | | | |
|------------------------------------|---------------|----------------|
| a. Nekelrunda | na Lyiopa | (COMITATIVE) |
| FOC-1-HAB-work | Lioba | |
| '(S)he works with Lioba' | | |
| b. Nalekapa | mana na fimbo | (INSTRUMENTAL) |
| FOC-1-FARPAST-hit | child stick | |
| '(S)he hit the child with a stick' | | |
| c. Nalekapo | na miiwi | (AGENT) |
| FOC-1-FARPAST | thief | |
| '(S)he was beaten by a thief' | | |
| d. Naica | na numba | (GOAL) |
| FOC-1-PROG-come | house | |
| '(S)he's coming to the house' | | |
| e. Nalezrezra | na Ohanyi | (RECIPIENT/ |
| FOC-1-FARPAST-speak | John | COMITATIVE) |
| '(S)he spoke with John' | | |

The associative marker can often be translated as 'of', and serves to link nouns to each other in either a possessive or attributive relationship.

- (14) a. kitapu kya Ohanyi 'John's book' (POSSESSION)
 book AM John
- b. kitapu kya kisamusamu 'a red book' (ATtribution)
 book AM blood-color
- c. kitapu kya kawi '(the) second book' (ORDINALITY)
 book AM twice

To express the variety of argument relations conveyed by the rich inventory of prepositions found languages like English, Kivunjo has many strategies other than use of the preposition na and the associative marker. These strategies are (a) the double object construction, (b) verbal derivational affixes (referred to by Bantuists as verbal "extensions"), (c) the locative clitic or case suffix nyi, (d) argument positions with inherent oblique Case, and (e) "pseudo-prepositions" -- nouns denoting relationships or locations, which govern a following noun through the mediation of the associative marker.

(15) Double object construction with inherent ditransitive verbs:

- a. Ngasoka mana soka
 FOC-1:1-RECPAST-snatch child axe
 'I snatched the axe from the child'
- b. Ngileenenga Lyiopa leeri
 FOC-1:1-FARPAST-give Lioba money
 'I gave Lioba money'

- (16) Double object construction with applicative extension (examples taken from Bresnan & Moshi 1988, exx. (2-3))

- a. N-a-i-lyi-i-a mka kelya (BENEFACTIVE/
FOC-1-PROG-eat-APP-FV wife food MALEFACTIVE)
'He is eating food for/on his wife'
- b. N-a-i-lyi-i-a mawoko kelya (INSTRUMENTAL)
FOC-1-PROG-eat-APP-FV hands food
'(S)he is eating food with his/her hands'
- c. N-a-i-lyi-i-a mlri-nyi kelya (LOCATIVE)
FOC-1-PROG-eat-APP-FV homestead-LOC food
'(S)he is eating food at the homestead'
- d. N-a-i-lyi-i-a njaa kelya (MOTIVE)
FOC-1-PROG-eat-APP-FV hunger food
'(S)he is eating the food because of hunger'

- (17) Suffixed and inherent locative/goal arguments:

- a. Nalesoka ngasi-nyi
FOC-1-FARPAST-descend ladder-LOC
'(S)he came down the ladder'
- b. Naleenda sangazra
FOC-1-FARPAST-go market
'(S)he went to market'

- (18) Pseudo-prepositions:

- a. N-a-le-ngi-kap-i-a numa ya numba
FOC-1-FARPAST-1:1-hit-APP-FV rear AM house
'(S)he hit me behind the house'
- b. Zrema seri ya mfongo!
farm earth AM irrigation ditch
'Farm below the irrigation ditch!'

Note that the associative marker in (18) has a different shape (ya) from its occurrences in (14) above (kya). This is because in Bantu languages the associative marker is generally inflected to agree with the possessed or modified noun. Thus in (14) the Class 7 noun kitapu triggers Class 7 agreement on the AM, while in (18) the Class 9

pseudo-prepositions numa and seri trigger Class 9 agreement. The entire agreement paradigm appears below:

(19) Noun class agreement of the associative marker

1	o	2	wa	11	lo
3	o	4	ya	12	ka
5	lya	6	gha	14	wo
7	kya	8	sha	15	ko
9	ya	10	tsha	16	ha
				17	ko

- (20) a. kitapu kya mana 'a child's book'
 7-book 7-AM 1-child
 b. shitapu sha mana 'a child's books'
 8-book 8-AM 1-child
 c. numba ya kisamusamu 'a red house'
 9-house 9-AM 7-blood-REDUP
 d. numba tsha kicaka 'Chaga houses'
 10-house 10-AM 7-Chaga
 e. mfiri o kalralru 'third day'
 3-day 3-AM 12-three
 f. mana o kuwooka 'first child'
 1-child 1-AM 17-beginning

In addition to overt pseudo-prepositions, there are empty categories that trigger noun class agreement on the associative marker:

- (21) a. Ngilezrezra na o [e] kya Fulore
 FOC-1:1-RECPAST-speak with him 7 7-AM Flore
 'I spoke with him about (the matter of) Flore'
 b. Ngileenda [e] ko Fulore
 FOC-1:1-RECPAST-go 17 17-AM Flore
 'I went to Flore's (place)'

In (21) the empty categories appear to represent ellipsis of kindo 'thing, matter' (Class 7) and kundu 'place' (Class 17), respectively.

In other contexts ko's connection to class 17 is less transparent:

- (22) a. Nalengikapa ko nyashi
 FOC-1-RECPAST-1:1-hit 17-AM anger
 '(S)he hit me angrily (in anger)'
- b. Nalengikapa ko kipfa kica
 FOC-1-RECPAST-1:1-hit 17-AM 7-reason 7-good
 '(S)he hit me for a good reason'

The problem with calling the associative marker a preposition is that unlike the Kivunjo preposition na or prepositions in many other languages, the associative marker is inflected for noun class agreement, as was just shown in (19) and (20). This may follow from the fact that in Kivunjo virtually all noun modifiers must agree with the head noun, and the associative marker's syntactic function is to transform a noun into a noun modifier. This is a function performed in many languages by genitive case morphology. Thus it may be more accurate to regard the associative marker as a genitive case marker. Its similarity to a preposition is entirely consistent with the fact that Genitive Case is often realized as a preposition: In English, for example, many occurrences of the preposition of are in fact best analyzed as resulting from a rule that realizes Genitive Case (Chomsky 1984). Genitives that agree with the head noun in gender or case are attested in other languages (Hausa, many Australian languages). In any event, regardless of whether we consider the associative marker an underlying preposition or case marker, it can be expected to undergo the same phrasing behavior, as I will show in C.2.

A limited number of "functional" adverbs exist in Kivunjo, which appear to be distinct from "lexical" adverbs (e.g. of manner, time) in their morphological behavior, in that they do not receive lexical

accent. These may include items which would be termed "ideophones" by Africanist convention, as well as conversational particles. Consequently, it is not clear whether this class is open or closed. Nonetheless, it patterns like a closed, functional class, in that its members fail to receive lexical accent.

- (23) a. tupu/tiki 'only'
b. piu(piu) (with negative) 'at all'
c. ng'u (emphatic particle)
d. se 'also, again'
e. daa 'also'
f. pfo 'not'
g. nyi 'not'
h. maa 'even'
i. wai 'reported speech particle'
j. le 'as for' (topic marker)

Some of the adverbs in (23), even though they fail to receive lexical accent, not only stand alone as phonological words, but also form separate p-phrases from preceding material. I presume that this correlates with the fact that they typically come at the end of a sentence, and thus follow rather than precede their potential hosts. We may therefore presume that in Kivunjo cliticization of nonlexical items onto lexical categories to form phonological words may only proceed in a rightward direction.

The only remaining nonlexical categories to be discussed are conjunctions, complementizers, and INFL constituents. INFL constituents are routinely cliticized to the verb, so there is no need to consider their phrasing behavior apart from that of verbs. More data is needed to determine whether complementizers such as kee 'that', kooka 'if, whether' behave like nonlexical categories by failing to

receive accent and by cliticizing to the clause-initial constituent. Conjunctions fall into two categories: na 'and' clearly does not stand alone as a phonological word and does not receive accent, as was shown with vowel coalescence data in 3.4.2. a(ng'u) 'or' is indeterminate, but may be presumed to pattern with na. Other polysyllabic conjunctions, however, are either constructed from phrases containing lexical stems (kyaindi 'but' < kya indi 'that-of (7-AM) when', ko kipfa 'because' < 'for (17-AM) reason') or borrowed from lexical words in Arabic through Swahili (lakinyi 'but', alafu 'and then'). In both cases they receive lexical accent and form a separate word from what follows.

To sum up, then, words belonging to lexical morphosyntactic categories undergo the lexical Stem Accent Rule and stand alone as phonological words in the phrasal phonology. These categories are N, V, Adj and polysyllabic conjunctions derived from lexical words or borrowed from Swahili. Lexical adverbs can be analyzed as either nouns or adjectives. Nonlexical categories such as P, Adv, Comp, Conj, and INFL constituents do not receive stem-penultimate accent, and may not stand alone as independent phonological words. One exception to this is when a nonlexical adverb lacks a suitable host on its right to which it may cliticize, in which case it forms a separate word and p-phrase. The algorithm for mapping morphosyntactic constituents onto phonological words is as follows:

(24) Phonological word construction algorithm

Every lexical word (N, V, A) or derivative thereof forms its own phonological word.

Every nonlexical constituent cliticizes to its righthand neighbor to form a phonological word, provided it does not share more category memberships with its lefthand neighbor than with its righthand neighbor.

Every nonlexical constituent that remains uncliticized forms its own phonological word.

This algorithm ensures that nouns, verbs, adjectives, lexical adverbs (actually nouns and adjectives) and function words derived transparently from lexical words will form autonomous phonological words. The nonlexical constituents P, Comp, and INFL will cliticize to the following word. This is because they typically head phrases (PP, CP and IP) that contain the following word and so will always share more category memberships with their righthand neighbor than with their lefthand neighbor.

Conjunctions will likewise cliticize rightward since they share an equal number of category memberships with the preceding conjunct as with the following conjunct. Nonlexical adverbs, however, typically follow what they modify and therefore share more category memberships with what precedes than with what follows. As a result, they are ineligible to cliticize rightward, by the algorithm in (24). Yet since Kivunjo constituents may not cliticize leftward, adverbs will end up completely isolated, cliticizing to neither of their neighbors.

C.1.3. X-bar structure of Kivunjo syntactic phrases

As might be inferred from the examples already presented above, Kivunjo is a canonically head-initial language. This means that within the VP the verb precedes its complements and adjuncts, while within the NP the noun precedes its complements and modifiers. Below I give examples of verb-initial order within the VP.

- (25) a. Naisoma kitapu (V - Direct Object)
FOC-1-PRES-read book
'(S)he is reading a book'
- b. Nailrunda ulalu (V - Adverb)
FOC-1-PRES-work now
'(S)he is working now'
- c. Waienda shuule (V - Oblique Object)
FOC-2-PRES-go school
'They are going to school'
- d. Naienenga mana kelya (V - IO - DO)
FOC-1-PRES-give child food
'(S)he is giving a child food'
- e. Naisoma kitapu ulalu (V - DO - Adv)
FOC-1-PRES-read book now
'(S)he is reading a book now'
- f. Naica na numba (V - PP)
FOC-1-PRES-come to house
'(S)he is coming (in)to the house'
- g. Waleamba kee wawozre leeri (V - S)
FOC-2-RECPAST that FOC-2-have money
'They said that they have money'

In two cases, what might logically be expected to follow the verb does not. First, auxiliary verbs precede the main verb, even though they are in some sense modifying the verb's meaning. This is not peculiar to Chaga, however, and presumably the syntactic structure of auxiliary verb constructions is that of a verb subcategorizing for

another VP, much like an analysis of INFL as heading the IP and taking VP as its complement.

The second apparent exception is the fact that object pronoun clitics precede the verb, as was shown in the verb morphology template in (4b). However, this is only an exception if we require the syntax to handle the placement of clitics. Here I adopt the more plausible analysis that morphological principles determine clitic placement.

Example (26) below illustrates the head-initial structure of the Kivunjo NP.

- (26) a. mana m-tutu
1-child 1-small
'a small child'
- b. mana u-mu
1-child 1-one
'one child'
- c. mana o Ohanyi
1-child 1-AM John
'John's child'
- d. wana ikumi
2-child 5-ten
'ten children'
- e. wana ngilewawona
2-child 1:1-RECPAST/REL-2-see
'children that I saw'

One notable exception to this is that certain quantifiers that do not take agreement morphology precede the noun.

- (27) a. kila mfiri
every 3-day
'every day'
- b. nusu saa
half 9-hour
'half an hour'

Again, as with the auxiliary verbs mentioned above, this is a phenomenon found across languages, and presumably the correct way to analyze it is to posit the existence of a QP (quantifier phrase), headed by the quantifier. Interestingly, in Kivunjo the associative marker does not appear between a pronominal quantifier and the noun it quantifies. The anomalous behavior of kila and rusu may also result from their special status as borrowings from Arabic through Swahili.

Demonstratives and the native quantifier -ose 'all' also follow the noun, although they phrase separately:

- | | |
|--|--|
| <p>(28) a. shindo shi
 8-thing 8-this
 'these things'</p> | <p>b. shindo sho
 8-thing 8-that
 'those things (by you or
 previously mentioned)'</p> |
| <p>c. shindo shilya
 8-thing 8-yon
 'those things
 (over there)'</p> | <p>d. shindo shoose
 8-thing 8-all
 'all/any things'</p> |

An exception to this pattern is that nouns marked with the Locative suffix -nyi are preceded by their demonstratives, not followed by them.

- (29) a. Naica na kunu zreme-nyi
 FOC-1-PRES-come to 17-this 5-farm-LOC
 '(S)he's coming to this farm'
- b. Nalesoka ipfo ngasi-nyi
 FOC-1-FARPAST-descend 17-that 9-ladder-LOC
 '(S)he came down inside that staircase (nearby)'
- c. Nalesoka kulya ngasi-nyi
 FOC-1-FARPAST-descend 17-yon 9-ladder-LOC
 '(S)he went down those steps (out there somewhere)'
- d. Naica na iha ofisi-nyi
 FOC-1-PRES-come to 16-this 9-office-LOC
 '(S)he's coming to this office'

Note that the locative demonstratives take agreement for Classes 16 and 17, not for the original class of the noun before locative suffixation. The same agreement and syntactic facts are obtained when the noun is an inherent locative, unsuffixed with the -nyi suffix.

- (30) a. Naleca na kunu numba
 FOC-1-FARPAST-come to 17-this house
 'He came into this house'

It appears that demonstratives are the only items that must precede locative nouns. Other modifiers follow locative nouns just as they do regular nouns. Nonetheless, unless it is an adjective, the modifier still takes Class 17 agreement, not the noun's original class agreement.

- (31) a. ofisi-nyi koko
 9-office-LOC 17-my
 'in my office'
- c. numbe-nyi kuinga?
 9-house-LOC 17-how many
 'in how many houses?'
- e. numbe-nyi ngiili
 9-house-LOC 9-white
 'in a white house'
- b. *ofisi-nyi yako
 9-office-LOC 9-my
- d. mlri-nyi kui?
 3-town-LOC 17-where
 'in which town?'
- f. mlri-nyi mtutu
 3-town-LOC 3-small
 'in a small town'

Although the glosses I have given in (26d) and (28-31) suggest that the modifiers in those examples are constituents within the NP headed by the noun, the separate phonological phrasing of these structures suggests otherwise. This may reflect an appositive structure, as I will argue in C.2.

Pseudoprepositions and other inherent locatives allow for non-appositive specification and modification:

- (32) a. seri yako
 9-earth 9-my
 'below me'
- b. numba yako
 9-house 9-my
 'in my house'
- c. Uestuwudi hanga?
 Westwood 16-which
 'Where in Westwood?'

Thus despite their inherent locative meaning these words take modifiers in the same way that nonlocative words do.

One class of phrases that are not easily classified as either verbal or nominal are infinitive phrases. Kivunjo infinitive phrases are used in some cases like English infinitives, and in other cases like English gerunds and -ing nominalizations. Their internal syntactic structure resembles that of English gerunds in that their subcate-

gorization behavior is identical with that of verbs, but their external behavior with respect to the phrases they are contained in is parallel with that of nouns, to the point that they exhibit noun class morphology. The infinitive prefix is identical with the Class 5 noun prefix:

- (33) a. I-kapa mana lyiwico
 5-hit 1-child 5-bad
 'to hit/hitting a child is bad'
- b. Luizrezra kya mai ikapa wana
 FOC-2:1-PRES-talk 7-AM 1-mother 5-hit 2-child
 'We're talking about mothers hitting children'

The most interesting fact about Kivunjo infinitives is the way in which they may take specified subjects.

- (34) a. Mana ikapa mai lyiwico
 1-child 5-hit 1-mother 5-bad
 'For a child to hit a mother is bad'

This indicates that the specifier position in Kivunjo VPs is in fact before the head. Cf. also the structure of IP, in which the subject precedes INFL, yielding SVO basic word order of SVO.

It is not clear whether complex APs are possible in this language. I have not yet found a true adjective that can logically take a complement. The closest approximation is the following class of expressions:

- (35) a. mmeeku mpfu meso
1-old:man 1-dead 6-eye
'a blind old man'
- b. kite kipfu mazru
7-dog 7-dead 6-ear
'a deaf dog'
- c. Na muumu mzro
FOC-1 1-dry 3-head
'(S)he's stubborn'
(lit. 'dry-headed')
- d. [e] ico mleshi mazrende
1 1-that 1-long 6-leg
'that long-legged one
(by you or referred to)'

Although AP complements seem elusive, it is easier to find AP adjuncts or specifiers:

- (36) a. lruwu lyiwishi nawi
5-banana 5-unripe very
'a very/excessively unripe banana'
- b. lyitutu mnu
5-small very
'It's very/too small'
- c. Lruwu lyi lyiwiri kuta iyilya
5-banana 5-this 5-ripe than 5-yon
'This banana is riper than that one'
- d. Ngikundi lruwu lyiwiri ca ilyo lyapfo
FOC-1:1-want 5-banana 5-ripe as 5-that 5-your
'I want a banana as ripe as yours'

In these cases, though, it is not always clear whether the modifying adverbial phrase is part of the AP or attached to the IP or VP instead. This will be discussed in greater detail when we consider phrasing facts.

PPs are likewise head-initial, with the preposition preceding the NP it governs.

- (37) a. na fimbo
 with stick
 'with a stick'
- b. ko Ghanyi
 17-AM John
 'at John's'

The IP is presumably head-initial, with INFL preceding the V, as shown in the verb morphology template in (4b) above. However, it is not clear whether this is due to syntactic ordering, since INFL constituents are morphologically fused with the verb. Thus it might just be an accident of morphological constituent order that INFL precedes, or reflect an earlier stage of the language in which INFL was a separate word from the verb. Alternatively, the verb may have moved to INFL in order to serve as the latter's host. In section C.2 we will see phrasing facts that bear on this question.

As in infinitive phrases, subjects of IPs precede the INFL+V complex:

- (38) Lyiopa nawonyi Ladi
 Lioba FOC-1-see Ladi
 'Lioba sees Ladi'

The CP is also head-initial. Complementizers occur at the beginning of the clauses they head:

- (39) a. Naleamba kee nawozre ikari
 FOC-1-FARFAST-say that FOC-1-have 5-car
 '(S)he said that (s)he has a car'
- b. Nalengiwea kooka ngiwozre ikari
 FOC-1-FARFAST-1:1-ask whether FOC-1:1-have 5-car
 '(S)he asked me whether I have a car'

From the examples presented above, it is clear that Kivunjo Chaga

phrase structure may be generated by an X-bar structure such as that given in (40) below:



There appears to be no need in Kivunjo to distinguish structurally between complements and modifiers. If there turns out to be such a need, then we would presumably have the three-tiered X-bar structure in (41):



C.2. P-phrase construction

C.2.1. Basic phrasing facts

Syntactic strings, before they undergo sentence-level phonological rules, must be reorganized into phonological phrases. This is necessary because in many cases what counts as a phonological phrase is not a coherent phrase or unit for syntactic purposes:

- (42) a. [_{NP}leeri [_{CP}[_{NP}Prayanyi][_{VP}aleenenga [_{NP}Ladi]]]]
[lèérì Pràyanyì]_p [ālè-énéngà Lādì]_p
money Brian gave Ladi
'money that Brian gave to Ladi'
- b. [_{NP}kitapu [_{AP}kiiu] [_{AP}king'anyi]]
[kìtápú kīiú]_p [kìng'ányí]_p
book black big
'a big black book'

It is therefore necessary to examine the phrasing of various syntactic structures in the language in order to arrive at a rule transforming syntactic phrasing into phonological phrasing.

Almost trivially, the simplest phrasing cases are single-word utterances. These always constitute one phrase. The building blocks of phonological phrases are phonological words, which as stated in C.1.2 may correspond to a single morphosyntactic word, as in (43a-b), or to more than one morphosyntactic word, as in (43c-e).

- (43) a. Lyǎ! b. Lyǎ̀òpâ! c. N-a-lê-enda~ (INFL+V)
 eat-IMPER Lioba FOC-1-FARPAST-go
 'Eat!' 'Lioba!' '(S)he went'
- d. Kô Lyǎ̀òpâ e. Nâ Y!nyí? f. N-a "mtùtǎ
 17-AM Lioba and I FOC-1 l-small
 'At Lioba's' 'And me?' '(S)he is small'
 (answer to an in- (in appropriate con- (INFL+A)
 formation question) versational context)

As a result, a p-phrase may never be smaller than a word. This is consistent with the Strict Layer Hypothesis, which proposes that each nonminimal category in the Prosodic Hierarchy is composed of a whole number of units of the immediately lower category in the hierarchy:

- (44) Strict Layer Hypothesis (Selkirk 1984, Nespor & Vogel 1986; repeated from Chapter 1, example (5))
- a. A given nonterminal unit of the prosodic hierarchy, X^P , is composed of one or more units of the immediately lower category, X^{P-1} .
- b. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

Moving on to two-word utterances, we see instantiations of the p-phrase formation algorithm introduced in Chapter 2, example (10), which I repeat here:

(45) Kivunjo Chaga P-phrase Formation

For each pair of consecutive words X and Y,

- (a) if X p-governs Y, then X and Y form part of a single p-phrase;
 (b) otherwise they are phrased separately.

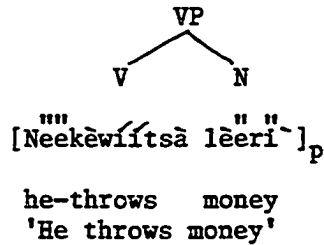
Definition of p-government

X p-governs Y if X is the head of a maximal projection that dominates Y.

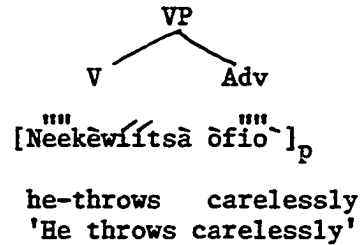
This algorithm correctly predicts that a verb will phrase with its

first object or lexical adverb, and a noun will phrase with its first adjective or PP:

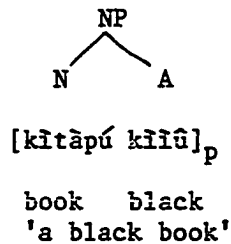
(46) a.



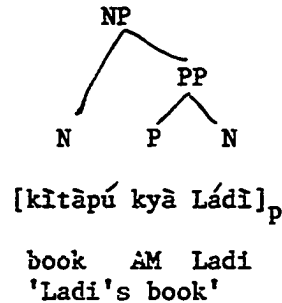
b.



c.



d.



If the verb is followed by two objects or by an object and an adverb, only the first phrases with the verb. The second complement forms a p-phrase of its own. Likewise for a noun followed by two modifiers:

(47) a. [Ná'soká kalranyĩ]_p[lèerĩ]_p b. [Neekewítsà lèerĩ]_p[òfio]_p

snatch clerk money
'He snatched the money
from the clerk'

throw money carel.
'He throws money away,
carelessly'

c. [kítàpú kĩũ]_p[kĩng'ányĩ]_p d. [kítàpú kĩũ]_p[kyà Ládĩ]_p

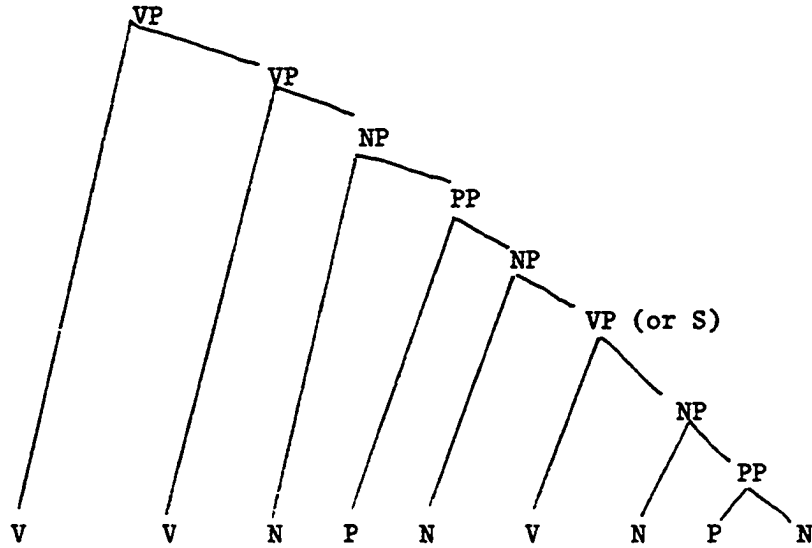
book black big
'a big black book'

book black AM Ladi
'Ladi's black book'

This vacuously applies also to PP, IP and CP, since the heads of each of these phrase types are nonlexical constituents that cliticize to their first complement.

As p-phrase adjunction is recursive, p-phrases of many words in length may be created, provided each constituent in the relevant syntactic string p-governs the next:

(48)



[Ngeciízárimā iwíitsā lèérī tsā mndū àlèkóoyā lèérī tsā kalranyĩ~]_p

I-can throw money AM pers. who-found money AM clerk
'I can throw the money of someone who found the clerk's money'

A prehead specifier will not join with its following head because p-government is asymmetrical. In Kivunjo, p-government operates only from left to right. Thus, although the subject of a sentence is contained within the IP, it fails to phrase with the following INFL-V constituent because it does not p-govern that constituent. The last constituent of the subject NP will never be able to p-govern anything outside that NP:

- (49) a. [kālrányĩ] [nāĩlrũndâ]_p b. [kālrányĩ ngĩwĩcō]_p [ĩĩlrũndâ]_p
 clerk is-working clerk bad is-working
 'A clerk is working' 'A bad clerk is working'

Likewise, in infinitive clauses with specified subjects the subject phrases separately from the infinitive verb. This is because the infinitive verb heads the clause and may not p-govern preceding material, while the right-hand boundary of the subject NP blocks the subject's last constituent from p-governing the infinitive verb.

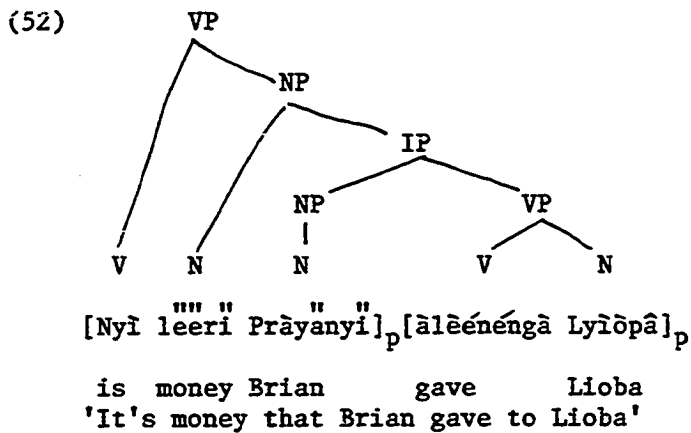
- (50) a. [māĩ]_p [ĩkāpá mǎná]_p... b. [mǎná m̃bĩcō]_p [ĩkāpá māĩ]_p...
 mother to-hit child child bad to-hit mother
 'For a mother to hit a 'For a bad child to hit a
 child...' mother...'

At the CP level, I assume that focused NPs are located in specifier position of CP. This predicts correctly that focused NPs, like subjects, will not phrase with first constituent of the rest of the sentence. Kivunjo focuses NPs by placing them in a cleft construction, such as in (51):

- (51)
-
- [Nyĩ leerĩ]_p [Prāyanyĩ]_p [ālēénéngā Lyĩòpā]_p
 is money Brian gave Lioba
 'It's money that Brian gave to Lioba'

Note the relative morphology on the verb in (51). Focus constructions

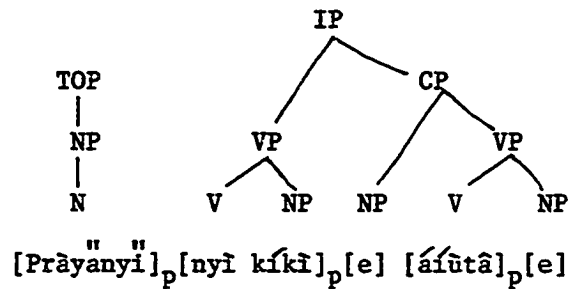
are distinguished from relative clauses only in their phrasing. While a focused noun forms a p-phrase of its own, a noun modified by a relative clause will phrase jointly with the first constituent of the relative clause. If we place the entire NP after the copula nyi, as in (52), we obtain a sentence that forms a minimal pair for phrasing with (51):



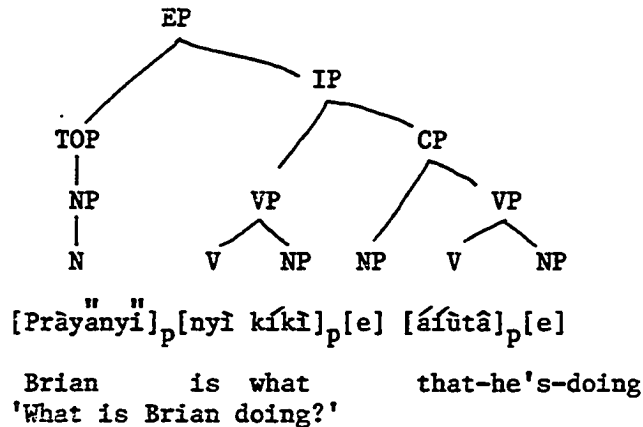
The relative clause in (51) shows also that p-government can take place across a series of left-hand syntactic phrase boundaries. This is why the definition of p-government given in (45) does not require the p-governor to immediately dominate the following word. Simple dominance is sufficient.

Akin to focus position is the topic position in the Kivunjo sentence. Like focused items, topics fail to phrase with the remainder of the utterance. Whether this is because topics are sentence-external or because they are specifiers dependent on a node even higher than CP is not clear. I give the two possible structures below:

(53) a.



b.



APs and PPs appear not to admit of prenominal specifiers, but there are two classes of prenominal items that might tentatively be analyzed as specifiers of NP. The first such class consists of prenominal quantifiers such as kila 'each' and nusu 'half'. If we assume these words are in specifier position, we correctly predict separate phrasing:

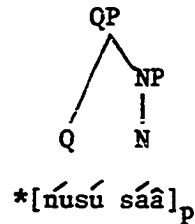
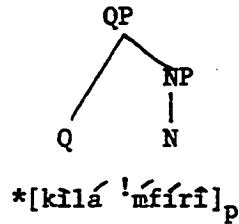
(54) a. [kīlā]_p[m'fīrī]_p
 every day
 'every day'

b. [nusu]_p[!sāâ]_p
 half hour
 'half an hour'

However, if we were to analyze the structures in (54) as quantifier phrases headed by the quantifiers, then we would expect joint phras-

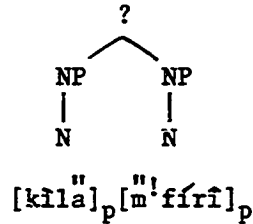
ing:

(55) a.

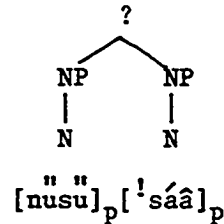


A third possible analysis of these structures would be that the quantifier and the noun are juxtaposed in an appositive relationship, as two separate, equivalent NPs:

(56) a.

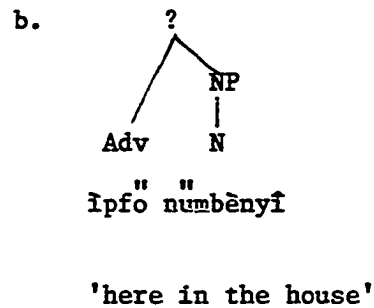
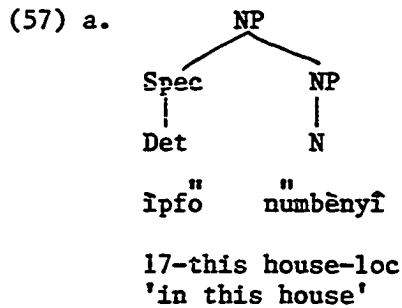


b.

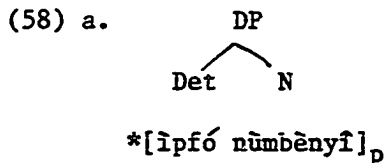


Data on constituency are needed to shed light on this question. I will return to this question in the next section, in the contexts of certain apparent exceptions to the phrasing algorithm in (45).

The other class of prenominal items eligible for analysis as NP specifiers consists of locative demonstratives. These items, as observed in C.1.1, precede the locative noun rather than following it as nonlocative demonstratives do. Like prenominal quantifiers, locative demonstratives phrase separately from the locative nouns they precede. As with quantifiers, this could be because they are in specifier position, or because they simply stand in apposition to the following noun:

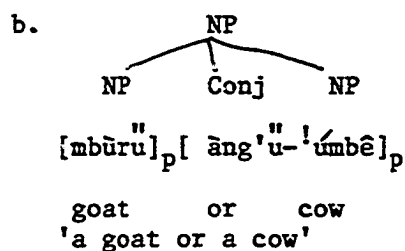
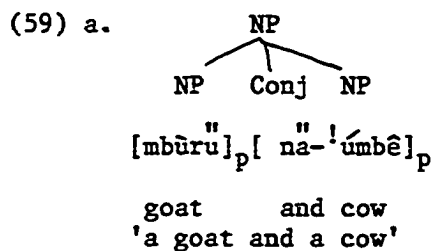


If these demonstratives were to head a determiner phrase parallel to the quantifier phrase in (55) above, we would incorrectly expect joint phrasing:



As with prenominal quantifiers, I will discuss these cases again in the larger context of postnominal demonstrative and quantifier phrasing in the next section.

We have seen that heads phrase with their first following complement or modifier, but not with their preceding specifiers. In double complement/modifier constructions, the second item phrases separately from the first. Likewise, in conjoined structures the first conjunct phrases separately from the second:



The conjunction itself cliticizes to the second noun, as noted above. Since the first noun heads only its own NP, not the entire conjoined NP, it p-governs neither the conjunction nor the second noun, and thus forms its own separate p-phrase. I have no data concerning conjoined APs or PPs, while conjoined sentences are difficult to elicit naturally without a pause between conjuncts. What might seem at first to be conjoined VPs actually turn out to be phrased as V+PP sequences:

- (60) [Na^{'''}isômâ nâ-îzrêzrâ]_p
 1-reading and to-write
 'She's reading and writing'

This is because the conjunction na may also be analyzed as a preposition meaning 'with', and the infinitive of the verb, essentially a gerundive nominalization, may be analyzed as a noun object of the preposition na.

C.2.2. Exceptional phrasings

There are several apparent exceptions to the algorithm in (45). Verbs phrase with certain nonlexical adverbs, but not with others. Imperative verbs phrase separately from anything that follows. Nouns phrase with adjectives, PPs and relative clauses, but fail to phrase with following adverbs, nouns, demonstratives and quantifiers. Finally, adjectives do not phrase with any AP constituents at all. I will attempt to account for these facts in the remainder of this section.

To begin with, while all the lexical adverbs I have encountered phrase jointly with a preceding verb, not all functional adverbs do

- (62) [Náilrúnda' ínû]_p
 1-working today
 '(S)he's working today'

Further data collection is needed to determine whether more unequivocally sentence-level modifiers such as epistemic adverbs phrase with the verb or not. If clearly sentence-level adverbs likewise phrase together with the verb, it may reflect some sort of adjunct lowering process that only affects members of lexical categories.

The next exceptional phrasing case involves imperative verbs, which fail to join with their following objects, adverbs or subjects to form p-phrases.

- (63) a. [òlonga]_p[mbürû]_p b. [Wlitsa]_p[òfiò~]_p c. [Lyà]_p[iò~]_p
 point goat throw carelessly eat you
 'Point at a goat!' 'Throw carelessly!' 'You eat!'

As I argued in McHugh (1987), this reflects movement of imperative verbs to a higher position in the sentence, either COMP or Spec of CP:

- (64)
- a.

```

graph TD
    CP --> Spec
    CP --> COMP
    CP --> IP
    Spec --> V1[V]
    COMP --> e1[e]
    IP --> NP1[NP]
    IP --> VP
    NP1 --> e2[e]
    VP --> V2[V]
    VP --> NP2[NP]
    V1 --- olonga
    e1 --- e1_label[e]
    e2 --- e2_label[e]
    NP2 --- mburu
          
```

olonga [e] [e] [e] mburu

b.

```

graph TD
    CP --> COMP
    CP --> IP
    COMP --> V1[V]
    IP --> NP1[NP]
    IP --> VP
    NP1 --> e1[e]
    VP --> V2[V]
    VP --> NP2[NP]
    V1 --- olonga
    e1 --- e1_label[e]
    V2 --- e2_label[e]
    NP2 --- mburu
          
```

olonga [e] [e] mburu

In (64a) the verb may not p-govern any following constituent because it is not the head of anything. In (64b) we must assume that even though the verb is in the CP's head position, it does not function as

head of CP because it does not belong to the Complementizer category: the CP in this case is not an endocentric phrase. I reject the latter analysis because infinitives may in fact constitute an example of non-endocentric NPs headed by verbs that may p-govern following material in the clause. Thus I assume on the basis of both phrasing and syntactic evidence that imperative verbs occupy the same position in the sentence as do focused NPs in Kivunjo.

In the structure in (64), the verb's empty subject position follows the verb. This correctly predicts that when an overt non-topicalized subject occurs with an imperative verb in Kivunjo, it follows the verb, and precedes the object:

- (65) a. Lyà ^{''}iyò~!
eat you
'You eat!'
- b. Lyà ^{''}iyò shààná shò!
eat you spinach that
'You eat that spinach!'

If this were the result of subject postposing rather than verb fronting, we would expect the subject pronoun to appear after the object, as does the focused subject pronoun in (66):

- (66) a. Ngìl^{'''}l^{'''}rùndá ìní
I'm-working I
'I'm working'
- b. Ngècì^{''}l^{''}vá sháàná ìnyí.
I'll-eat spinach I
'I'll eat spinach'

Thus the unexpected phrasing behavior of imperative verbs turns out to not to be an idiosyncratic exception to the p-phrase formation algorithm, but rather follows from the independently motivated fact that they are fronted to Spec of CP.

I now turn to oddities of phrasing found in the NP. To begin

with, a noun never phrases with a following delimiting adverb or pragmatic particle:

- (67) a. [nyĩ mburũ]_p[daã]_p b. [nyĩ mburũ]_p[sẽ]_p c. [nyĩ mburũ]_p[ng'ũ]_p
 is goat also is goat again is goat EMPH
 'It's a goat, too' 'It's a goat again' 'It's a goat!'
- d. [cĩ mburũ]_p[pfõ]_p e. [nyĩ mburũ]_p[tũpu]_p f. [mburũ]_p[lẽ]_p...
 COP goat NEG is goat only goat TOP
 'It's not a goat' 'It's only a goat' 'As for a goat...'

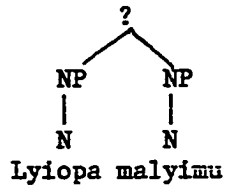
This is not too surprising, since there is little reason to assume any of the adverbs in (67) are modifiers within the NP. Thus we may account for the failure of nouns to phrase with adverbs in the same way that we accounted for verbs' failure to phrase with delimiting adverbs and emphatic particles.

If a noun is modified by another noun rather than by an adjective, the two nouns phrase separately. Numerals above six are nouns rather than adjectives, and fall into this pattern:

- (68) a. [shĩtãpũ]_p[ĩkũmĩ]_p b. [wãna]_p [ĩkũmĩ]_p c. [Lyĩõpã]_p[mãlyĩmũ]_p
 8-book ten 2-child ten Lioba teacher
 'ten books' 'ten children' 'Lioba the teacher'

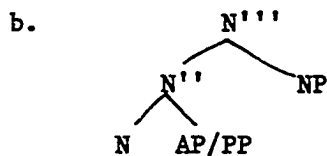
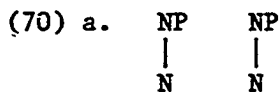
Note that the modifiers in (68) are invariant: They do not inflect for noun class agreement with the nouns they modify. In (68c) this is clearly an appositive construction, which could be viewed as the juxtaposition of two NPs. This would derive the desired separate phrasing:

(69)



In (68a-b), however, the numeral appears not to be semantically appositive. But for their morphological invariance, numerals above six should be expected to behave syntactically just like numerals six and below. Since the latter phrase with the nouns they modify, it is puzzling that the former do not. However, radical differences in syntactic behavior among numerals are not an unprecedented phenomenon. In Polish the numeral 'one' exhibits a standard adjectival agreement pattern, numerals five and above exhibit a limited pattern of case agreement typical of quantifiers, subcategorizing for Genitive Case, while the numerals from two through four show a mixed pattern depending on the noun's gender. Similar facts obtain for other Slavic languages. Thus it may be that despite their semantic parallelism to lower numerals, numerals above six in Kivunjo stand in an appositive relationship with the nouns they modify.

It then remains only to discuss whether appositive structures involve simple juxtaposition without any unifying overarching node, as in (70a), or attachment at a higher X-bar level than for normal complements and modifiers, as in (70b):



Tests for constituency must be devised to decide among these and other possible analyses.

Regarding demonstratives and the postnominal quantifier -ose 'all', I propose that these items, although they show morphological agreement with the preceding noun, in fact stand in the same sort of appositive relationship with the noun as do higher numerals.

- (71) a. [wana]_p[wa]_p b. [wana]_p[walya]_p c. [wana]_p[woose]_p
 2-kid' 2-this 2-kid' 2-yon 2-kid' 2-all
 'these children' 'those children' 'all children'

Just as in English the quantifier 'all' may either precede the noun as head of a QP or follow the noun in apposition, I propose that in Kivunjo certain quantifiers (kila, nusu) precede nouns as QP heads, while others (-ose) follow them in apposition. The same sort of analysis can be extended to demonstrative determiners, since in many languages there appears to be motivation for a determiner phrase whose structure is parallel to that of the quantifier phrase. In Kivunjo demonstratives and -ose may stand alone, or head a NP:

- (72) a. ikyo ulewona b. lyica kuta ghoose
 7-that which-you-saw 5-good than 6-all
 'that which you saw' 'best (of all)'

Thus it is not implausible that they function as appositive nouns rather than as adjectives.

While we have seen certain exceptions to the generalization that verbs and nouns always phrase with their following objects and modifiers, there remains a core of examples that fit the

generalization. Furthermore, the exceptions turn out not to counterexemplify the p-phrase construction algorithm in (45), but rather indicate the need for a syntactic analysis in which the modifier or object does not form part of the same maximal projection as the head. Thus I have argued that certain adverbs modify the IP rather than the VP, while imperative verbs are moved out of VP into Spec of CP. Adverbs that delimit nouns are presumed to be outside of NP, as are appositive modifiers. Demonstratives and the universal quantifier may be analyzed as nominal appositives. In all cases except imperative verbs, further data is needed to confirm the claims I have made regarding constituency.

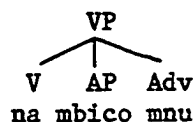
When we look at adjectives, however, we find that there is no core of examples that conform to the predictions of the p-phrase construction algorithm. Adjectives simply never phrase with what follows. Even items which, on the basis of syntactic ordering alone, would seem to exemplify conformity to X-bar structure within the AP fail to phrase with the adjective. These items may be nonlexical adverbs, lexical (adjectival) adverbs or PPs that specify degree as in (73a-b), or they may be nominal modifiers that limit the extension of the adjective, as in (73c-d):

- | | |
|--|--|
| <p>(73) a. [nā mbīcō]_p[mnū]_p
 1-is bad very
 '(S)he is very bad'</p> | <p>b. [nā mlēshī]_p[kútā Lyíôpā]_p
 1-is tall than Lioba
 '(S)he is taller than Lioba'</p> |
| <p>c. [nā mpfù]_p[mēsò]_p
 1-is dead eyes
 '(S)he is blind'</p> | <p>d. [nā mlēshī]_p[mázrëndé]_p
 1-is long legs
 '(S)he is long-legged'</p> |

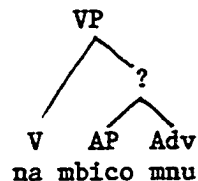
Since my data contain no examples of adjectives taking true

subcategorized complements such as those found in English ('angry at NP'), I propose that in Kivunjo the AP is a defective category that may not contain any material other than its head. Without a specifier position, the AP cannot accommodate the adverbials of degree in (73a-b) other than through apposition or a structure analogous to that of an NP modified by a delimiting adverb such as tupu 'only'.

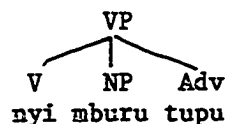
(74) a.



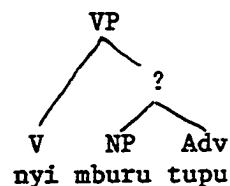
b.



c.



d.



Similarly, the nouns in (73c-d) might be unable to serve as modifiers within the AP for the same reason that nouns may not serve as modifiers within the NP: they do not agree with the head they modify. Thus we may assume an appositive structure for them even though the semantic relation between the two elements is not equational.

If we adopt the QP analysis of the prenominal quantifiers kila and nusu, the correlation of phrasing with agreement morphology may be of help in explaining the lack of joint phrasing there as well, since the noun does not take the associative marker so as to be able to agree with the quantifier.

My proposal for accounting for these facts without abandoning altogether the valuable generalizations made possible by X-bar theory is that maximal projections of all categories have the potential to contain specifiers, complements and modifiers, but that category-specific differences in licensing properties restrict the range of possibilities actually available to each category. Apposition is a structure of last resort available for items that have no place within a given maximal projection.

To begin with, I propose that only CP, IP and VP may license material in the Spec position. For CP, this is possible because the copula nyi assigns case to the NP in focus position, while relative and agreement morphology on the verb indexes the focused NP with the rest of the sentence. In IP, INFL presumably assigns Nominative Case to the subject, while also indexing the subject through agreement. Infinitive phrases, which have the internal structure of a VP, also permit subjects despite the lack of agreement morphology. The remaining categories -- NP, AP and PP -- may not assign Nominative Case, and so may not license material in their specifier positions. Thus as a default strategy, NP and AP specifiers are simply apposed to the head. This includes demonstratives, the quantifier -ose and adverbs of degree.

Regarding objects or complements, CP, IP, VP and PP may license material through Case assignment. Neither NP nor AP may take bare objects, however. This is self-explanatory. Finally, I propose that only CP, IP, VP, and NP license modifiers within the maximal projection, while PP and AP may not. What it is that licenses lexical and

nonlexical adverbs in CP, IP, and VP is not clear, but the fact that they are allowed is certainly uncontroversial.

My proposal with regard to NP, however, is that modifiers of NP are licensed only through agreement. Thus adjectives and associative phrases, which must agree with their head, are licensed. Relative clauses, although they do not necessarily show agreement with a head coindexed with an indefinite, [-human] object position, show special relative morphology that may qualify as agreement for licensing purposes. On the other hand, nouns used to modify other nouns take no agreement or relative morphology, and therefore may not occur within the NP. Similarly, in the AP noun modifiers are unlicensed because they do not agree with the adjective. In fact, nothing agrees with the adjective.

I have thus outlined an analysis of Case and Agreement assignment which may well account for the various exceptions to the phrasing generalizations embodied in the p-phrase construction algorithm in (45) without modifying that algorithm. Constituency and movement data still need to be amassed in order to confirm and flesh out this tentative analysis.

C.3. The syntactic distribution of strong juncture

In 3.3 I introduced the phonological paradigm of strong juncture, analyzing its source as a floating accent contained in a separate p-phrase from preceding material. While this might at first seem an implausible phrasing, it is in fact consistent with the behavior of other pragmatic particles such as the emphatic particle ng'u and the topic marker le, each of which phrases separately from the item it follows:

- (75) a. [Nāilrũnda]_p[ng'ũ]_p b. [Ohānyi]_p[lẽ]_p...
- l-working EMPH John TOP
- '(S)he's working!' 'As for John,...

As I claimed in C.1.2, these items, even though they are function words, fail to cliticize to the preceding word because in Kivunjo phrasal cliticization only proceeds rightward. Furthermore, they fail to phrase with the preceding word because they are not contained within that word's maximal projection.

Thus the strong-juncture accent patterns exactly like a pragmatic particle except that it lacks any representation on the segmental tier. As a result, however, identifying the syntactic and pragmatic factors that govern its distribution is, as with ng'u and le, a difficult task. The ensuing discussion is therefore not meant to be a complete treatment of the distribution of strong juncture, but rather aims to identify certain syntactic regularities that emerge from the examples of strong juncture I have so far collected.

The most reliable correlate of strong juncture appears to be the

penultimate-accented kiki 'what' fails to raise in (79a):

- (79) a. [Nyĩ kíkĩ]_p[áíútâ]_p b. [Nyĩ kilyĩ]_p[ðéndǎ]_p
 is what 1-rel-doing is why 2-rel-went
 'What is (s)he doing?' 'Why did you come?'

Another context in which strong juncture reliably appears consists of p-phrases that end in an accented verb. I have been unable to find a p-juncture at which an accented verb undergoes the weak juncture paradigm. Thus, for example, a H-final penultimate-accented verb will raise p-finally before a sentence-level adverb, as well as before a non-subordinate clause in the same utterance:

- (80) a. [Ná'lrúndǎ]_p[ng'ǔ]_p c. [Ná'lrúndǎ]_p[kaendǎ kǎnyĩ]_p
 1-worked EMPH 1-worked and-go home
 'He worked' 'He worked and went home'

Vocative tags are regularly preceded by strong juncture:

- (81) a. [Ná lyá málrũwũ]_p[ndá'wó]_p b. [Nǎlrũ'ndě]_p[Ohǎnyĩ]_p
 he-ate bananas (peer address) may-he-work John
 'He ate bananas, ndawo (term 'He should work, John'
 of address to one's peer)'

Two junctures that appear to be consistently weak are that between a subject and its predicate and that between a verb's two objects:

- (82) a. [Lǎdĩ]_p[ǎírzèzrà]_p[pfǒ]_p b. [Ngá'sóká Fúlòrè]_p[málrũwũ]_p
 Ladi 1-speaking NEG I-snatched Fulore bananas
 'Ladi is not speaking' 'I snatched the bananas from F.'

It should be clear from the examples so far seen that strong juncture, although variable in distribution, is not a marker of an intonational phrase boundary. If it were, we would expect strong juncture at the ends of constituents that are typically followed by intonational phrase breaks in other languages, such as parentheticals and the first part of disjunctive questions. Yet in Kivunjo these items are almost obligatorily followed by pause, which triggers u-final phenomena:

(83) [[Nyi máru^Vá]_p]_u[[á^V nyí mírĩngâ]_p]_u

is milk or is water
'Is it milk or water?'

Also, if strong juncture marked intonational phrase boundaries, we would expect it to appear at the end of every utterance. Yet as we saw in (77-78) above, it only occurs at the end of an utterance whose final p-phrase begins with nyi. Thus it appears that there is little distinction phonologically between the prosodic categories i(tonational)-phrase and u(tterance), and that strong juncture is not an intonational phrase marker.

Rather than delimiting any particular prosodic category, it seems that strong juncture serves to mark certain phrases in the utterance with greater prominence than what follows. In the case of in situ focus and vocative tags in English, this function is performed by assignment of primary sentence stress to a non-utterance final constituent, as well as higher pitch prominence regardless of position in the utterance.

Since strong juncture is an accentual morpheme found at the end of focused constituents and before vocative tags, and serves to ensure that the phrase preceding the juncture receive tonal prominence regardless of its final tone-accent pattern, I propose that it be regarded in the same way as contrastive stress is in English. Although cases of contrastive focus and vocative tags fairly consistently receive contrastive stress, in many other contexts contrastive stress may be found to give prominence to items for reasons that are not nearly so clear (cf. Selkirk 1984). Thus both the variability in distribution of strong juncture and its fairly regular appearance in focus and tag contexts are consistent with an analysis of strong juncture as the Kivunjo Chaga equivalent of English contrastive stress.