Tonal Interaction in Kinande: Cyclicity, Opacity, and Morphosyntactic Structure

by

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ABSTRACT

This dissertation develops a constraint-based analysis of opaque tonal interactions in Kinande verb forms and, based on this analysis, argues for a phonological architecture that incorporates both *cyclic evaluation* and *constraint reranking*. Evidence for cyclic evaluation comes from a close correspondence between process ordering and phonological domain structure: in order for one process to follow another, and thereby render it opaque, it must apply within a larger domain. Evidence for constraint reranking is found in the fact that some processes that interact serially through cyclic evaluation are governed by incompatible constraint hierarchies.

The dissertation also presents a new analysis of *bounded leftward tone shift* as the expansion of an underlying/intermediate falling tone. This analysis connects the seemingly unmotivated shift of H tones in phrase-internal position to the transparently motivated shift of H tones in utterance-final position, where H tones move left in order to avoid tonal crowding. Empirical evidence for this analysis is found in the language's unusual distribution of active L tones: these systematically follow shifted H tones, just as would be expected if their presence were the cause of leftward movement.

Finally, the dissertation argues for a new morphological analysis of finite verb forms in Kinande, based upon a close examination of their tone patterns. According to this analysis, many verbal elements that have been previously identified as inflectional prefixes are analyzed either as components of phonologically reduced verb phrases or as auxiliary verb stems. Crucially, the latter are inflected just like main stems, showing that Kinande allows multiple inflected stems to co-exist within a single verb.

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Title: Associate Professor of Linguistics

For Emily and Persephone,

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Symbols, abbreviations, glosses and transcription conventions

Tone conventions			
<u>H</u>	lexical high tone	V́	high-toned vowel
H	grammatical high tone	V̀	low-toned vowel
L	grammatical low tone	V̂	falling-toned vowel
H_{φ}	φ-level H boundary tone	V̋	vowel bearing both H_{φ} and H_{ι} (ch. 3)
L_{ι}	ι-level L boundary tone		***or*** vowel bearing just H_{φ} (ch. 5)
H_{ι}	ι-level H boundary tone	V̏	vowel bearing L_{ι} (ch. 5)
		V̌	rising-toned vowel (ungrammatical forms only)

Symbols		*Other Abbreviations*	
Ø	absence of tone	EXT	extension suffix
α	traditional stem	FV	final vowel
β	reduplicated stem	LP	lexical phonology
γ	tonèd stem	LP-PLPW	LP–PLP Watershed
δ	domain	MR	Meeussen's Rule
ι	intonational phrase	Pen	penultimate vowel of stem
ι_D	declarative intonational phrase	PLP	postlexical phonology
ι_I	interrogative intonational phrase	V0	1st vowel before verb stem
ν	tonal root node / melodic unit	V1	1st vowel of verb stem
τ	tone	V2	2nd vowel of verb stem
φ	phonological phrase	VU	Verbal Unit

Nouns: (AUG)-NC-√

AUG = augment vowel

NC = noun class prefix

- a following number 1-20 indicates the class to which the noun belongs

DEM = demonstrative root

Adjectives: NC-√

NC = nominal concord

- a following number 1-20 indicates the class of the noun with which the adjective agrees

Verbs: ⟨(FOC/NEG)-SM-TAM-(AFF)-{(OM)-[STEM]}⟩

[...]	Stem boundaries
{...}	Macrostem boundaries
⟨...⟩	Verbal unit boundaries

Pre-stem: agreement	SM	subject marker
	OM	object marker
	1-20	noun class agreeemnt
	1S/2S/3S	personal agreement (animate subjects)
	1P/2P/3P	
Pre-stem: tense, aspect and mood	TAM	tense/aspect/mood (cover term)
	PRES	present
	PAST	past
	IMPV	imperfective
	STAT	stative
	INC	inceptive
	POT	potential
Pre-stem: focus and polarity	FOC	focus
	NEG	negation
	AFF/AFFIRM	affirmative marker
Stem	√	root
	APP	applicative
	CAU	causative
	REC	reciprocal
	PASS	passive
	INT	intensive
	DES	entire final desinence (*-a*, *-a-a*, *-a-e*, *-ịr-e*)
	DES1/DES2	$1^{st}/2^{nd}$ morpheme of bimorphemic DES

Segmental Transcription (Non-IPA values only)

b = [β]	[ị], [ụ]	=	[+ATR] high vowels
g = [ɣ]	[i], [u]	=	[-ATR] high vowels
y = [j]	[e], [o]	=	[-ATR] mid vowels
	[a]	=	[-ATR] low vowel

Note that I systematically ignore the effects of ATR harmony (cf. Valinande 1984, Mutaka 1995, Archangeli and Pulleyblank 2002, Gick et al. 2006, Kenstowicz 2009, Jones 2012).

1 Introduction

This dissertation develops a unified, constraint-based analysis of tonal interaction in Kinande, and explores its implications for (a) phonological architecture and the morphology-phonology interface, (b) the nature of tonal representations and constraints, and (c) the morphological analysis of the Kinande verb. In this chapter, I discuss some of the main theoretical and empirical considerations that guide this analysis, and preview its main results. I also provide some background information about the data presented in this dissertation, and a brief outline of the chapters to follow.

1 Phonological architecture and the morphology-phonology interface

Based on an analysis of the intricate and frequently opaque tonal interactions that take place within Kinande verb forms, I will argue in this dissertation for a phonological architecture in which surface forms are derived over the course of multiple derivational stages, as increasingly large morphological and prosodic constituents are evaluated according to potentially distinct Optimality Theoretic grammars (i.e. constraint rankings). Thus, this study broadly supports the theoretical program of understanding phonological opacity and phonological domain structure as consequences of cyclic, constraint-based evaluation (Wolf 2008). In addition, in embracing a limited degree of constraint reranking, it more specifically supports the idea that the basic architecture of phonology is *stratal* (Kiparsky 1998, 2000; Bermúdez-Otero 1999, 2003, 2011; Bermúdez-Otero & McMahon 2006; and many others).

The primary motivation for a stratal account of Kinande tone comes from three related observations. First, many interactions between tone-related phonological processes in Kinande are *opaque* in a way that suggests that they must be serially ordered. Second, in all of these cases, the process that applies *later* also applies within a *larger* morphological or phonological domain. Third, in many cases, the interacting processes require different constraint rankings. These three observations collectively suggest a model of phonology in which both cyclic evaluation (1a,b) and constraint reranking (1c) play crucial roles.

(1) Key components of stratal OT analysis

Cyclic evaluation

a. Smaller domains are evaluated before larger ones.
b. Any phonological process that is restricted to a morphological or phonological domain δ must apply as soon as δ is first evaluated.

Constraint reranking

c. Different domains may be evaluated by different grammars (i.e. constraint rankings).

An important component of the cyclic evaluation proposed here is the requirement, stated in (1b), that phonological processes which are restricted within some domain δ apply as soon as that domain is first submitted for phonological evaluation. This condition, which I assume to be enforced by *Bracket Erasure* (Chomsky and Halle, 1968), prohibits phonological processes from applying within domains any smaller than the full phonological input at the time that the process applies, and therefore demands an exact correspondence between the domain of a process and the order in which it applies. The fact that this correspondence is in fact observed within the verbal phonology of Kinande – a phonology that, as we will see, has an abundance of both ordering-based opaque interactions and domain-limited phonological processes – constitutes powerful evidence that the phonological evaluation of complex morphological and phonological structures proceeds cyclically.

In some cases, cyclic evaluation alone is able to derive an opaque interaction that cannot be easily accounted for in fully parallel, monostratal OT (Prince and Smolensky, 1993/2004). In other cases, however, we will see that cyclic evaluation is not in and of itself sufficient to derive opaque interactions, and constraint reranking will be necessary as well. However, this reranking does *not* occur at arbitrary points in the derivation, but is keyed to the evaluation of prominent morphological and prosodic constituents. This is just the sort of reranking that we expect from a stratal architecture.

The specific stratal grammar that I propose for Kinande is summarized in (2) below. This grammar has six distinct levels corresponding to six distinct constraint rankings. The first three levels, situated within the *lexical phonology* (LP), evaluate increasingly large *morphological* constituents, namely the *Stem*, the *Macrostem*, and the *Verbal Unit*. These morphological constituents are evaluated cyclically, with each morpheme triggering a new phonological evaluation. The last two levels, within the *postlexical phonology* (PLP), evaluate increasingly large *prosodic* constituents, namely the *Phonological Phrase (φ)* and the *Intonational Phrase (ι)*. In between, a transitional level between the LP and the PLP, which I will refer to as the LP-PLP Watershed (LP-PLPW), modifies the output of the LP so that it can be correctly evaluated by the PLP.

(2) Proposed stratal grammar of Kinande

Lexical Phonology (LP)

Stem Level
Lexical tone association
Grammatical tone assignment

↓

Macrostem Level
Leftward tone spread

↓

Verbal Unit Level
Lexical tone suppression

↓

LP-PLP Watershed

LP-PLP Watershed
Fall conversion (H → HL)
Establishment of Prosodic Domains

↓

Postlexical Phonology (PLP)

Phonological Phrase (φ) Level
Fall expansion ($VC_0\hat{V} \rightarrow \acute{V}C_0\grave{V}$)
φ-level boundary tone assignment

↓

Intonational Phrase (ι) Level
ι-level boundary tone assignment
Vowel contraction

In the remainder of this section, I preview some of the phenomena that motivate the distinct levels of this grammar. I first provide some initial justification for a distinction between the LP and the PLP in 1.1, and then turn to phenomena which motivate the more fine grained divisions to LP-internal and PLP-internal strata. In 1.2, I discuss phenomena that motivate the separation of the LP into Stem and Macrostem strata, and in 1.3 I discuss phenomena that motivate the division of the PLP into separate Phonological Phrase and

Intonational Phrase strata. In 1.4, I discuss some of the considerations which motivate the existence of the LP-PLPW, before providing a local summary in 1.5.

1.1 Opaque interactions between the lexical phonology and the postlexical phonology

A good first illustration of the basic point that processes that apply later also apply within larger domains is provided by the interaction between tone shift and reduplication in Kinande nouns. The effects of tone shift are illustrated in (3). Here, we see that lexical H̲ tones that are underlyingly linked to vowels within noun stems always shift one vowel to the left (Hyman and Valinande 1985; Mutaka 1994). (Vowels bearing lexical H̲ tones are underlined.)

(3) Leftward H tone shift in nouns

a.	/o-ku-gulu/	→	[o-ku-gulu]	'a leg'	(AUG-NC.15-LEG)
b.	/o-mu-gongó̲/	→	[o-mu-gó̲ngo]	'a back'	(AUG-NC.3-BACK)
c.	/o-mu-lú̲me/	→	[o-mú̲-lume]	'a man'	(AUG-NC.1-MAN)
d.	/a-ka-hú̲ká̲/	→	[a-ká̲-hú̲ka]	'an insect'	(AUG-NC.12-INSECT)

The effects of nominal reduplication are illustrated in (4). Here, we see that a noun stem's tones are copied by reduplication together with its segmental material (Mutaka and Hyman 1990). In addition, we see that tones in reduplicated nouns, like those in non-reduplicated nouns, shift to the left.

(4) H tones copied in nominal reduplication

a.	/o-ku-gulu.RED/	→	[o-ku-gulu.gulu]	'a real leg'	(AUG-NC.15-LEG.RED)
b.	/o-mu-gongó̲.RED/	→	[o-mu-gó̲ngo.gó̲ngo]	'a real back'	(AUG-NC.3-BACK.RED)
c.	/o-mu-lú̲me.RED/	→	[o-mú̲-lumé̲.lume]	'a real man'	(AUG-NC.1-MAN.RED)
d.	/a-ka-hú̲ká̲.RED/	→	[a-ká̲-hú̲ká̲.hú̲ka]	'a real insect'	(AUG-NC.12-INSECT.RED)

The crucial data for present purposes are the forms in (4c) and (4d). In these forms, where leftward tone shift causes a stem-initial tone to appear on the preceding vowel, the joint effects of tonal copying and leftward shift cause the Base and the Reduplicant to show distinct tone patterns, i.e. *lumé~lume* and *húká~húka*. That being the case, it is not at all clear how tonal copying could arise through surface-based B-R correspondence constraints (McCarthy & Prince 1995, 1999) within a fully parallel, monostratal OT grammar (Prince and Smolensky, 1993/2004); in this framework, if copying does not cause the reduplicant to be similar to the Base in surface forms, it should not happen.

On the other hand, a perfectly straightforward account of tonal reduplication is possible if reduplication and leftward shift take place in separate evaluations. In that case, as shown in (5), we can understand reduplication as involving *perfect base copying* which is simply opacified by the subsequent application of tone shift.

(5) Stratal interaction of reduplication and leftward shift

	Underlying		*Word Level Reduplication*		*Phrasal Leftward Shift*
a.	o-ku-gulu	→	o-ku-gulu.gulu	→	o-ku-gulu.gulu
b.	o-mu-gongó	→	o-mu-gongó.gongó	→	o-mu-góngo.góngo
c.	o-mu-lúme	→	o-mu-lúme.lúme	→	o-mú-lumé.lume
d.	a-ka-húká	→	a-ka-húká.húká	→	a-ká-húká-húka

Crucially, under the assumptions given in (1a) and (1b), this is just the ordering that we would expect to obtain between these processes based on their domains of application: while reduplication is obviously a word-internal process, we see in (6) that tone shift applies freely from one word to another. (In chapter 3, section 3, we will see evidence that tone shift is bounded within the phonological phrase.)

(6)	e-ri-[hum-a]	ɲ-kókò	→	e-ri-[hum-á] ŋ-gokò
	AUG-NC.5A-[HIT-FV]	NC.9-CHICKEN		'to hit a *chicken* (and not, e.g., a goat)'

In the interaction between reduplication and tone shift, then, we see that a process applying within the *lexical phonology* (LP) is opacified by a process applying within the *postlexical* phonology (PLP). This is our first example in which the ordering of two processes may be predicted by the domains within which they apply. However, this interaction also provides our first evidence that a successful account of Kinande tone will require a *stratal* grammar, which countenances at least some reranking between evaluations, rather than a merely *cyclic* one in which a single ranking is iteratively applied to increasingly large morphological and/or constituents. This is the case because in order for perfect copying to take place at an intermediate level of representation, the constraints which drive tone shift (on which see section 2 below) must be active in the PLP but *not* in the LP.

As we will see throughout the dissertation, it is not just reduplicated tone that is opacified by the postlexical operation of leftward shift, but essentially *all* of the tone-related phonological generalizations established within the lexical phonology. This includes a generalization that lexical H̲ tones belonging to verb roots are restricted to root-initial vowels (due to tone shift, they surface on the first vowel *before* the root), a generalization that leftward spreading is restricted to the Macrostem (due to tone shift, spreading sometimes appears to cross a Macrostem boundary) and a generalization that grammatical **H** tones which are assigned to finite verbs are assigned to either the second vowel of the stem (V2) or the final vowel of the stem (FV), just as in other closely related Bantu languages (due to tone shift, they surface on the first vowel of the stem or the penult). A stratal distinction between the LP and the PLP, then, is absolutely crucial to the analysis of Kinande tone.

1.2 Opacity within the lexical phonology

Evidence for a stratal division within the LP comes from a tone pattern present in many finite verbs in which grammatical **H** tones appear to be assigned *either* at the left edge of the verb stem *or* at the right edge of the stem, depending on the underlying tone of the verb's root. In particular, toneless verb stems (i.e. stems with toneless roots) appear to be assigned a **H** tone on the stem's second vowel (V2), while H-toned stems (i.e. stems with H-toned roots) appear to be assigned a **H** tone on the final vowel (FV). In chapter 4, I will argue that grammatical **H** tones are actually assigned to *both* V2 *and* FV, but that their realization is affected by an OCP constraint that forbids adjacent **H** tones on the tonal tier. The effect of this constraint is that a grammatical **H** tone always lowers if it is immediately preceded on the tonal tier by another H tone. Thus, when a *toneless* stem is assigned two **H** tones, the **H** assigned to V2 emerges faithfully, while the **H** assigned to FV lowers due to the OCP (7a-c). When a *H-toned* stem is assigned two grammatical **H** tones, the **H** assigned to V2 lowers to **L** in response to the H̲ tone of the root, while the **H** assigned to FV emerges faithfully (7d-f).

(7) OCP-based lowering of grammatical **H** tones (all outputs represent intermediate forms)

	toneless stems			
a.	humana + **H H**	→	hum**á**n**à**	'hit each other'
b.	humirana + **H H**	→	hum**í**ran**à**	'hit for each other'
c.	humanirira + **H H**	→	hum**á**niri**rà**	'hit each other on purpose'
	H-toned stems			
d.	tú̲mana + **H H**	→	tú̲m**à**n**á**	'send each other'
e.	tú̲mirana + **H H**	→	túm**ì**ran**á**	'send for each other'
f.	tú̲manirira + **H H**	→	tú̲m**à**nirir**á**	'send each other on purpose'

What is of most interest for present purposes is the interaction between OCP-based lowering and a subsequent process of leftward H tone spread. By this process, all grammatical

H tones that survive OCP-based lowering spread leftward onto the preceding vowel, resulting in the outputs in (8).

(8) Leftward tone spread renders OCP-based lowering opaque

	toneless stems			
a.	hum**á**n**à**	→	h**ú**m**á**n**à**	'hit each other'
b.	humíran**à**	→	h**ú**míran**à**	'hit for each other'
c.	hum**á**niri**rà**	→	h**ú**m**á**nirir**à**	'hit each other on purpose'
	H-toned stems			
d.	túm**à**n**á**	→	túm**á**n**á**	'send each other'
e.	túm**ì**ran**á**	→	túm**ì**r**á**n**á**	'send for each other'
f.	túm**à**nirir**á**	→	túm**à**nir**í**r**á**	'send each other on purpose'

The crucial form of interest here is that in (8d). Here, the grammatical **H** tone initially assigned to FV spreads leftward and overwrites the grammatical **L** tone on V2. As a result, the grammatical **H** tone, now doubly-linked to V2 and FV, stands directly adjacent to the lexical H tone on V1, in violation of the OCP. Thus, the phonological generalization that **H** tones cannot be adjacent on the tonal tier, which governs the lowering of grammatical **H** tones in the course of tone assignment, is rendered opaque by the subsequent application of leftward tone spread.

Just as with the interaction between reduplication and leftward tone shift, we find that the ordering between lowering and tone spread is just what we would predict from their domains of application, assuming that the processes apply as soon as their domains are evaluated. The domain of grammatical **H** tone assignment is the stem, since it crucially refers to positions defined in terms of the stem's left and right edges. Tone spread, however, applies within the larger domain of the *Macrostem* – i.e. the stem together with any preceding object marker (OM). This is shown by the forms in (9), where we see that a lexical H tone on a stem's first vowel spreads onto a preceding OM.

(9) Leftward spread is a Macrostem-level process

	toneless stems			
a.	mu-humír**à**	→	mu-h**ú**mír**à**	'hit for him'
b.	mu-humírir**à**	→	mu-h**ú**mírir**à**	'hit him on purpose'
	H-toned stems			
c.	mu-tú̲mìr**á**	→	mú̲-tú̲m**á**n**á**	'send for him'
d.	mu-tú̲mìran**á**	→	mú̲-tú̲mìr**í**r**á**	'send him on purpose'

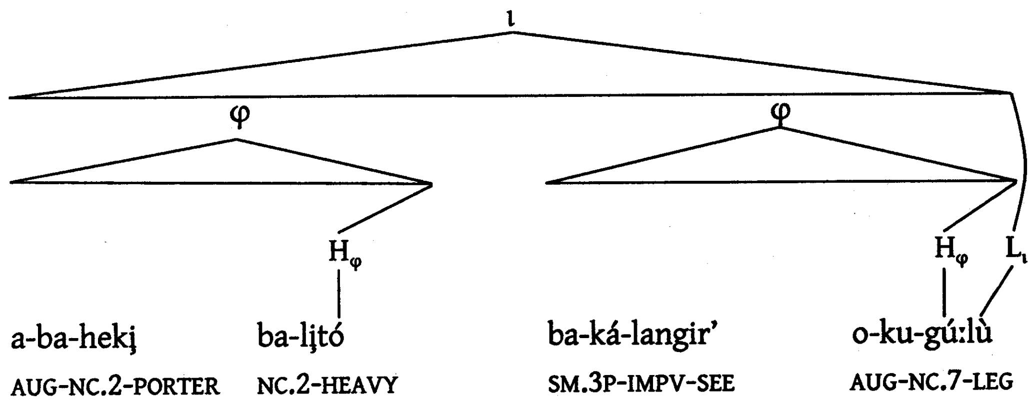
Thus, we find that within the Lexical Phonology, a process that applies within the larger domain of the Macrostem is able to opacify a process that applies within the smaller domain of the Stem. This is just what we expect given the assumptions of cyclic evaluation laid out in (1a) and (1b). In addition, as we will see in chapter 4, section 4.2, the interaction between tone assignment and tone spreading crucially requires that the two processes be subject to distinct constraint rankings. This motivates a division of the lexical phonology into distinct Stem and Macrostem strata.

1.3 Opacity within the postlexical phonology

Two examples of opaque interactions that are wholly internal to the PLP include (a) the interaction between the *blocking* of one intonational tone and the *assignment* of another, and (b) the interaction between intonational tone assignment and vowel contraction. Once more, in these opaque interactions, we find that the serial ordering of interacting processes may be predicted from their domains of application.

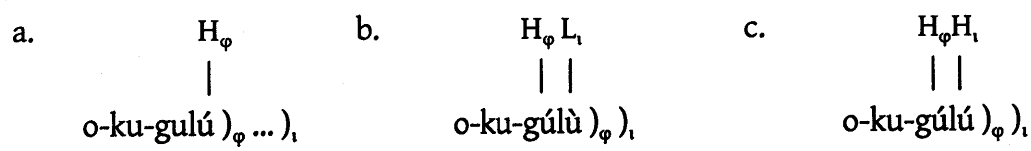
In Kinande, words that lie at the ends of phonological phrases (φ) or intonational phrases (ι) are assigned intonational boundary tones. Thus, if an underlyingly toneless word stands at the end of a phonological phrase, it will show a final H_φ boundary tone on its final vowel. If it stands at the end of an ι as well, it receives an additional L_ι or H_ι boundary tone, depending on whether it stands at the end of a declarative ι (ι_D) or interrogative ι (ι_I). If both boundary tones are assigned, L_ι/H_ι occurs on the final vowel, while H_φ is pushed back onto the penult. This is illustrated in (10) and (11) below.

(10) Assignment of boundary tones to the ends of φ and ι



'The heavy porters see the leg.'

(11) Phrasal variants of noun with toneless final vowel: *o-ku-gulu* 'leg'



In chapter 3, I will argue that the assignment of boundary tones necessarily takes place in two stages, with H_φ assigned before L_ι, and that this ordering results from the cyclic evaluation of prosodic constituents: φ is evaluated before ι, so that φ-level boundary tones are assigned before ι-level boundary tones. This argument is based upon the interaction of H_φ with word-final L tones. As shown in (12), a word-final L tone always *blocks* the assignment of H_φ. Thus, unlike toneless *o-ku-gulu* 'leg,' L-final *e-ki-hekà* 'truck' does not show a final H_φ tone in φ-final, ι-nonfinal position (12a), and it does not show a penultimate H_φ tone in ι_D-final position (12b) or ι_I-final position (12c). In the latter contexts, however, it does show a final *ι-level* boundary tone (i.e. either L_ι or H_ι).

(12) Phrasal variants of a noun with a final L tone: *e-ki-hekà* 'truck'

a.	b.	c.
L | e-ki-hekà)$_{\varphi}$ ...)$_{\iota}$	L_{ι} | e-ki-hekà)$_{\varphi}$)$_{\iota\text{-D}}$	H_{ι} | e-ki-heká)$_{\varphi}$)$_{\iota\text{-I}}$

It is this last fact that causes difficulties for an analysis of intonational tone assignment within monostratal parallel OT. In φ-final, ι-nonfinal position, the reason that H_{φ} fails to appear is surface-transparent: it is blocked by a L tone that occurs on the final vowel. Therefore, if we assume that intonational boundary tones follow all lexical tones in the input, we can capture the blocking of H_{φ} by L by ranking MAX-H_{φ} below MAX-L and below LINEARITY(τ,τ), a constraint penalizing tonal metathesis.

(13) φ-final *e-ki-hekà*: H_{φ} is transparently blocked by final L

	L H_{φ} | e-ki-hekà)$_{\varphi}$	MAX-L	LINEARITY(τ,τ)	MAX-H_{φ}
a.	☞ L | e-ki-hekà)$_{\varphi}$			*
b.	H_{φ} | e-ki-heká)$_{\varphi}$	*!		
c.	H_{φ} L | | e-ki-hékà)$_{\varphi}$		*!	

In ι-final contexts, however, the blocking of H_{φ} is *opaque*. Here, L does *not* occur on the surface, since it is overwritten by either L_{ι} or H_{ι}. Therefore, it is not clear why H_{φ} does not emerge on the penult of ι_{D}-final *e-ki-hekà*, just as it does with ι_{D}-final *o-ku-gulu* in (10) and (11).

(14) ι-final *e-ki-hekà*: H_φ is opaquely blocked by final L

		MAX-L_ι	LINEARITY(τ,τ)	MAX-L	MAX-H_φ
	L H_φ L_ι | e-ki-hekà $)_\varphi)_\iota$				
a.	☞ L_ι | e-ki-hekà $)_\varphi)_\iota$			*	*!
b.	L | e-ki-hekà $)_\varphi)_\iota$	*!			
c.	💣 H_φ L | | e-ki-hékà $)_\varphi)_\iota$			*	

It is possible to think of this as an instance of counterfeeding opacity, since L_ι assignment creates a context (a form without a final L tone) in which H_φ should appear, but does not. Such opacity is difficult to account for if all boundary tones are assigned at once. However, its analysis becomes straightforward if boundary tones are assigned cyclically, with H_φ assigned upon the evaluation of φ while L_ι is assigned during the subsequent evaluation of ι.

To see this, first consider how cyclic boundary tone assignment would take place in ι-final position within a toneless noun like *o-ku-gulu*. This is shown in (15) below. There, we see that H_φ is initially assigned to the *final* vowel of *o-ku-gulu* during the evaluation of φ, and subsequently shifts to the *penultimate* vowel when L_ι is assigned during the evaluation of ι.

(15) Two-step intonational tone assignment in *o-ku-gulu* 'leg'

		H_φ |		$H_\varphi L_\iota$ | |
/o-ku-gulu/	→	o-ku-gulú $)_\varphi$	→	o-ku-gúlù $)_\varphi)_{\iota\text{-D}}$

When this same process of boundary tone assignment is applied to L-final *e-ki-hekà*, it automatically derives the correct assignment of boundary tones. In the φ-level evaluation, the assignment of H_φ is blocked by the noun's final L tone, and so H_φ deletes (16a). In the subsequent ι-level evaluation, this L tone is overwritten by either L_ι or H_ι, but because H_φ has already been deleted in the previous evaluation, this does not cause H_φ to re-emerge on the penult (16b).

(16) H_φ blocking with two-step intonational tone assignment in *e-ki-hekà* 'truck'

		a.		b.
		L ($H_\varphi \rightarrow \emptyset$)		L_ι
		|		|
/e-ki-hekà/	→	e-ki-hekà $)_\varphi$	→	e-ki-hekà $)_\varphi\ )_{\iota\text{-D}}$

In (17) below, we see this same result formalized within a cyclic OT analysis, where φ is evaluated before ι. In (17a), we see that in the φ-level evaluation of ι-final *o-ku-gulu*, H_φ is blocked by L, just as in the monostratal analysis of φ-final *o-ku-gulu* in (13) above, by a ranking of MAX-L and LINEARITY(τ,τ) above MAX-H. This means that H_φ is not present in the input to the ι-level evaluation shown in (17b), so that its appearance on the penult would constitute a gratuitous violation of DEP-H. (In these tableaux, I assume that MAX-T_ι, a constraint that specifically protects ι-level boundary tones from deletion, is undominated, and do not consider candidates that violate it.)

(17) 2-step analysis of intonational tone assignment in *e-ki-hekà* 'truck'

a. φ stratum: H_φ blocked by final L tone

	L H_φ | e-ki-hekà $)_\varphi$	MAX-L	LINEARITY(τ,τ)	MAX-H_φ	DEP-H
a.	☞ L | e-ki-hekà $)_\varphi$			*	
b.	H_φ | e-ki-heká $)_\varphi$	*!			
c.	H_φ L | | e-ki-hékà $)_\varphi$		*!		

b. ι stratum: Non-input H_φ cannot occur in the output

	L L_ι | e-ki-hekà $)_\varphi)_\iota$	MAX-L	LINEARITY(τ,τ)	MAX-H_φ	Dep-H
a.	☞ L_ι | e-ki-hekà $)_\varphi)_\iota$	*			
c.	H_φ L_ι | | e-ki-hékà $)_\varphi)_\iota$	*			*!

This interaction, then, provides evidence for *cyclicity* in the PLP, but not necessarily for *stratality*: as inspection of the tableaux above makes clear, no reranking is required. Evidence for reranking between the φ and ι strata, however, comes from the interaction between boundary tone assignment and vowel contraction (e.g. shortening and coalescence). To understand this interaction, note first that underlying long vowels and vowel-vowel sequences give rise to surface short vowels *unless their contraction gives rise to a contour tone.* Thus, while the [a] deriving from the contraction of the nonce infinitive *e-ri-na-[asánà]* (18a) is indistinguishable from the comparable [a] of the nonce infinitive *e-ri-na-[sana]* (18b), the [â] that results from the contraction of the nonce infinitive *e-ri-ná-[àsánà]* is approximately one and half times as long (18c). This is reflected in the phonetic data presented in (18).

(18) Vowel durations resulting from *na* + (a)C (2 tokens each)[1]

a.	e-ri-**na-a**sánà → e-ri-**n-a**sá:nà	[**na**]: 104 ms, 103 ms	(mean = 103.5 ms)
b.	e-ri-na-sánà → e-ri-**na**-sá:nà	[**na**]: 99 ms, 97 ms	(mean = 98 ms)
c.	e-ri-ná-àsánà → e-ri-**n-â**sa:nà	[**nâ**]: 148 ms. 147 ms	(mean = 147.5 ms)

Now consider the interaction between vowel shortening and boundary tone assignment. In nouns with final long vowels or final vowel-vowel sequences, like *e-ki-komee* 'snail' or *e-rí-[ta-a]* 'to bury,' the assignment of H_φ and L_ι yields a falling tone on the final vowel: [e-ki-ko:mê] and [e-rí:tâ]. In order for this to occur, the final long vowels or vowel-vowel sequences of these words must remain uncontracted until the assignment of L_ι. If shortening were to happen any sooner – in the φ-stratum, for example – then the two step process of intonational tone assignment described above would systematically cause them to show not a final falling tone, but instead a penultimate H tone, just as in *o-ku-gulu*. This is because the final vowel would always shorten in the φ-level evaluation, where it is associated with just H_φ. Below, this is illustrated for *e-ki-komee*.

(19) Shortening must not happen until the ι stratum

		H_φ		H_φ L_ι
		|		| |
/e-ki-komee/	→	e-ki-komé $)_\varphi$	→	e-ki-kómè $)_\varphi$ $)_{\iota\text{-D}}$

[1] The transcriptions of these forms show the effects of penultimate lengthening, which is independent of length derived from tonal contours.

On the other hand, if shortening is delayed until the evaluation of ι, then we can derive final falling tones so long as *LongV is ranked below Linearity(V,H), the constraint which penalizes leftward H tone shift (cf. chapter 2, example (37)).

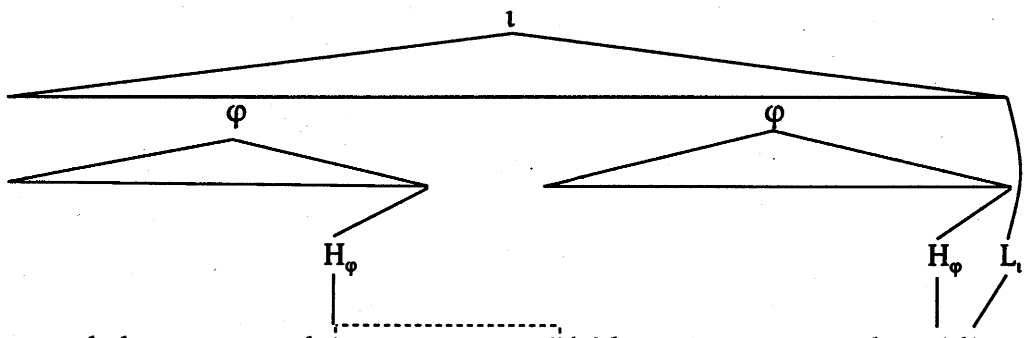
(20) 2-step analysis, ι stratum: No constraint favors H_φ

		Linearity(μ,H)	*LongV
	H_φ L_ι | e-ki-komé: $)_\varphi$ $)_\iota$		
a.	☞ H_φ L_ι \/ e-ki-komê:) $)_\iota$		*
b.	H_φ L_ι | | e-ki-kómè $)_\varphi$)	*!	

We must therefore ensure that shortening be delayed until the ι-final stratum. In order for this to occur, the relative ranking of *LongV (the pro-shortening markedness constraint) and Max-μ (the anti-shortening faithfulness constraint) must flip in the transition from the φ stratum to the ι stratum. Before ι, Max-μ » *LongV, so shortening is blocked. At ι, *LongV » Max-μ, so shortening is triggered.

We have therefore seen evidence that H_φ assignment precedes both L_ι/H_ι assignment and vowel contraction. Once more, this is exactly the ordering that we expect given the domains over which these processes operate. Obviously, H_φ assignment takes place within φ while L_ι/H_ι assignment takes place within ι. In addition, the domain of vowel contraction is ι rather than φ. This is shown by the sentence below, which may be contrasted with the one given earlier in (10). The difference in these sentences lies in the fact that the sentence below has a singular animate subject rather than a plural one, so that the initial subject marker is *a-* rather than *ba-*. There is therefore a vowel-vowel sequence across the subject-verb φ boundary, comprised of the final vowel *-lįtó* 'heavy' and the vowel of the subject marker. As shown in (21), this pre-contraction [óa] sequence contracts to [wâ], indicating that the domain of vowel contraction is ι.

(21) Assignment of boundary tones to prosodic domains



o-mu-hekį mu-lįtw ą̂-ká-langir' o-ku-gú:lù
AUG-NC.1-PORTER NC.1-HEAVY SM.3S-IMPV-SEE AUG-NC.7-LEG
'The heavy porter sees the leg.'

Once more, then, we see that in all cases where there exists a crucial ordering between processes, the process which applies first applies within a smaller domain than the one which applies second. The only difference is that in the postlexical phonology, the relevant domains are not morphological domains, but rather prosodic domains which are indirectly derived from them. This is a crucial consequence of the final component of the analysis: an interface layer between the Lexical Phonology and the Postlexical Phonology, briefly described below.

1.4 The LP-PLP Watershed

The Lexical Phonology – Postlexical Phonology Watershed (LP-PLPW), which I imagine as an interface layer between the LP and the PLP, has two main purposes. First, it plays a crucial role in leftward tone shift. I will propose in chapter 2 that lexical and grammatical H tones shift to the left because in the input to the PLP, they belong to *falling* tones which expand leftwards in order to avoid tonal crowding. The reason for this, I propose, is that all H tones which emerge from the LP are converted to falling tones at the LP-PLPW.

This conversion is motivated, in brief, by a tension between the following two observations.

1) As discussed in detail in chapter 2, both theoretical and empirical considerations suggest an analysis of leftward shift as the leftward expansion of an input falling tone. Since I analyze this process as occurring during the evaluation of φ, this requires that all non-intonational H tones enter the PLP as part of falling tones.
2) All of the tonal processes of the LP are most easily and insightfully described not with falling tones, but rather with simple H and L tones. For example, the OCP-based lowering process discussed in 1.2 is much more simply described as the lowering of H to L following another H than as the lowering of HL to L following HL. Moreover, by formulating the tonal processes of the lexical phonology in terms of simple H and L tones, it is much easier to compare them with processes in related Bantu languages, where falling tones are not motivated.

The proposal that the LP's H tones are converted to the PLP's falling tones at the LP-PLPW resolves the tension between these two observations by allowing each component of grammar to act on the representations most suited to it.

The second role of the LP-PLPW is to establish the prosodic domains which are evaluated stratally in the PLP proper. The idea that prosodic domains are derived indirectly from prosodic structure has been widely assumed since the influential work of Selkirk (1986). There, the construction of derived domains is conceived of as an important dividing line in the phonological derivation, in which morphosyntactic domains are *replaced* by prosodic ones.

Before this replacement, phonological rules are permitted to refer to morphological and syntactic structure; afterwards, they are not, because this structure no longer exists.

Adaptations of this proposal within Optimality Theory (e.g. Selkirk 1996, 2011; Truckenbrodt 1995, 1999) have de-emphasized this transitional nature of the syntax-to-prosody mapping by incorporating the constraints which govern it into the same monostratal grammar that enforces all other aspects of phonology as well. In localizing the syntax-to-prosody mapping in the LP-PLPW, then, I return to the former conception of prosodic domain formation as an important threshold; before it, the LP evaluates morphological constituents, and after it the PLP evaluates prosodic ones.

1.5 Local summary

In the preceding sections, we have seen initial evidence that although the Kinande tone system is rife with opacity, this opacity is always of a very specific kind, with phonological processes that apply within larger domains obscuring the generalizations established by processes that apply within smaller domains, and with reranking tied to the evaluation of major morphological and prosodic constituents. In the chapters that follow, this initial evidence is examined in more detail, but this fundamental conclusion will stand. A major conclusion of the dissertation, then, is that the facts of Kinande strongly support the view that the basic architecture of phonology is stratal.

2 Tonal representations and constraints

The decision to pursue an analysis whereby all opacity in the Kinande tone system derives from stratal interaction has two important consequences for tonal representations and constraints. First, as much as possible, I avoid relying on diacritics to distinguish different *types* of tones, i.e. *lexical* (underlying) vs. *grammatical* vs. *intonational.* In part, this is for heuristic reasons: I am attempting to determine the extent to which stratal interactions are sufficient, in and of themselves, to generate the opaque tonal interactions of Kinande, and this effort is compromised by the use of tonal diacritics because they can covertly allow opaque generalizations to be stated transparently. In addition, however, the use of tonal diacritics generally leads to a less insightful analysis. For example, we saw in (8) and (9) that both lexical and grammatical H tones are subject to leftward spreading. Intonational H tones are not. This is a generalization that clearly arises from counterfeeding opacity: while spreading occurs within the LP, specifically within the Macrostem stratum, the intonational H tones are introduced only in the PLP, when spreading is no longer active. While we could account for the non-spreading of intonational H tones simply by diacritically distinguishing intonational tones from lexical and grammatical tones, and declaring that only the latter undergo spreading, this would be purely a stipulation, with no connection to other facts of the language. By contrast, a stratal approach which avoids the use of diacritics in favor of ordering is able to relate the non-spreading of intonational tones to the fact that the fact that they are assigned within large phrasal domains, and are therefore (according to the logic of cyclicity) assigned *late*.

A second consequence of the decision to analyze opaque interactions as arising from stratal interaction is that the tonal representations that I adopt in the analyses to follow are standard autosegmental ones, involving tonal autosegments and association lines, rather than the domain-based representations proposed in Span Theory (McCarthy 2004) or Optimal Domains Theory (ODT: Cassimjee 1998; Cassimjee and Kisseberth 1998). These theories make use of enriched representations in order to account for phenomena that would otherwise crucially require ordering.

For the sake of illustration, suppose that we have reason to believe that a grammatical H tone which surfaces on a verb's *first* vowel is initially assigned to its *second* vowel. (As we will see in chapter 4, this situation actually arises in Kinande, but the facts are made more complicated by the presence of leftward spread.) In ODT, we could analyze this situation as arising in a single step through the establishment of an abstract High Tone Domain (HTD). This HTD would include both V1 and V2, and would produce tone shift rather than tone spread due to a requirement that only the domain's *head* vowel – i.e. the target of shift – actually surface as H. This hypothetical case is illustrated in (22); for a more detailed example of the use of ODT in accounting for tone shift, see the discussion of Mijikenda in the conclusion of chapter 2.

(22) Simultaneous tone assignment and shift in hypothetical verb stem
  a. balala + Grammatical Tone → (bála̲)la

In this way, ODT allows a transparent statement of a generalization that is intuitively opaque: a tone is initially assigned to one position, but surfaces in another. (Indeed, one goal of ODT is to provide a characterization of seemingly opaque tonal processes within fully parallel OT.) There is therefore a danger that the adopting of domain-based representations could present a distorted picture of the ability of stratal interaction in and of itself to produce the opaque tonal interactions of Kinande.

In addition, within a stratal analysis, in which cyclic evaluation ensures that not all phonological material is available at all stages of representation, there is a fundamental problem with transparent accounts of tone shift or spread: the vowel onto which a tone must spread or shift is often not available when that tone is first assigned. Above, we saw this with the lexical H̲ tone that spreads onto an object marker: by hypothesis, the object marker is not present when the H tone of the root first appears in the Stem stratum, since the OM is not introduced until the following Word Stratum. The same basic point can be made about leftward tone shift: whenever a stem-initial H tone shifts onto a preceding vowel, it is shifting onto morphological material that is not available when the tone is first introduced as part of the verbal root. In some cases, then, a stratal analysis actively forces us to adopt a two-step approach to tonal movement over one that is surface-transparent.

3 Morphological analysis of the Kinande verb

In the final chapter, a close examination of the way that tones surface within finite verbs reveals that Kinande verbs may contain *multiple inflected stems*, most of which have been previously analyzed as inflectional prefixes. This leads to a more refined picture of Kinande verbal structure, in which many verbs are ultimately analyzed as consisting of (phonologically reduced) phrases.

4 Data sources

Most of the data reported in this dissertation comes from one of three sources: the previous linguistic literature on Kinande tone (especially Mutaka (1994), Valinande (1984), Musubaho (1982), Hyman (1990), Hyman and Valinande (1985), Akinlabi and Mutaka (2001), and Mutaka and Hyman (1990)), two tone-marked dictionaries written by Kavutirwaki (1978) and Mutaka and Kavutirwaki (2011), and my personal notes based upon work with one native speaker of Kinande, Mr. Pierre Mujomba. This work first began in 2007, when Kinande was selected for MIT's Topics in the Grammar of an Unfamiliar Language course, then led by Michael Kenstowicz and Shigeru Miyagawa. It then continued in 2008, when the language was selected once more for this course, this time led by Michael Kenstowicz and Norvin Richards. The work then continued during the summers of 2009, 2010, and 2011, in independent sessions with Mr. Mujomba. All phonetic data included in this dissertation comes from recordings collected in the course of this work. In addition, Mr. Mujomba's judgments provide much of the data for chapter 5, which presents a number of complex verb forms not previously described in the Kinande literature.

In addition to the data provided by Mr. Mujomba, I have also relied on occasional judgments from Philip Mutaka and Jackie Syauswa, who have kindly answered occasional questions via email. In general, the judgments of all three speakers are in agreement. While there appear to be some dialectal differences in reduplication (cf. Bjorkman 2009, note 1), they do not affect any of the data discussed here.

5 Structure of the dissertation

The remainder of the dissertation will proceed as follows:

CHAPTER 2: This chapter argues that leftward tone shift in Kinande is postlexical, and that it consists not in the simple movement of a tone from one vowel to another, but rather in the expansion of *falling* tones which are derived from underlying high tones at the LP-PLPW. This analysis is supported both by empirical considerations, in that the L tones predicted by this analysis are actually observed in surface forms, and by theoretical ones, in that the expansion-based analysis allows an account of tone shift that is based on constraints that are both crosslinguistically well-attested and independently observed in Kinande.

CHAPTER 3: This chapter argues that the postlexical phonology of Kinande is organized stratally, with the phonological phrase evaluated before the intonational phrase. Evidence for this, briefly discussed above, comes from interactions between intonational tones and lexical tones, and from the interaction between intonational tone assignment and vowel shortening.

CHAPTER 4: In this chapter, I present an analysis of the Lexical Phonology of Kinande in the course of developing an analysis of an intricate tone pattern (which I refer to as "Complex tone") in which grammatical **H** tones are assigned to different edges of the stem depending on the tone of its root.

CHAPTER 5: This chapter argues that a basic division of Kinande's finite indicative verbs into those that are assigned the Complex tone pattern and those that are assigned no grammatical tone pattern, assumed in previous accounts of Kinande tone, is in fact illusory. All finite indicative verbs receive grammatical tone; those that appear not to do so simply realize it in a disguised form, due to their complex structures consisting of more than one verb stem.

2 Leftward H tone shift as postlexical melodic expansion

1 Introduction

One of the most striking and unusual properties of the Kinande tone system is that all of its non-intonational H tones shift exactly one vowel to the left of their underlying or initially-assigned positions. This may be seen, to begin with, in the realization of lexical H̲ tones (i.e. H tones that belong underlyingly to roots) in the infinitive forms in (1). The infinitive in (1a) contains only toneless morphemes, and therefore surfaces as entirely low-toned in contexts where no intonational boundary tones are assigned. (On infinitive morphology, see note 1 below.) The infinitive in (1b) is almost exactly the same, but its root -*tá̱ng*- 'precede' bears a lexical H̲ tone. Because of this, it is not surprising that (1b) surfaces with a H tone that (1a) lacks. What *is* surprising, however, is that this H tone surfaces not on the root that introduces it, but rather on the preceding noun class prefix. This is the result of leftward tone shift.[1]

[1] Infinitives are deverbal nouns that have the basic structure (AUG)-NC.5A-[STEM]. The STEM has verbal morphology, and therefore minimally consists of a verb root (√) and final desinence (DES); in infinitives, the latter is always -*a*. Preceding the STEM are the nominal morphemes NC.5A and the "augment" vowel AUG. The morpheme directly preceding the stem, NC.5A, is a noun class prefix that identifies the infinitive as a class 5 noun that triggers the

(1) Displaced tone contrast of verb roots (phrase-medial forms: no boundary tones)[2]

a. Infinitive w/ toneless root: 'to peel'
e-ri-[tang-a] → e-ri-[tang-a]
AUG-NC.5A-[√-DES]

b. Infinitive w/ H-toned root: 'to precede'
e-ri-[tá̲ng-a] → e-rí̲-[tàng-a]
AUG-NC.5A-[√-DES]

Leftward tone shift also affects the underlying H̲ tones of noun roots. Here, in fact, its effects are even more dramatic, for while verb roots contain at most a single underlying H̲ tone, noun roots can have as many underlying H̲ tones as they have underlying vowels. The nouns in (2), for example, show every possible way of combining underlying H̲ tones and underlying vowels within CVCV roots, and in all of these nouns, all H̲ tones shift exactly one vowel to the left of their underlying positions. Thus, a H̲ tone which originates on the first vowel *of* the root surfaces on the first vowel *before* the root (2b), while a H̲ tone which originates on the root's *second* vowel surfaces on the root's *first* vowel (2c); and in nouns with underlying H̲ tones on both the first and second vowels of the root, both H̲ tones shift, so that they surface on the first vowel of the root and on the first vowel before it (2d).

(2) Leftward shift of lexical H in nouns (phrase-medial forms: no boundary tones)

	a. 'leg'	b. 'man'	c. 'cup'	d. 'insect'
Underlying	o-ku-gulu	o-mu-lú̲me	e-ki-kombé̲	a-ka-hú̲ká̲
Surface	o-ku-gulu	o-mú̲-lùme	e-ki-kó̲mbè	a-ká̲-hú̲kà
Gloss	AUG-NC.15-√	AUG-NC.1-√	AUG-NC.7-√	AUG-NC.12-√

same agreement morphology as underived class 5 nouns (e.g. *e-ri-rimá ry-owénè* 'the field is good' vs. *e-ri-[hum-a] ry-owénè* 'to hit is good'). The identification of this prefix as NC.5A reflects the fact that I assume, following the analysis of Kenstowicz (2009), that the class prefixes of underived nouns and the class prefixes of infinitives differ in their underlying specifications for Advanced Tongue Root (ATR). Finally, infinitives generally appear with an initial augment vowel *e-*. The presence of the augment in Kinande nouns (including infinitives) is determined by a variety of syntactic and semantic conditions; it is invariably present in utterance-initial position (and hence in citation forms), but it may be absent in other contexts (cf. Progovac 1993). Phonologically, it appears as [a] before noun class prefixes with [a], as [o] before noun class prefixes with [u], and as [e] everywhere else (i.e. before noun class prefixes with [i] or before noun class prefixes with no vowel).

[2] In these forms as well as those to follow, vowels which are marked with a grave accent are phonologically L-toned, as opposed to toneless. These will be discussed shortly.

One last example of tone shift involves an intricate pattern of tone assignment in which morphosyntactically-conditioned or "grammatical" **H** tones are assigned to specific positions within the verb stem. This pattern, which Goldsmith (1987) calls the "Complex Stem Tone" pattern, is found in a number of eastern Bantu languages, each of which displays it in a particular subset of its verb forms. Its details vary from language to language, but in most languages, the pattern causes a grammatical **H** tone to appear on the *second* vowel (V2) of a toneless stem but on the *final* vowel (FV) of a H-toned stem (i.e. a stem with a H-toned root). This is what we see, for example, in the Kihunde forms in (3). (In these forms, vowels that surface with grammatical **H** tones are given in bold while vowels with lexical H̲ tones are underlined. In addition, as in (1), the edges of the verb stem are marked with square brackets.)

(3) Complex Stem Tone Pattern in Kihunde (Goldsmith 1987)

a. Toneless Stem	b. H-toned Stem
tu-na-[som-**é**r-an-a] SM.1P-PRES-[√-APP-REC-DES] 'we read for each other'	tu-na-[t<u>é</u>m-er-an-**á**] SM.1P-PRES-[√-APP-REC-DES] 'we cut for each other'

Kinande's version of the Complex Stem Tone pattern differs from Kihunde's in two main ways. First, all grammatical **H** tones spread one vowel to the left, so that they surface over two vowels instead of one. Second, (the right edges of) all grammatical **H** tones in Kinande surface one vowel to the left of where they occur in Kihunde: in verbs with toneless stems (4a), the right edge of a grammatical **H** occurs not on the *second* vowel but the *first*, and in verbs with H-toned stems (4b), the right edge of a grammatical **H** occurs not on the *ultima* but the *penult*.

(4) Leftward shift of the Complex Stem Tone pattern in Kinande

a. Toneless Stem	b. H-toned Stem
tu[3,4]-anga-ná-[sóm-èr-an-à]	tu-anga-ná-[tèm-ér-án-à]
SM.1P-POT-AFF-[√-APP-REC-DES]	SM.1P-POT-AFF-[√-APP-REC-DES]
'we can read for each other'	'we can cut for each other'

As I will argue in detail in chapter 4, these facts obtain because in Kinande, both leftward H tone spread and leftward H tone shift act on grammatical **H** tones that are initially assigned as part of the same V2/FV pattern seen in Kihunde. This analysis is illustrated in (5).

(5) Simplified derivation of grammatical tone in Kinande

		toneless stem	H-toned stem
a.	Stem (before Gramm. Tone)	[somerana]	[témerana]
b.	Grammatical Tone (V2/FV)	[somérana̋]	[témèraná]
c.	High Tone Spread	[sómérana̋]	[témèráná]
d.	Prefixal Morphology	tu-anga-na-[sómérana̋]	tu-anga-na-[témèráná]
e.	High Tone Shift	tu-anga-ná-[sómèranà]	tu-anga-ná-[tèmérána̋]

Leftward tone shift, then, is a pervasive phenomenon in Kinande, affecting not just underlying H̲ tones but also grammatical **H** tones whose placement is determined by the phonological grammar. This fact is especially noteworthy because crosslinguistically, leftward tone movement is quite rare; it is far more common – both within Bantu and outside of it – for tones to spread or shift to the *right* (Hyman and Schuh 1974; Javkin 1979; Hyman 2007). Indeed,

[3] Vowel hiatus is almost always eliminated on the surface through some process of vowel contraction (i.e. glide formation, vowel deletion, or coalescence), so that *tu-* will surface as [tw] in this form. I will usually abstract away from contraction in transcriptions, since tone pattern are generally clearer in their pre-contracted forms.

[4] I will generally transcribe the SM in Kinande as toneless, even though there is a good deal of evidence that it is underlyingly H-toned (cf. (44) below; ch. 3, section 3; ch. 5, note 10). This is because in the vast majority of cases, the underlying H tone of the SM deletes without producing any surface effect. Unless the tone is the specific focus of discussion, then, I will omit it so that it does not distract from more relevant aspects of a form.

as noted by Hyman, leftward tone movement within Bantu is largely restricted to the Interlacustrine (Zone J) language group to which Kinande (classified as JD42) belongs.

This typological asymmetry between leftward and rightward tone movement has its roots in the phonetics of tone, for while rightward shift, in the words of Hyman (2007), "phonologizes the common tendency of tone targets to be realized late," there is no opposite tendency for tone targets to be realized *early* that can serve as the phonetic basis for *leftward* shift. Thus, when leftward tone shift arises, it does so not because it itself is favored, but because it resolves some other difficulty that rightward shift cannot. Hyman argues, for example, that leftward shift commonly originates as a right edge phenomenon, in which final tones are driven to the left by intonational boundary tones or nonfinality restrictions.

This historical explanation relies upon the insight that leftward tone movement, while not *generally* favored by phonetic considerations, may nevertheless be favored and well-motivated in specific contexts (e.g. the right edge). For Kinande, this historical explanation is almost certainly correct: as we will see, H and L boundary tones mark the right edges of prosodic domains, and it is likely that leftward tone shift began when the assignment of these boundary tones, coupled with a desire to avoid tonal crowding, drove previously final H tones to the left. That said, however, we have already seen that in the modern language, tone shift is no longer restricted to this particular context: it affects all non-intonational H tones, regardless of their position, and regardless of their proximity to boundary tones. A key question, then, is how leftward shift became generalized to contexts where its original motivation is absent.

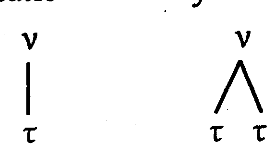
This question can be restated in purely synchronic terms: how do learners analyze tone shift as the product of constraint interaction in contexts where no obvious markedness constraint compels tones to move? While the phonetic pressures involved in peak delay, reified as phonological constraints, can motivate H tones (regardless of context) to move to the right (cf. Kaplan 2008), and considerations like tonal crowding or nonfinality can motivate certain (e.g. final) H tones to move to the left, what compels the leftward shift of uncrowded, nonfinal H tones?

In this chapter, I argue that Kinande speakers have extended the crowding-based analysis of tone shift to nonfinal positions by restructuring their tonal representations at the interface between the lexical phonology (LP) and the postlexical phonology (PLP). Specifically, I propose that in the transition from the LP to the PLP, all H tones are converted to complex *falls*. As a result, every H tone assigned within the LP comes to be accompanied by a L tone which crowds it from the right. Thus, leftward tone shift – which I show to be a postlexical process – is not an arbitrary movement of a H tone from one vowel to another, but rather an expansion of a HL sequence with the phonetically motivated aim of avoiding tonal crowding.

To implement this idea, I follow Yip (1989) and Akinlabi & Liberman (2001) in proposing that individual tones (e.g. H and L) are organized into higher-order constituents internal to the tonal tier. I will refer to these constituents as *melodic units*, and will represent them (following Yip) as dominated by a single *tonal root node* (ν). If individual tones are the atoms of the tonal tier, then melodic units are its molecules; they may consist of single tones (in which case they define static pitch targets) or they may consist of multiple tones (in which case they define dynamic ones). These two possibilities are shown in (6).

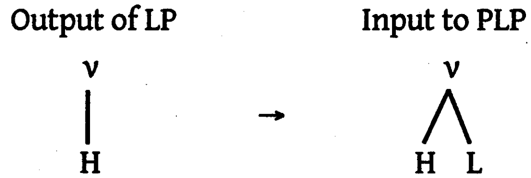
(6) Static and dynamic melodic units

a. Static b. Dynamic



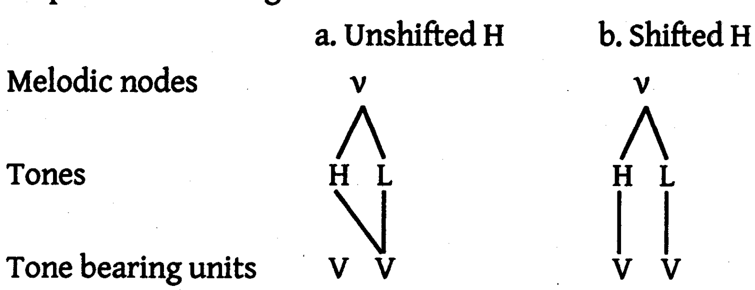
The claim, then, is that the transition into the PLP involves the conversion of the static melodic units in (7a) into the dynamic ones in (7b).

(7) Tonal conversion from static to dynamic melodic units



As a result of this conversion, any H tone which emerges from the LP enters the PLP as a HL sequence associated with a single vowel (8a). However, this configuration cannot appear in the *output* of the PLP due to a high-ranking markedness constraint penalizing tonal crowding (cf. ONET/μ: Yip 2002; NOCROWD: Gussenhoven 2004). Tone shift solves this problem, since by (minimally) shifting a H tone to the left, and thereby expanding the duration of its HL melodic unit, it avoids tonal crowding while still preserving all tones from the input (8b).

(8) Expansion of falling melodic unit in PLP



A key advantage of this analysis is that it provides an explanation for across-the-board leftward tone shift that is grounded in phonological imperatives (e.g. preservation of input material, avoidance of tonal crowding) that are (a) typologically well-attested and (b) visibly at work elsewhere in the language. This makes it attractive from a theoretical perspective. However, the analysis also receives strong *empirical* support from the fact that it predicts a striking and otherwise unexpected generalization: that the vowel which immediately follows a shifted H tone in Kinande is never toneless, but instead always bears a *phonologically active L tone*. This would be genuinely mysterious if tone shift involved merely the movement of a H tone from one vowel to another, but in the present analysis it is straightforwardly predicted: a shifted H tone cannot help but be followed by a L tone, since the presence of this L tone is what causes it to shift in the first place. Any account which derives tone shift by some other means must incorporate some constraint demanding that all H tones be followed by L tones, but cannot use this constraint in order to explain shift. In the account developed here, these two properties – leftward shift, and the occurrence of L tones – are intricately connected, which explains why both of them (each highly unusual within Bantu) are found in the same language.

Before proceeding to the main body of the chapter, a few words about the analysis, and the broad assumptions which underlie it, are in order. As noted above, I will argue that the tonal representations of Kinande change in the transition from the LP to the PLP, so that H tones which emerge from the LP enter the PLP as falls. This strategy – made possible by the stratal approach adopted in this dissertation – is driven by a number of considerations.

First, falls are not *logically necessary* until the PLP, because tone shift is postlexical. This is shown both by the *ordering* of tone shift (we will see that it follows, for example, such lexical processes as grammatical tone assignment, reduplication, and Meeussen's Rule) and by its *domain of application*. As shown in (9), it can apply across word boundaries.

(9) Tone shift cross word boundaries

e-ri-[hum-a]	ɲ-kó̲kò	→	e-ri-[humá̲]	ŋ-gòkò]	'to hit a chicken'
AUG-NC.5A-[HIT-FV]	NC.9-CHICKEN				

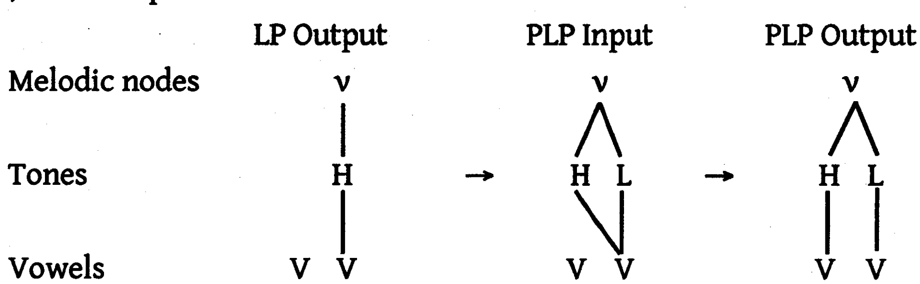
Second, falls are not *empirically motivated* until the PLP, since all of the evidence for them comes from processes which are themselves postlexical, namely intonational tone assignment and vowel contraction.

Third, many of the phenomena in the LP are closely parallel (if not identical) to processes occurring in other Bantu languages, where there is neither leftward tone shift nor evidence for active L tones; by positing that the LP acts on high tones rather than falls, it is possible to understand fundamentally similar phenomena in related languages as resulting from interactions of the same basic constraints.

Finally, the assumption that the LP acts on H tones rather than HL melodic units allows for a simpler and clearer exposition; we can continue to speak, for example, of H-toned stems rather than HL-toned stems, of grammatical **H** tones rather than grammatical **HL** tones, and of OCP-based lowering from H to L rather than from HL to L. In addition to making easier reading, this will also make the analysis easier to compare with those of other Bantu languages.

For all these reasons, I will proceed under the assumption that the LP operates on high tones, that these high tones are converted to falls in the transition from the output of the LP to the input of the PLP, and that these falls are then expanded in the PLP proper.

(10) Two-step leftward tone shift



I will refer to the transition from the LP output to the PLP input as the LP-PLP Watershed (LP-PLPW), and identify it not only as the locus of tonal conversion, but also as the moment when morphosyntactic domains are parsed into phrasal prosodic ones (which are then evaluated cyclically in the PLP proper; cf. chapter 3). This is essentially identical to the syntax-phonology interface as envisioned by Selkirk (1986): a conversion of (morpho)syntactic domains into prosodic ones, which occurs before any rules referring to the latter can apply. The principal difference is that I allow the constraints which govern the LP-PLPW to manipulate (auto)segmental representations as well as domain structure.

With this much in place, the rest of the chapter will proceed as follows. In section 2, I present initial evidence for phonologically active L tones in Kinande, and demonstrate that these L tones systematically follow shifted H tones. This provides crucial empirical support for the idea that H tone shift consists in the expansion of a HL melodic unit. In section 3, I discuss the LP-PLPW and the conversion of the LP's H tones to intermediate falls. This sets the stage for the analysis of tone shift itself in section 4. Here, I introduce the basic constraints and rankings which drive shift, and show how they play out in a variety of phonological contexts. Finally, in section 5, I briefly compare the expansion-based analysis of Kinande tone shift with other analyses posited in the literature, and conclude that both empirical and theoretical considerations favor the expansion-based analysis. Section 6 concludes.

2 Active L tones in Kinande

As described just above, the primary empirical support for the idea that Kinande's leftward tone shift results from the expansion of a HL melodic unit is the curious distribution of actively specified L tones: while vowels with H, L, and Ø tone are all observed in Kinande, *the vowels which follow shifted H tones always bear specified L tones.* This fact is rather unexpected if tone shift is simply the movement of a H tone from one vowel to another, but is predicted if leftward tone shift is analyzed as melodic expansion. The primary aim of this section, then, is to demonstrate this pattern of distribution. In 2.1, I present initial evidence for the existence of active L tones in Kinande using data from intonational tone assignment. I then argue in 2.2 that L tones systematically follow H tones using data from intonational tone assignment and vowel contraction.

2.1 Intonational evidence for a phonological L/Ø contrast

At the phonetic level, Kinande shows a simple binary contrast between low pitch and high pitch, and in this respect looks essentially the same as most other Bantu languages (Kisseberth and Odden 2003). This phonetic similarity is misleading, however, for this binary *phonetic* distinction masks a ternary *phonological* distinction between the presence of a high tone (H), the absence of any tone (Ø), and the presence of an active *low* tone (L). This makes Kinande's phonological system quite different from those of most other eastern Bantu languages, which are typically analyzed as having just H and Ø (Hyman 2001).

The basic evidence for a contrast between L and Ø is that vowels which are produced with low pitch in the absence of boundary tones can show divergent realizations when boundary tones are assigned. Consider, for example, the range of tone patterns shown by the nouns *o-ku-gulu* 'leg' and *e-ki-hekà* 'truck' shown in (11) below.[5]

(11) Differing patterns of phrasal variation in *o-ku-gulu* 'leg' and *e-ki-hekà* 'truck'

a.	φ-medial: *noun is not in position to receive* H_φ	((o-ku-gulu ku-lʄtò $)_\varphi)_\iota$ AUG-NC.15-LEG NC.15-HEAVY 'a heavy leg'	((e-ki-hekà ki-lʄtò $)_\varphi)_\iota$ AUG-NC.7-TRUCK NC.7-HEAVY 'a heavy truck'
b.	φ-final: *noun is in position to receive* H_φ	((o-ku-gulú $)_\varphi$ (kú-Ø-[lʄtòh-ɉrè]$)_\varphi)_\iota$ AUG-NC.15-LEG SM.15-STAT-[√-DES] 'the leg is heavy'	((e-ki-hekà $)_\varphi$ (kí-Ø-[lʄtòh-ɉrè]$)_\varphi)_\iota$ AUG-NC.7-TRUCK SM.7-STAT-[√-DES] 'the truck is heavy'
c.	φ-final, ι-final: *noun is in position to receive* H_φ *and* L_ι	((o-ku-gúlù $)_\varphi)_\iota$ AUG-NC.15-LEG 'the leg'	((e-ki-hekà $)_\varphi)_\iota$ AUG-NC.7-TRUCK 'the truck'

[5] Italicized nouns and verbs that are not fully contained within square brackets (e.g. *e-ki-hekà*, *e-ri-[hum-a]*) always refer to *phrase-medial* forms; this provides a means of referring to a word without committing to any particular phrasal variant of it. Particular phrasal variants will always be fully enclosed in square brackets (e.g. [erihúmà]).

In (11a), we see that *o-ku-gulu* and *e-ki-hekà* show identical tonal realizations in the middle of a phonological phrase (φ), where they are not assigned any boundary tones. In (11b) and (11c), however, their tone patterns diverge. In (11b), since both nouns stand at the end of φ, both are eligible to receive a H_{φ} boundary tone. However, H_{φ} surfaces only on *o-ku-gulu*; *e-ki-hekà* remains low-toned, just as in φ-medial position. In (11c), the two nouns stand at the end of both φ and a declarative intonational phrase (ι), and are therefore eligible to receive not just H_{φ} but also L_{ι}. Again, however, only *o-ku-gulu* realizes the boundary tones in full: it shows both H_{φ} and L_{ι} (on its penultimate and final vowels, respectively) while *e-ki-hekà* shows only L_{ι}.[6]

The generalization which emerges from (11), then, is that H_{φ} systematically surfaces in *o-ku-gulu* but not *e-ki-hekà*. From this, we can infer that the two nouns have distinct underlying representations. Following Mutaka (1991, 1994) and Hyman (1990), I assume that they differ in the underlying tone of their final vowel: the final vowel of 'leg' is toneless and therefore receptive to the assignment of H_{φ}, while the final vowel of 'truck' has a final L tone which repels it.[7] (See chapter 3 for a full analysis of this interaction.)

In addition to final lexical $\underline{H}$ tones in nouns like *e-ki-hekà*, another source of phonological L tones is a Kinande-specific version of *Meeussen's Rule* (MR: Goldsmith 1984a,b) that changes H-H to H-L within verb stems. This occurs, for example, when a H-toned stem with two vowels is assigned the Complex Stem Tone pattern. Recall from section 1 that this pattern initially assigns a grammatical **H** tone to the *second* vowel (V2) of a toneless stem and

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[6] There is no direct phonetic evidence that the final L tone of *e-ki-hekà* is L_{ι} rather than the final lexical L tone that I will posit immediately below. I assume that L_{ι} overwrites the lexical L tone largely because this is what the ι-level boundary tone H_{ι} does. In questions, where H_{ι} is assigned instead of L_{ι}, *e-ki-hekà* shows just H_{ι} on the final vowel (i.e. [e-ki-heká]), where *o-ku-gulu* shows both H_{ι} on the ultima and H_{φ} on the penult (i.e. [o-ku-gúlú]).

[7] Kenstowicz (2008) notes that many L-final nouns in Kinande derive diachronically from H-H stems which are affected by Meeussen's Rule; this makes their final L tones historically expected, given the data on MR discussed immediately below. In addition, Kenstowicz notes that in many nouns with final L tones, the final syllables have NC onsets, which often cause depression of a following tone in Bantu.

to the *final* vowel (FV) of a H-toned stem (cf. (5b)). In stems with only two vowels, these positions are the same, so toneless and H-toned stems receive grammatical **H** tones on the same vowel. They are realized, however, quite differently. This is illustrated in (12) below, where we see the Complex Stem Tone pattern assigned in "Potential" forms with 2-vowel toneless and H-toned stems. In toneless stems, after a grammatical **H** tone is assigned to V2 (=FV) (12b), it subsequently undergoes leftward spreading (12d) and shift (12f). In H-toned stems, however, once a grammatical **H** tone is assigned to FV (=V2) (12b), it immediately lowers to L by Meeussen's Rule (12c) because it is preceded by the lexical H̲ tone of the root.

(12) Simplified derivation of grammatical tone (2-vowel stems)

		toneless stems	H-toned stems
a.	Stem (before Gramm. Tone)	[huma]	[túma]
b.	Grammatical Tone (V2/FV)	[hum**á**]	[tú̲m**á**]
c.	MR (V́ → V̀ / V́__)	---	[tú̲m**à**]
d.	High Tone Spread	[h**ú**m-**á**]	[tú̲m**à**]
e.	Prefixal Morphology	tu-anga-na-[h**ú**m-**á**]	tu-anga-na-[tú̲m**à**]
f.	High Tone Shift	tu-anga-n**á**-[h**ú**mà]	tu-anga-ná̲-[tùm**à**]
		SM.1P-POT-AFF-[√-DES]	SM.1P-POT-AFF-[√-DES]
		'we can hit'	'we can send'

The fact that MR is a rule of tone *lowering* rather than a rule of tone *deletion* is shown by the fact that **H** tones lowered by Meeussen's Rule block the assignment of H_φ in exactly the same way that lexical L tones do. This is shown in (13b) below, where *tw-anga-ná-tùmà* 'we can send' occurs at the end of an intonational phrase. If its final vowel were toneless – as would be the case if MR were a rule of deletion – we would expect to find a H_φ tone on its penultimate vowel, just as we saw in ι-final *o-ku-gulu* (11c). Instead, the verb behaves like *e-ki-hekà*, showing the same tone pattern in ι-final position that it does in φ-medial position. Like *e-ki-hekà*, then, this verb must have a low-toned final vowel, so MR must lower a grammatical **H** tone rather than delete it.

(13) Final L tones from MR block the realization of H_φ[8]

		tu-anga-na-[tú̲m-a] + **H** 'we can send'	e-ri-[tú̲ma] 'to send'
a.	φ-medial: *verb is not in* *position to* *receive* H_φ	((tu-anga-ná̲-[tùm-**à**] mu-[hékḭ] $)_\varphi)_\iota$ SM.1P-POT-AFF-[√-DES] NC.1-[CARRIER] 'we can send a carrier'	((e-rí̲-[tùm-a] mu-[hékḭ] $)_\varphi)_\iota$ AUG-NC.5A-[√-DES] NC.1-[CARRIER] 'to send a carrier'
b.	φ-final, ι-final: *verb is in* *position to* *receive* $H_\varphi + L_\iota$	((tu-anga-ná̲-[tùm-**à**] $)_\varphi)_\iota$ SM.1P-POT-AFF-[√-DES] 'we can send'	((e-rí̲-[túm-à] $)_\varphi)_\iota$ AUG-NC.5A-[√-DES] 'to send'

As shown above, a useful contrast with *tw-anga-ná-tùmà* 'we can send' is found in the corresponding infinitive *e-rí-tùma* 'to send.' Its final vowel is toneless, since no grammatical tones are assigned to infinitives. As a result, when it appears in ι-final position, its stem surfaces with a penultimate H_φ tone, just like *o-ku-gulu* 'leg' does. This establishes that the failure of H_φ to surface on *tw-anga-ná-tùmà* is not due simply to the fact that its root is underlyingly H-toned; it must instead result from a **L** tone derived from Meeussen's Rule.

Finally, grammatical tone patterns can provide phonological L tones directly, even without triggering MR. The clearest example of this comes from a tone pattern which appears in (a subset of) remote past forms. It assigns no grammatical **H** tones, but it does assign a **L** tone to the stem's final vowel. As shown below, this **L** tone blocks the assignment of H_φ in exactly the same way as a final lexical L tone or a grammatical **H** lowered to **L** by MR.

(14) H_φ blocked by grammatical **L**

a. /tu-a-luh-ḭre + L/
((tu-a-[luh-ḭrè] $)_\varphi)_\iota$
SM.1P-PAST-[√-DES]
'we have been tired for a long time'

b. /tu-a-tsé̲m-ḭre + L/
((tu-á̲-[tsèm-ḭrè] $)_\varphi)_\iota$
SM.1P-PAST-[√-DES]
'we have been happy for a long time'

[8] The pitch of the SM is not marked because the SM undergoes glide formation on the surface (cf. note 3).

We see, then, that there is a good deal of evidence for phonologically L-toned vowels that contrast with toneless vowels in their ability to block H_φ. These L tones can be underlying, derived through the application of a phonological rule, or assigned directly to the final vowel as part of a grammatical tone pattern. In the next section, we will see that they also occur in one other context: on the vowel immediately following a shifted H tone.

2.2 Phonological L tones follow shifted H tones

2.2.1 Evidence from intonational tone assignment

The first source of evidence that shifted H tones are followed by L tones comes from intonational tone assignment: whenever lexical $\underline{H}$ tones shift from the final vowel of a noun to the penultimate vowel, the assignment of H_φ is blocked. We can see this clearly when we compare the phrasal realizations of *o-mú-tì* 'tree' - a noun whose sole root vowel bears an underlying $\underline{H}$ tone – with that of *o-mu-ndu* 'person,' whose sole root vowel is toneless.

(15) H_φ blocked when $\underline{H}$ shifts from ultima

	/o-mu-tí/ 'tree' AUG-NC.3-TREE	/o-mu-ndu/ 'person' AUG-NC.1-PERSON
a. φ-medial: *not in position to receive H_φ*	(o-mú-tì ...)$_\varphi$	(o-mu-ndu ...)$_\varphi$
b. φ-final: *in position to receive H_φ*	((o-mú-tì)$_\varphi$ ...)$_\iota$	((o-mu-ndú)$_\varphi$ ...)$_\iota$
c. ι-final: *in position to receive H_φ and L_ι*	((o-mú-tì)$_\varphi$)$_\iota$	((o-mú-ndù)$_\varphi$)$_\iota$

In (15a), we can see clearly that the root of *o-mú-tì* is underlyingly H-toned; in the absence of any boundary tones, this is the only explanation for why its noun class prefix surfaces with a H tone. This leads us to the primary fact of interest in (15b): although the lexical $\underline{H}$ of *o-mú-tì* has shifted to the penult, H_φ still cannot surface on the final vowel.

This effect is also observed in nouns with disyllabic stems. We have already seen the φ-medial realizations of these nouns in (2) above. That data is repeated in (16a), together with their φ-final and ι-final forms in (16b) and (16c). Here, we see that φ-final *e-ki-kómbè* and *a-ká-húkà* fail to surface with final H_φ, even though the lexical H̲ tones which underlyingly occupy the final vowel have shifted left onto the penult. Moreover, we see from the ι-final realization of *o-mú-lùme* in (16c) that this cannot be attributed to an OCP effect obtaining between H_φ and shifted H̲; there, H̲ and H_φ appear on adjacent vowels without any problem.[9]

(16) Phrasal variation in nominal tone

	/o-ku-gulu/ AUG-NC.15-LEG	/o-mu-lú̲me/ AUG-NC.1-MAN	/e-ki-kombé̲/ AUG-NC.7-CUP	/a-ka-hú̲ká̲/ AUG-NC.14-INSECT
a. φ-medial: no boundary tones	(o-ku-gulu ... $)_\varphi$	(o-mú̲-lùme ... $)_\varphi$	(e-ki-kó̲mbè ...$)_\varphi$	(a-ká̲-hú̲kà ... $)_\varphi$
b. φ-final: H_φ assigned	(o-ku-gulú $)_\varphi$	(o-mú̲-lùmé $)_\varphi$	(e-ki-kó̲mbè $)_\varphi$	(a-ká̲-hú̲kà $)_\varphi$
c. φ-final, ι-final: H_φ, L_ι assigned	((o-ku-gúlù$)_\varphi)_\iota$	((o-mú̲-lúmè $)_\varphi)_\iota$	((e-ki-kó̲mbè$)_\varphi)_\iota$	((a-ká̲-hú̲kà$)_\varphi)_\iota$

Following Hyman and Valinande (1985) and Hyman (1990), I assume that what blocks the realization of H_φ in *e-ki-kó̲mbè* 'cup and *a-ká̲-hú̲kà* 'insect' is the same thing that blocks H_φ in *e-ki-hekà* 'truck' (11), *tu-anga-ná̲-[tùmà]* 'we can send' (12), and *tu-a-[luhirè]* 'we've been tired (for a long time)' (14): the presence of a L tone on the final vowel. The fact that every noun which surfaces with a lexical H̲ tone on its penultimate vowel also happens to surface with an active L tone on its final vowel, then, is our first sign that H tone shift and the presence of L tones are closely connected.

[9] See Ch. 3 for a full discussion of why ι-final *o-mú̲-lùme* surfaces with H_φ on the penult despite its penultimate L tone.

2.2.2 Evidence from vowel contraction

The second source of evidence that shifted H tones are followed by L tones comes from vowel contraction, by which I mean any process that resolves vowel hiatus by reducing the number of input vowels that appear in the output; this includes glide formation, vowel deletion, or coalescence, each of which is illustrated in (17) below. (Note that the input in these examples is not the underlying form, but simply the input to contraction; since contraction applies after every other rule in Kinande, the input reflects the effects of the lexical phonology as well as much of the postlexical phonology.)

(17) Hiatus resolution in Kinande (φ-medial)

a. Glide formation: /ia → ya/

e-ri-[ambal-a]	→	e-ry-[ambal-a]	'to dress (intr.)'

b. Vowel deletion: /aa → a/

e-ri-na-[ambal-a]	→	e-ri-n-[ambal-a]	'to indeed dress (intr.)'

c. Coalescence: /aį/ → e

tú-[sángà-įrè][10]	→	tú-[sáng-erè]	'we are astonished'

At this point, we are primarily interested in what happens when vowel contraction affects a VV sequence whose first vowel bears a shifted H tone and whose second vowel (in the absence of contraction) is realized with low pitch. If the second, low-pitched vowel is phonologically *toneless* (Ø) before contraction, then we should expect the result of contraction to yield a high tone, since this would preserve all input tones without inserting any new ones, in full satisfaction of MAX-H (18a), MAX-L (18b), and DEP-L (18c). This is illustrated in (19) below.

[10] The underlying form of the stem (ignoring its grammatical H tone) is /sangal+įre/. The final vowel of the root and the initial vowel of the desinence suffix *-įre* are put into contact after the intervening /l/ deletes in a process known as *imbrication*. For details on imbrication in Kinande, cf. Mutaka (1994), p. 21-23.

(18) Tonal faithfulness constraints relevant to contraction

a. MAX-H — A H tone in the input should have a correspondent in the output.

b. MAX-L — A L tone in the input should have a correspondent in the output.

c. DEP-L — A L tone in the output should have a correspondent in the input.

(19) Contraction of H-Ø should produce H

	/áa/	Max-H	Max-L	Dep-L
a.	☞ á			
b.	a	*		
c.	â			*
d.	à	*		*

However, if the low-pitched vowel in the input to contraction bears a phonologically active L tone, then we should expect contraction to yield a *falling* tone, provided that falling tones are permitted by the surface phonotactics (discussed shortly below).

(20) Contraction of H-L should produce fall

	/áà/	MAX-H	MAX-L	DEP-L
a.	☞ â			
b.	á		*	
c.	à	*		
d.	a	*	*	

With these predictions in mind, let us now examine the output of contraction in a verb form where a vowel bearing a shifted H tone stands in hiatus with a vowel that, in a non-hiatus context, would surface as low-pitched. This situation arises, for example, when the Complex Stem Tone pattern is assigned to a H-toned stem ending in the desinence *-aa*.[11] In (21) below,

[11] This desinence originates historically from *-ay-a* (still observed in the Irungu dialect of Kinande, according to Mutaka and Kavutirwaki (2011: p. xlii), and prior to vowel contraction, it behaves as a sequence of two independent vowels, as if its historical consonant were still there (Mutaka 2014). For example, it is split in two by the passive suffix *-w*, which consistently surfaces immediately before the stem-final vowel. Thus, while the

we see this with the stem [*tú̲m-ir-an-aa*] 'send for each other'. Recall from (5) above that when Complex tone in Kinande is assigned to a H-toned stem, a grammatical **H** tone is assigned to the stem-final vowel (21b) which first *spreads* to the left (21c) and then *shifts* to the left (21e). In a H-toned stem like [*tú̲m-ir-an-aa*], where the stem ends in two adjacent vowels, this means that prior to contraction, a H-toned penult stands in hiatus with a non-H final vowel. As shown in (21f), the output of contraction in this case is a final *falling* tone.

(21) Stem-final contraction of grammatical HL

a.	Stem Morphology	[tú̲m-ir-an-aa]
		[√-APP-REC-DES]
b.	Grammatical Tone Assignment (V2/FV)	[tú̲m-ìr-an-a**á**]
c.	High Tone Spread	[tú̲m-ir-an-**áá**]
d.	Prefixal Morphology	tu-a-na-[tú̲m-ir-an-**áá**]
		SM.1P-PAST-AFF-[√-APP-REC-DES]
e.	High Tone Shift	tu-a-ná̲-[tùm-ir-**á**n-**á**à]
f.	Contraction	tu-a-ná̲-[tùm-ir-**á**n-**â**]
		'we did indeed send for each other'

The fact that a final falling tone is observed here provides clear evidence that a shifted grammatical **H** tone is followed by a L tone – i.e. not Ø – prior to contraction. Moreover, this L tone cannot be identified as simply the ι-final boundary tone $L_ι$. This is because, as shown in (22), we also see a final fall in the same word in φ-medial position. Thus, the word-final L tone must be connected with the leftward shift of the final grammatical **H** tone.

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passive of infinitive *e-ri-[hum-a]* 'to hit' is *e-ri-[hum-w-a]* 'to be hit', the passive of habitual *tu-ká-ndi-[hum-a-a]* 'we hit' is *tu-ká-ndi-[hum-a-w-a]* 'we are hit'. In addition, the penultimate *-a* vowel of *-a-a* is exceptionally targeted by penultimate lengthening, which normally passes over a final vowel-vowel sequence to target the vowel of the penultimate syllable. We will see in chapter 3, for example, that the noun *e-ki-komee* 'snail' surfaces in ι-final position as [e-ki-ko:méè], but the verb in (21) above, with its final *-a-a* desinence, surfaces as [tw-a-ná-tùmiránâ:].

(22) Stem-final contraction of grammatical HL (φ-medial position, pre-H)

a.	Underlying	((tu-a-na-[túm-ir-an-aa]	Ø-kopóo $)_{\varphi}$ $)_{\iota}$
		SM.1P-PAST-AFF-[√-APP-REC-DES]	NC.9-CUP
b.	Pre-contraction	((tu-a-ná-[tùmir**ánáà**]	kópóò $)_{\varphi}$ $)_{\iota}$
c.	Post-contraction	((tw-a-ná-[tùmir**ánâ**]	kópô[12] $)_{\varphi}$ $)_{\iota}$
		'we did indeed send a cup to each other (recently)'	

In (21) and (22), then, the emergence of a surface falling tone supports the idea that shifted H tones are followed by L tones. As noted above, this is the predicted output of a H-L input, provided that falling tones are phonotactically permitted. However, there is one circumstance where this same input yields a different result: when the vowel resulting from contraction is followed on the surface by a vowel with low pitch. In that case, the result of contraction is always a *high* tone rather than a falling tone. This may be seen, for example, when the verb seen in (21) and (22) above is followed by a noun whose first vowel surfaces with low pitch.

(23) Stem-final contraction of grammatical HL (φ-medial position, pre-L)

a.	Underlying	((tu-a-na-[túm-ir-an-aa]	ɲ-gulube $)_{\varphi}$ $)_{\iota}$
		SM.1P-PAST-AFF-[√-APP-REC-DES]	NC.9-PIG
b.	Pre-contraction	((tu-a-ná-[tùmir**ánáà**]	ŋ-gulúbè $)_{\varphi}$ $)_{\iota}$
c.	Post-contraction	((tw-a-ná-[tùmir**áná**]	ŋ-gulúbè[13] $)_{\varphi}$ $)_{\iota}$
		'we sent a pig to each other'	

What we are seeing here is *tonal absorption* whereby (what would otherwise be) a *falling* tone is changed to a *high* tone before a low-pitched surface vowel (i.e. HL-L → H-L: Hyman and

[12] [kópô] is an unaugmented class 9 noun with a null noun class prefix. Its underlying root is /kopóo/, with a penultimate H tone which shifts to the initial vowel in surface forms. Its final surface fall results from the contraction of H_{φ} and L_{ι} assigned to its final two vowels (cf. chapter 3, section 5).

[13] [ŋgulúbè] is an unaugmented class 9 noun with a nasal noun class prefix. Its underlying root is /gulube/, and its penultimate and final L tones result from the assignment of H_{φ} and L_{ι}.

Schuh 1974).[14] Adopting a constraint from Akinlabi and Mutaka (2001), I will assume that tonal absorption is driven by the markedness constraint *HL-L.[15]

(24) *HL-L A falling tone cannot surface immediately before a phonetically L-toned vowel.

The phonetic basis of *HL-L lies both in the production and in the perception of tone. Contour tones require more effort than level tones because their execution requires faster laryngeal movements (Zhang 2002). That being the case, contour tones are especially avoided in contexts where they cannot be easily distinguished from level tones: there is little purpose in a more effortful movement that sounds the same as a less effortful one. This is why falling tones are avoided before low-toned vowels: a HL-L sequence will differ from a H-L sequence only in rather subtle details of timing, which may (especially in rapid speech) be easily lost in transmission. Before a phonetically low-toned vowel, then, it makes sense to neutralize the surface HL/H contrast in favor of the less effortful H; Hyman and Schuh (1974) note that this occurs in many languages, including Mende, Kikuyu, and Hausa.

I will implement the neutralization of HL-L and H-L with a ranking of *HL-L and MAX-H above MAX-L. In (25), we see how this ranking derives the tonal absorption seen in (23) above.

(25) Contraction of H-L before L/Ø yields surface H

		/tumiránáà ŋgulúbè/	*HL-L	Max-H	Max-L
a.	☞	tumiráná ŋgulúbè			*
b.		tumiránâ ŋgulúbè	*!		
c.		tumiránà ŋgulúbè		*!	

[14] Mutaka (1994: p.139) posits a rule of Contour Simplification that produces this effect.

[15] Akinlabi and Mutaka (2001) posit that surface falling tones arise when underlying H tones are converted to falls so that they are not perfectly aligned with their input positions, and thereby satisfy AVOID-SPONSOR (cf. (64) below). In their analysis, then, the role of *HL-L is to block this conversion from H to HL when H tone is followed by a low-pitched vowel.

With the basic mechanics of contraction and tonal absorption worked out, we are now in position to appreciate one additional set of forms: verbs with H-toned vowel-initial roots. In these forms, since most prefixes are vowel-final, there is typically an underlying vowel-vowel sequence at the prefix-root boundary. Assuming that tone shift in these forms behaves the same as in forms with consonant-initial roots, we can expect that in the input to contraction (which, again, applies after all other processes), the first vowel of this sequence will bear the shifted root H̲ while the second vowel bears either Ø or L. In (26) below, we see this for infinitives with VC and VCVC roots; infinitives with CVC roots are given for comparison.

(26) Input to contraction in H-toned infinitives: VC, VCVC, CVC

		/e-ri-[ó̲t-a]/ AUG-NC.5A-[BASK-FV]	/e-ri-[ó̲mbol-a]/ AUG-NC.5A-[FILCH-FV]	/e-ri-[tú̲m-a]/ AUG-NC.5A-[SEND-FV]
a.	φ-medial: no boundary tones	(e-rí̲-[òt-a] …)$_{\varphi}$	(e-rí̲-[òmbol-a] …)$_{\varphi}$	(e-rí̲-[tùm-a] …)$_{\varphi}$
b.	φ-final: H_{φ} assigned	(e-rí̲-[òt-á])$_{\varphi}$	(e-rí̲-[òmbol-á])$_{\varphi}$	(e-rí̲-[tùm-á])$_{\varphi}$
c.	φ-final, ι-final: H_{φ}, L_{ι} assigned	((e-rí̲-[òt-â][16])$_{\varphi}$)$_{\iota}$	((e-rí̲-[òmból-à])$_{\varphi}$)$_{\iota}$	((e-rí̲-[túm-à])$_{\varphi}$)$_{\iota}$

In assessing these forms for evidence that L tones follow shifted Hs, the same logic applies as before. In the two forms with vowel-initial roots, if the second vowel is toneless in the input to contraction, then we should expect its output to yield a H tone *in all circumstances*. If this vowel bears a L tone, however, we should expect contraction to yield a falling-toned vowel before a surface high or falling tone, and a high-toned vowel *only before surface Ø or L tone*. As shown in (27), this latter pattern is exactly what we see. Contraction yields a falling

[16] In forms with VC roots, both H_{φ} and L_{ι} are exceptionally assigned to the final vowel, producing a final falling tone. See Mutaka and Hyman (1990: pp. 96-97), Mutaka (1994: pp. 18, 42-44), and Jones (2011) for varying explanations.

tone if a high or falling tone (here, supplied by H_φ or a $H_\varphi L_\iota$ combination) follows, and a high tone only if the following tone is Ø.

(27) Output of contraction in H-toned infinitives: VC, V̦CVC, CVC

	/e-ri-[ó̱t-a]/ AUG-NC.5A-[BASK-FV]	/e-ri-[ó̱mbol-a]/ AUG-NC.5A-[FILCH-FV]	/e-ri-[tú̱m-a]/ AUG-NC.5A-[SEND-FV]
a. φ-medial: no boundary tones	(e-ry-[ó̱t-a] ...)$_\varphi$	(e-ry-[ó̱mbol-a] ...)$_\varphi$	(e-rí̱-[tùm-a] ...)$_\varphi$
b. φ-final: H_φ assigned	(e-ry-[ô̱t-á])$_\varphi$	(e-ry-[ó̱mbol-á])$_\varphi$	(e-rí̱-[tùm-á])$_\varphi$
c. φ-final, ι-final: H_φ, L_ι assigned	((e-ry-[ô̱t-â])$_\varphi$)$_\iota$	((e-ry-[ô̱mból-à])$_\varphi$)$_\iota$	((e-rí̱-[túm-à])$_\varphi$)$_\iota$

In addition, note that this data provides evidence against an alternate explanation for falling tones based on the OCP. According to this interpretation, falling tones would result from the epenthesis of a L tone whose purpose is to ensure that lexical H tones are not adjacent to H_φ.[17] The problem with this explanation is that lexical H tones and H_φ have no difficulty occurring next to one another in forms whose roots are consonant-initial (cf. 27c). That being the case, there does not seem to be any straightforward OCP constraint that would force L tone epenthesis in vowel-initial forms.[18] Since I do not see any other constraint that

[17] The idea that the L component of the fall is epenthetic is pursued by Akinlabi and Mutaka (2001) in their AVOID-SPONSOR-based account of leftward shift (cf. (64)). In their analysis, the purpose of epenthesis is to satisfy AVOID-SPONSOR: they appear to assume that if a H tone appears on its sponsoring vowel subsequent to vowel contraction, it will nevertheless satisfy AVOID-SPONSOR so long as a L tone follows it on the same vowel. They are not fully explicit, however, as to why AVOID-SPONSOR is avoided in this case. It is worth noting that Akinlabi and Mutaka (2001) are attempting to analyze leftward shift and boundary tone assignment within a fully parallel framework. One of the limitations posed by this framework is that it is very difficulty to account for the clearly sequential interaction of tone assignment and vowel contraction.

[18] If we wished to pursue the OCP-based approach, we might – based on the fact that the H-H sequence in *e-rí-tùma* falls across a prefix-stem boundary, while the HL-H sequence in *e-ry-óta* falls entirely within the stem - posit that *stem-internal* H-H sequences are particularly marked (and so repaired through L tone epenthesis) while other H-H

would have this effect either, I conclude that the L tones are not epenthetic but present in the input. Note, incidentally, that this approach makes a strong prediction about the location of surface falling tones in Kinande: that they can only surface as the result of vowel contraction. This is true, and it is not predicted if the L components of falling tones are considered to be epenthesized for the sake of the OCP.

2.3 Summary

The conclusion of this section, then, is that within the postlexical phonology, shifted H tones are systematically followed by active L tones. These L tones are able to block the assignment of H_{φ}, and give rise to falling tones when they contract with the H tones that precede them. This situation is predicted under the current account of tone shift described in section 1: if tone shift consists of the expansion of a HL melodic unit, we naturally expect specified L tones to follow H tones. Thus, the presence of L tones following shifted H tones provides evidence for prior HL melodic units. Having established this, we can now move earlier in the derivation, to examine the formation of the melodic units themselves.

3 Deriving HL at the LP-PLP Watershed

As described in the introduction, I envision the LP-PLP Watershed (LP-PLPW) as a transitional zone between the LP and the PLP in which two major representational changes take place. First, phonological material evaluated by the LP is organized into two phrase-level prosodic constituents, namely the phonological phrase and the intonational phrase. As

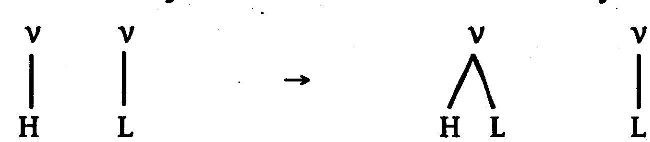
sequences are not. I will not pursue this idea further, but note in passing that this approach would require very late reference to word-internal phonological domains: since lexical H̲ tones and phrasal H_{φ} tones become adjacent only after the effects of coalescence in V-initial forms, the stem-restricted OCP constraint would need to apply within the last stratum of the postlexical phonology (the ι stratum: cf. chapter 3).

discussed in chapter 3, these constituents are then evaluated cyclically in the PLP proper. Second, all H tones that emerge from the LP are converted to falling tones before being evaluated by the PLP. Both of these changes, I assume, are mediated via constraint ranking. Here, I focus just on the conversion of H to HL, and leave the formulation of the morphosyntax-prosody interface constraints to future work.[19]

As stated in section 1, I assume that individual tones are obligatorily grouped into larger constituents called *melodic units* (v's). In the LP, tones and melodic units are always identical, with every H or L tone grouped into its own v. Thus, the *melodic inventory* of the LP consists simply of $(H)_v$ and $(L)_v$, represented more perspicuously in (28a). In the output of the LP-PLPW, tones and melodic units are not always identical, since every melodic unit that contains a H tone also contains a following L. The melodic inventory of the LP-PLPW, then, consists of $(HL)_v$ and $(L)_v$ (28b).

(28) Melodic inventories of LP and LP-PLPW

a. Melodic inventory: LP b. Melodic inventory: LP-PLPW



I assume that the melodic inventory of (28a) is favored by SIMPLE-v (29a), which demands that each tone be contained within its own melodic unit, while the inventory in (28b) is favored by $*H)_v$ (29b), which prohibits melodic units which end in H tones. This latter constraint, whose formulation is admittedly stipulative, is intended as means of expressing the common preference for the basic units of tone and intonation to be dynamic *falls* rather than simple H tones. This preference has been famously observed, for example, in Swedish (Bruce

[19] See Hyman (1990) for some discussion of this problem.

1977), Japanese (McCawley 1968; Beckman and Pierrehumbert 1986) and Luganda (Heny 1974; Hyman and Katamba 1993).

(29) Differing preferences for melodic inventories

a. SIMPLE-v — Every tone is contained within its own melodic unit.

b. $*H)_v$ — A melodic unit cannot end in a H tone.

The conversion of $(H)_v$ to $(HL)_v$, then, is accomplished via a reranking of SIMPLE-v and $*H)_v$. While SIMPLE-v dominates $*H)_v$ in the LP, thus favoring the inventory in (28a), $*H)_v$ dominates SIMPLE-v in the LP-PLPW, favoring the inventory in (28b). In addition, in the LP-PLPW both $*H)_v$ and MAX-H must dominate DEP-L, to ensure that $*H)_v$ is satisfied through conversion of $(H)_v$ to $(HL)_v$ rather than through deletion of input H tones. This is shown in (30).

(30) Fall Conversion: $(H)_v \rightarrow (HL)_v$[20]

		v | H	$*H)_v$	MAX-H	DEP-L	SIMPLE-v
a.	☞	v /\ H L			*	*
b.		v | H	*! W		L	L
c.		Ø		*! W	L	L

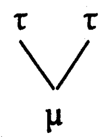
While this ranking ensures that L is inserted to convert $(H)_v$ to $(HL)_v$, additional rankings ensure that the epenthetic L tone associates to the same vowel as the preceding H tone, so that it forms an intermediate falling tone in violation of *CROWD (31a). In particular, this outcome arises because *CROWD is dominated not just by $*H)_v$ and MAX-H, but also by

[20] To aid in establishing rankings, I provide both violation marks and comparative marks in tableaux. On the latter, see Prince (2002). Briefly, constraints that favor the winning candidate are marked with W, constraints that favor losing candidates are marked with L, and constraints that penalize both equally are marked with ~.

*FLOAT (31b: Myers 1997), which demands that the L link to some vowel, and by PRESERVE-Ø (31c), which ensures that it does not link to any vowel that is entirely toneless in the input. These rankings are illustrated in (32).

(31) Constraints governing tone-vowel association at the LP-PLPW

a. *CROWD — Violated once for each instance of the structure



b. *FLOAT — Every tone must be linked to some vowel.

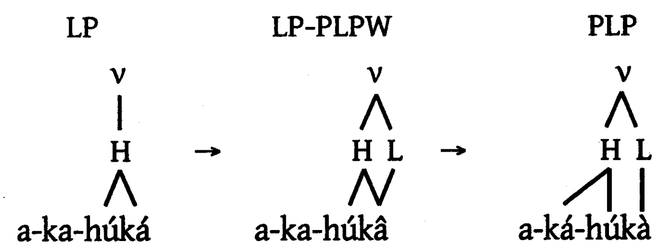
c. PRESERVE-Ø — If an input vowel V has an output correspondent V′, one violation is incurred if V′ but not V is associated with some tone τ.

(32) Conversion of lexical H to postlexical HL

	v | H | V V́ V	*H)v	*FLOAT	PRESERVE-Ø	MAX-H	*CROWD	DEP-L	SIMPLE-v
a.	☞ v /\ H L \/ V V̂ V					*	*	*
b.	v | H | V V́ V	*! W				L	L	L
c.	v /\ H L \ V V́ V		*! W			L	* ~	* ~
d.	v /\ H L \ \ V V́ V̀			*! W		L	* ~	* ~
e.	V V V				*! W	L	L	L

This basic interaction will also affect H tones which are linked to multiple vowels in the output of the LP. We have already seen (in (4), for example) that multiply-linked Hs can arise from the leftward spreading of grammatical **H** tones. They can also be present in underlying representations: following Mutaka (1990), I assume that nouns like *a-ká-húkà* 'insect,' which surface with lexical H tones on the first vowel of the root and also the first vowel before it, underlyingly contain a single H tone linked to both root vowels. Leftward shift then applies to these "geminate" Hs in the same way that it affects singletons: it first forms an intermediate representation at LP-PLPW which ends in a final falling tone, and then resolves the resulting falling tone in the PLP by expanding its melodic unit to the left.[21]

(33) Derivation of *a-ká-húkà* 'insect'



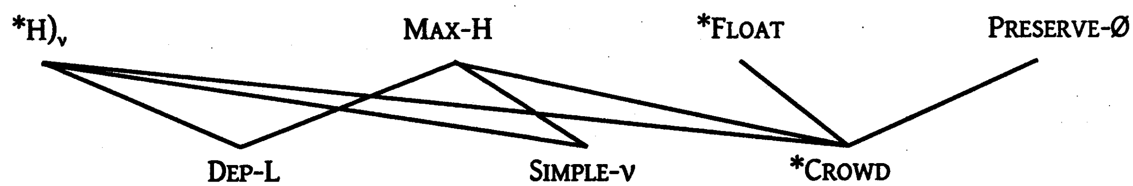
As shown in (34) below, the first step in this process – i.e. the one occurring in the LP-PLPW – is carried out with the same constraint ranking used in (32) to derive falls from singleton Hs. We therefore arrive at the grammar for LP-PLPW Fall Conversion shown in (35).

[21] Interesting historical evidence for the leftward shifting of multiply-associated H tones comes from Kenstowicz (2008), who shows that doubly-linked H tones in Kinande nouns must have arisen before tones had shifted to the left. In particular, among nouns with C_1VC_2V stems, doubly-linked H tones are particularly common when C_2 is voiceless (e.g. *e-kí-sákà* 'bush'). This suggests initial spreading from $C_1VC_2\acute{V}$ to $C_1\acute{V}C_2\acute{V}$, with toneless C_2 favoring spreading more than voiced C_2 due to the tendency of voiced consonants to reduce f0, followed by leftward shift onto the preceding noun class prefix (e.g. **e-ki-saká* → **e-ki-sáká* → *e-kí-sákà*).

(34) Conversion of a multiply-linked H to a multiply-linked fall

		*H)$_v$	*FLOAT	PRESERVE-Ø	MAX-H	*CROWD	DEP-L	SIMPLE-v
	v – H – V V́ V́ V							
a.	☞ v – H L – V V́ V̂ V					*	*	*
b.	v – H – V V́ V́ V	*! W				L	L	L
c.	v – H L – V V́ V́ V		*! W			L	* ~	* ~
d.	v – H L – V V́ V́ V̂			*! W		L	* ~	* ~
e.	V V V V				*! W	L	L	L

(35) LP-PLPW Grammar for Fall Conversion



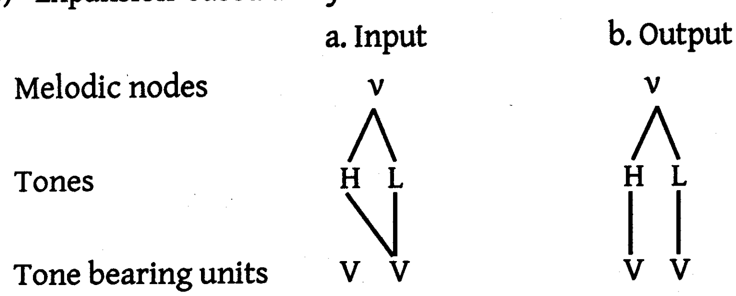
Before proceeding on to the next section, two aspects of this grammar deserve brief discussion. The first is the ranking of *H)$_v$ above SIMPLE-v. As discussed above, this ranking distinguishes the LP-PLPW grammar from the LP grammar, in which SIMPLE-v dominates *H)$_v$. The reversal of this ranking in the transition from the LP to the LP-PLPW is what explains, in my analysis, both *when* tone shift occurs and *which tones* it affects. As we will see in chapter 3, tone shift occurs in the first evaluation of the PLP, when phonological phrases are evaluated. This is predicted if H tones from the LP are converted to falls in a transitional stage before the PLP proper. In addition, by converting Hs from the LP to falls at just this point, we naturally predict why all *lexical* and *grammatical* tones shift to the left, but not all *intonational* high tones. While the former are present in the input to Fall Conversion at the LP-PLPW, the latter are inserted only after this conversion takes place. We therefore predict that intonational H tones should shift to the left only if they are crowded on the right by additional intonational tones. As we will see in chapter 3, this prediction is correct.

The second aspect of the LP-PLPW grammar worth noting is its ranking of MAX-H above *CROWD. As we will see in the next section, the opposite ranking is required in the PLP to explain cases in which H tones delete when they cannot shift to the left. The stratal analysis adopted here is able to capture this, since it has the flexibility to state different constraint rankings at different points in the phonology.

4 Constraint-based analysis of tone shift

In this section, I lay out the formal analysis of tone shift as the postlexical expansion of a $(HL)_v$ melodic unit. In this analysis, tone shift takes as its input a representation like (36a), where $(HL)_v$ is associated to a single vowel, and gives as its output a representation like (36b), where $(HL)_v$ expands by shifting its high tone component to the left.

(36) Expansion-based analysis of tonal shift



Since tones do not move without cause, tone shift must violate one or more faithfulness constraints that seek to keep tones in place. Among these constraints, I assume, are members of the Linearity constraint family, which seek to preserve input precedence relations between phonological elements. Specifically, I assume a sub-family of Linearity(V/τ) constraints including Linearity(V,H), Linearity(V,L), Linearity(H,V) and Linearity(L,V). As made clear by their definitions in (37), these constraints demand that if their first arguments precede their second arguments in the input, they must do so in the output as well. For example, Linearity(V,H) (37a) demands that if a given vowel precedes a H tone in the input, it should also precede it in the output, and thereby penalizes leftward H tone shift. Linearity(L,V) (37d), on the other hand, demands that if a L tone precedes a vowel in the input, it should precede it in the output as well, and therefore penalizes rightward low tone shift.

(37) Tone/Vowel Linearity constraints

a.	Linearity(V,H)	If an input vowel V has an output correspondent V′, and if an input high tone H has an output tone H′, then **if V < H then V′ < H′**.
b.	Linearity(V,L)	If an input vowel V has an output correspondent V′, and if an input low tone L has an output tone L′, then **if V < L then V′ < L′**.
c.	Linearity(H,V)	If an input vowel V has an output correspondent V′, and if an input high tone H has an output tone H′, then **if H < V then H′ < V′**.
d.	Linearity(L,V)	If an input vowel V has an output correspondent V′, and if an input low tone L has an output tone L′, then **if L < V then L′ < V′**.

Since the only kind of tone shift that we observe in Kinande is leftward H tone shift, the constraint that will be most relevant in the analysis to follow is Linearity(V,H). I assume that the other constraints are undominated. To save space, I will generally collapse Linearity(H,V) and Linearity(L,V) into a single constraint Linearity(τ,V), which is violated by the rightward movement of any tone.

Violations of Linearity(V,H) are compelled, of course, by *Crowd. By ranking *Crowd above Linearity(V,H), we ensure that an output in which input (HL)$_v$ expands to the left will be favored over a more faithful output in which (HL)$_v$ is linked to a single vowel. For example, this ranking ensures that [e-rí-tùma] (38a) – the actually observed (φ-medial) output for the postlexical input /e-ri-tûma/ 'to send' – is favored over the fully faithful candidate in (38b). Of course, one might also alleviate tonal crowding by expanding (HL)$_v$ to the right (38c), deleting an input H tone (38d), or deleting an input L tone (38e). Since none of these repairs are observed, we can conclude that Linearity(V,H) is dominated not just by *Crowd, but also Linearity(V,L), Max-H and Max-L.

(38) Tone shift repairs tonal crowding: *Crowd, Linearity(τ,V), Max-H, Max-L » Linearity(V,H)

	(HL)$_v$ V e-ri-tûma	*Crowd	Linearity(τ,V)	Max-H	Max-L	Linearity(V,H)
a.	☞ (H L)$_v$ | | e-rí-tùma					*
b.	(HL)$_v$ V e-ri-tûma	*! W				L
c.	(H L)$_v$ | | e-ri-túmà		*! W			L
d.	(L)$_v$ | e-ri-tùma			*! W		L
e.	(H)$_v$ | e-ri-túma				* W	L

Having established the basic ranking which drives tone shift, we can now examine more complicated cases in which high tones shift onto vowels which underlyingly bear tones of their own. First, consider the case where a H tone shifts onto a vowel which bears an underlying L tone. This case arises, for instance, when a verb with a final grammatical L tone is immediately followed by a noun whose initial vowel bears HL. As shown in (39), the observed result is that the noun's H tone shifts left onto the verb's final vowel, overwriting the L tone which was there previously.

(39) tu-anga-na-[t<u>û</u>m-à] ŋ-g<u>ô</u>kò → tu-anga-n<u>á</u>-[tùm-<u>á</u>] ŋ-gòkò
SM.1P-POT-AFF-[SEND-DES] NC.9-CHICKEN
'we can send a chicken'[22]

In this situation, then, where a L tone and a shifting H compete for the same vowel, the L tone deletes. This establishes a ranking of MAX-H above MAX-L (40b). Interestingly, however, this ranking is not sufficient to select the attested candidate as optimal. This is because the attested candidate, in satisfying *CROWD by overwriting a L tone with a shifting H tone, ends up violating both MAX-L and LINEARITY(V,H) (40a). It is therefore less harmonic, according to the current constraint hierarchy, than a candidate which satisfies *CROWD simply by deleting the L tone which crowds H in the input. This incurs the same number of MAX-L violations as the attested candidate, while avoiding any violations of LINEARITY(V,H) (40c).

[22] The pre-shift derivation of the verb in this sentence is shown in (12).

(40) Leftward tone shift causes tonal deletion; wrong deletion site favored

	L H L L | V | ... tumà ŋ-gôkò	*CROWD	MAX-H	MAX-L	LINEARITY(V,H)
a.	☞ H L L / | | ... tumá ŋ-gòkò			*	*!
b.	L L L | | | ... tumà ŋ-gòkò		*! W	L	L
c.	💣 L H L | | | ... tumà ŋ-gókò			* ~	L

In order for the desired candidate to emerge as optimal, it must fare better on at least one constraint ranked above LINEARITY(V,H). As the candidates are currently represented, it is difficult to see what this constraint might be. However, when we represent not just the tones of the candidates but also their melodic units, we see that the attested "H tone shift + L deletion" candidate in (40a) preserves the melodic structure of the input H, keeping it within a $(HL)_v$ melodic unit, while the improperly favored "L-deletion only" candidate in (40b) does not, causing it to surface within $(H)_v$.

(41) Candidates represented with v structure

a.	H deletion candidate (attested output)	Input	b.	L deletion candidate (incorrectly favored)
	v v Λ | H L L ⁄ / | ... tumá ŋ-gòkò	⇐ v v v | Λ | L H L L | V | ... tumà ŋ-gôkò ⇏		v v v | | | L H L | | | ... tumà ŋ-gókò

I therefore posit the faithfulness constraint PRESERVE-FALL (42), which is violated whenever a H tone belongs to a dynamic falling v in the input but to a simple high v in the output.[23] Ranked above LINEARITY(V,H), this constraint correctly eliminates (40c) and so ensures that the actually attested output is selected as optimal. This is demonstrated in (43).

(42) PRESERVE-FALL — Violated once if an input H tone is followed by L within its melodic unit while its output correspondent is not (i.e. penalizes a mapping of $(HL)_v$ to $(H)_v$).

(43) PRESERVE-FALL prevents deletion of v-final L, compels leftward shift

	v v v L HLL … tumà ŋ-gôkò	*CROWD	PRESERVE-FALL	MAX-H	MAX-L	LINEARITY(V,H)
a.	☞ v v HLL … tumá ŋ-gòkò				*	*
b.	v v v L H L … tumà ŋ-gókò		*! W		* ~	L

[23] An alternate (and perhaps more obvious) interpretation of (41) is that $*H)_v$, which was crucial to the derivation of falling melodic nodes at the LP-PLPW, remains active in the PLP proper. This interpretation cannot be correct. The problem is that (as we will shortly see below) the constraint which bans the mapping from input $(HL)_v$ to output $(H)_v$ will need to be ranked above MAX-H in order to account for the fact that when input $(HL)_v$ cannot expand to the left, it surfaces as $(L)_v$. If this outcome results from a ranking of $*H)_v$ above MAX-H, this will cause problems for the assignment of H_φ boundary tones, which – as we will see in chapter 3 – are assigned in the same evaluation where H tones from the LP shift left. In particular, the ranking would forbid H_φ tones from surfacing, since they are contained within their own melodic units without a following L (as revealed by the fact that they do not undergo tone shift unless they are crowded from the right by additional boundary tones).

Preserve-Fall is also crucial in explaining another otherwise puzzling fact: when an input (HL)$_v$ cannot expand because there are no vowels to the left of it, *Crowd is satisfied through deletion of the v's H tone. In (44) below, we see this for (HL)$_v$ originating on the class 7 subject marker *ki-*. In (44a), (HL)$_v$ expands onto the negative prefix *si-*, and in (44b) it expands onto the relative prefix *e-*. In (44c), however, where there is no morpheme before *ki-* that (HL)$_v$ can expand onto, its underlying H tone deletes.

(44) Underlying H of SM deletes when shift is impossible[24]

	LP Output		PLP Input		PLP Output
a.	si-kí-Ø-[bond-**ʃré**] NEG-SM.7-PRES-[√-DES] 'it (cl. 7) is not thin'	→	si-kî-Ø-[bond-**ʃrê**]	→	sí-kì-Ø-[b**ó**nd-ʃrè]
b.	e-kí-Ø-[bond-**ʃré**] REL-SM.7-PRES-[√-DES] 'which is thin (cl. 7)'	→	e-kî-Ø-[bond-**ʃrê**]	→	é-kì-Ø-[b**ó**nd-ʃrè]
c.	kí-Ø-[bond-**ʃré**] SM.7-PRES-[√-DES] 'it (cl. 7) is thin'	→	kî-Ø-[bond-**ʃrê**]	→	kì-Ø-[b**ó**nd-ʃrè]

The reason why this behavior is puzzling is that we have already established that in the PLP, Max-H is ranked above Max-L (cf. 40). We should therefore expect that if any tone belonging to input (HL)$_v$ were to delete in order to satisfy *Crowd, it should be its L tone. However, we can make sense of this fact with Preserve-Fall: by ranking Preserve-Fall above Max-H, we predict deletion of an input H tone rather than deletion of an input L tone because while deleting the L tone leads to a violation of Preserve-Fall, deleting the H tone (vacuously) satisfies it. This is shown in (45).

[24] The verbal roots of these forms are H-toned, but their lexical H tones do not surface for reasons discussed in chapter 4. I have excluded these H tones from both the input and output representations for expositional ease.

(45) If shift is impossible, PRESERVE-FALL prevents deletion of v-final L, compels deletion of H

	v Λ H L V kî ...	*CROWD	PRESERVE-FALL	MAX-H	MAX-L	LINEARITY(V,H)
a.	☞ v | L | kì ...			*		
b.	v Λ H L V kî ...	*! W		L		
c.	v | H | kí ...		*! W	L	* W	

The same phenomenon can be observed in nouns, though cases which illustrate it are somewhat difficult to find. This is because almost all nouns obligatorily contain augment vowels (as well as noun class prefixes) in utterance-initial position, so that any H tone originating on a root-initial vowel will almost always have a vowel before it that it can shift onto. There is, however, a restricted class of kinship terms and names which systematically lack augment vowels, as well as the class prefixes normally expected of animate nouns. In the singular, they take no prefixes at all, but instead appear in a bare root form. In the plural, they are not preceded by normal class 2 prefixes and augment vowels, but instead by the class 2 demonstrative pronoun *a-b-o* 'those' (Valinande 1984: p. 477-481). In (46a), this is shown with the underlyingly toneless *nįna* 'mother.' For comparison with normal animates, the singular and plural forms of toneless *o-mu-hekį* 'carrier' are given in (46b).

(46) Singular and plural forms of *niɲa* 'mother' and *o-mu-hekį* 'carrier' (φ-medial)

		Singular	Plural
a.	*-niɲa* 'mother'	niɲa	a-b-o niɲa
		MOTHER	AUG-NC.2-DEM MOTHER
b.	*-hekį* 'carrier'	o-mu-hekį	a-ba-hekį
		AUG-NC.1-CARRIER	AUG-NC.2-CARRIER

With this background established, we can now see the significance of ^{H}*tataa* 'father,' whose singular and plural forms are given in (47). Looking just at the singular form, this noun appears to be toneless, just like *niɲa* 'mother.' However, we see from its plural form that it must bear an underlying H tone on its initial vowel. This is because it, unlike *niɲa*, places a H tone on the final vowel of *a-b-o*. (Again, for comparison with normal animates, the singular and plural forms of tonally comparable *o-mú-lume* are given in (47b)). In the singular, then, this underlying H tone – just like the H of the subject marker *ki-* in (44c) – must simply delete.

(47) Singular and plural forms of ^{H}*tataa* 'father' and *o-mú-lume* 'man' (φ-medial)

	Root (underlying)	Singular	Plural
a.	*-tátaa* 'father'	tàtaa	a-b-ó tàtaa
		FATHER	AUG-NC.2-DEM FATHER
b.	*-lúme* 'man'	o-mú-lùme	a-bá-lùme
		AUG-NC.1-MAN	AUG-NC.2-MAN

Again, we can understand this deletion as resulting from a ranking of *CROWD and PRESERVE-FALL above MAX-H. This ranking is demonstrated in (48). Note also that the failure of candidate (48d) demonstrates that MAX-H must also be dominated by LINEARITY(τ,V). This explains why an initial falling tone is not resolved through rightward shift of its low tone rather than through deletion of its H tone.

(48) Preserve-Fall prevents deletion of ν-final L, compels deletion of H (just as in (45))

	ν HL tâtaa	*Crowd	Preserve-Fall	Linearity (τ,V)	Max-H	Max-L	Linearity (V,H)
a.	☞ ν L tàtaa				*		
b.	ν HL tâtaa	*! W			L		
c.	ν H tátaa		*! W		L	* W	
d.	ν HL tátaà			*! W	L		

We can now consider the most complicated case of tone shift: when a HL ν expands onto a vowel which, in the input, bears another HL ν of its own. This can occur, for example, when a noun with a final underlying H tone is followed by an adjective whose root bears an initial H tone, and whose noun class prefix contains no vowel. As shown in (49), what we see in this case is that both underlying H tones survive, each surfacing one vowel to the left.

(49) Doubled shift of adjacent underlying H tones (φ-medial)

	Underlying		PLP Input		PLP Output
a.	e-ɲ-geté ɲ-kée	→	e-ŋ-getê ŋ-gêe	→	e-ŋ-gété ŋ-gèe
	AUG-NC.9-SHOE NC.9-SMALL 'a small shoe'				

In (49), what appears to happen in the transition from the PLP input to the PLP output is the following:

1. The second (HL)$_v$ expands by shifting its H tone to the left.
2. The L tone of the first (HL)$_v$ deletes, overwritten by the H tone shifting from its right.
3. The H tone of the first (HL)$_v$ shifts to the left.

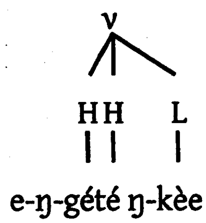
However, as shown by the tableau in (50) below, if the attested output results from this process, it cannot be derived from our current constraint hierarchy. This is because overwriting the first melodic unit's L tone causes its H tone to be v-final, in violation of PRESERVE-FALL (50a). We have just seen that PRESERVE-FALL dominates MAX-H (45c, 48c), so any candidate that avoids this fate by deleting H tones instead of v-final L tones will emerge as more harmonic. One such candidate is (50b), which deletes the H tone from the second (HL)$_v$ so that it does not need to expand and overwrite the L of the first.

(50) Doubled shift of adjacent underlying H tones (failed derivation)

		*CROWD	PRESERVE-FALL	MAX-H	MAX-L	LINEARITY(V,H)
		v v HL HL e-ŋ-getê ŋ-gêe					
a.	☞ v v H HL e-ŋ-gété ŋ-gèe		*		*	**
b.	💣 v v HL L e-ŋ-gétè ŋ-gèe		L	* W	* ~	L

Inspecting the tableau above, it is clear the attested candidate's downfall is its PRESERVE-FALL violation: if this violation could be removed, candidate (50b) would lose because of its MAX-H violation. I suggest, then, that the output of (49) results not in candidate (50a), where one melodic unit with a H tone precedes another with HL, but rather the one in (51) below, where the first H tone is "re-melodified" into the adjacent HL melodic unit.

(51) Remelodification of H tones



I will assume that this "re-melodification" is a free operation, which does not violate faithfulness. It is therefore comparable to resyllabification: just as segments can be reorganized within syllables to satisfy markedness constraints such as ONSET and *CODA, so too can tones be reorganized within melodic units so that H tones which form part of a falling v in the input will continue do so in the output, in satisfaction of PRESERVE-FALL. Under these assumptions, as shown in (52) below, the re-melodified candidate in (51) emerges as optimal. In addition, note that the tableau in (52) provides evidence of my earlier assertion that L tones do not shift to the left in Kinande. If L tones could shift to the left, then the expansion of adjacent HL melodic units would not lead to the deletion of any L tones, but would simply yield a H-L-H-L tone pattern realized over four vowels: *[é-ŋ-gèté ŋ-kèe] (52d). Ranking LINEARITY(V,L) above MAX-L eliminates this possibility, making it more costly to shift a L tone than to delete it.

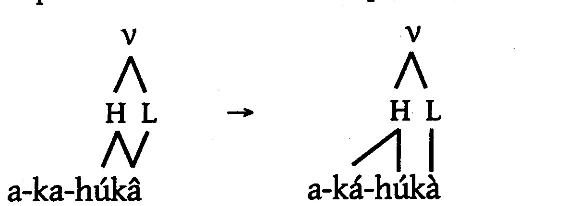
(52) Success of re-melodified H

	ν ν $H_1L_1\ H_2L_2$ e-ŋ-getê ŋ-kêe	LINEARITY(V,L)	PRESERVE-FALL	Max-H	MAX-L	LINEARITY(V,H)
a.	☞ ν $H_1H_2\ L_2$ e-ŋ-gété ŋ-kèe				*	**
b.	ν $H_1\ L_2$ e-ŋ-geté ŋ-kèe			*! W	* ~	L
c.	ν ν HL H e-ŋ-gétè ŋ-kée		*! W		* ~	* L
d.	ν ν $H_1L_1\ H_2L_2$ é-ŋ-gèté ŋ-kèe	*! W			L	***

At this point, only one last interaction concerning tone shift remains: what of forms like *a-ká-húkà*, which enter the postlexical phonology with a falling melodic unit associated with two vowels? We want to ensure that in the output of tone shift, the H component of the melodic unit continues to be associated with two vowels, as in (53).

(53) Preservation of input H's length

Input to PLP　　　　Output of LP-PLPW



To ensure this result, I assume the existence of Ident-Long(H), which seeks to preserve the number of vowels that H tones are associated with in the input.

(54) Ident-Long(H) The length of a H tone, as measured by the number of vowels it is associated to, is identical in the input and the output.

As shown in (55), including Ident-Long(H) in the constraint set ensures that a doubly-linked H tone will shift correctly as a unit.

(55) Ident-Long(H) preserves multiple linking

	a-ka-húkâ	*Crowd	Preserve-Fall	Max-H	Ident-Long(H)	Max-L	Linearity(V,H)
a.	☞ a-ká-húkà						*
b.	a-ka-húkâ	* W					L
c.	a-ka-húkà				*! L		*

In the above tableau, I have ranked Ident-Long(H) above Max-L but below Max-H. This ranking makes no difference to the evaluation of (55), since the winning candidate harmonically bounds the candidate which is unfaithful to the input duration of H. The ranking derives instead from two additional considerations.

First, when a doubly-linked H tone shifts onto a vowel which bears a L (or HL) tone, the L tone is overwritten. Since it would be possible to shift the H tone but also shorten it in order to preserve the L tone to its left, this demonstrates a ranking of IDENT-LONG(H) above MAX-L. We seee this, for example, with the verb form *tu-a-ná̱-[**túm-á-à**]* 'we did send (recently).' Here, when a doubly-linked grammatical **H** tone shifts left, it overwrites the L tone that we would normally expect after a shifted lexical H̲ tone. An overview of this form's derivation is given in (56). Since it has a H-toned stem, a grammatical **H** tone is assigned to its final vowel (56b), which subsequently spreads one vowel to the left (56c). Fall Conversion at the LP-PLPW then converts the both the lexical tone and the doubly-linked grammatical H tone to falls (56e), which expand in the PLP.

(56) Derivation of *tu-a-ná̱-[**túm-á-à**]* 'we did send (recently)'

a.	Stem Morphology	[tú̱m-aa] [√-DES]	Lexical Phonology
b.	Grammatical Tone (V2/FV)	[tú̱m-a**á**]	
c.	High Tone Spread	[tú̱m-**áá**]	
d.	Pre-Stem Morphology	tu-a-na-[tú̱m-**áá**] SM.1P-PAST-AFF-[√-DES]	LP-PLPW
e.	Fall Conversion	tu-a-na-[tû̱m-**ââ**]	
f.	Fall Expansion	tu-a-ná̱-[**túm-á**à]	Postlexical Phonology
g.	Contraction	tu-a-ná̱-[**túm-â**]	

In (57), we see the tableau just for Fall Expansion, which illustrates how the expansion of the doubly-linked fall in (56e) necessitates a ranking of IDENT-LONG (H) above MAX-L.

(57) A shifting long H tone overwrites a L tone rather than shortening

		*Crowd	Preserve-Fall	Max-H	Ident-Long(H)	Max-L	Linearity (V,H)
	H L H L tu-a-na-[tûm-áâ]						
a.	☞ H H L tu-a-ná-[túm-áà]					*	**
b.	H L H L tu-a-ná-[tùm-áà]				*! W	L	**

On the other hand, the ranking of Ident-Long(H) below Max-H reflects the fact that, in cases where it is not possible to preserve the entire duration of the input H tone under shift, the H tone does *not* simply delete. To see this, we can turn once more to kinship terms. Consider, for example, the singular and plural forms of *^{H}múkakaa* 'grandmother' in (58). In the plural, we see two H tones: one on the first vowel of the noun, and one on the preceding demonstrative. Assuming that this results from leftward shift of a doubly-linked H, the underlying representation of *^{H}múkakaa* must contain a doubly-linked H tone associated with the first two vowels of the root. We must therefore conclude that when this doubly-linked H tone attempts to shift, it shortens rather than deletes if there are not enough vowels to the left for the whole duration to be realized. A tableau showing how this establishes a ranking of Max-H over Ident-Long(H) is given in (59). (Note that the input to this tableau, /múkâkaa/, results from the application of Fall Conversion to the underying form */múkákaa/* at the LP-PLPW).

(58) Singular and plural of ^{H}*múkakaa* 'grandmother'

	Root (underlying)	Singular	Plural
a.	*múkákaa* 'grandmother'	múkàkaa	a-b-ó múkàkaa
		GRANDMOTHER	AUG-NC.2-DEM GRANDMOTHER

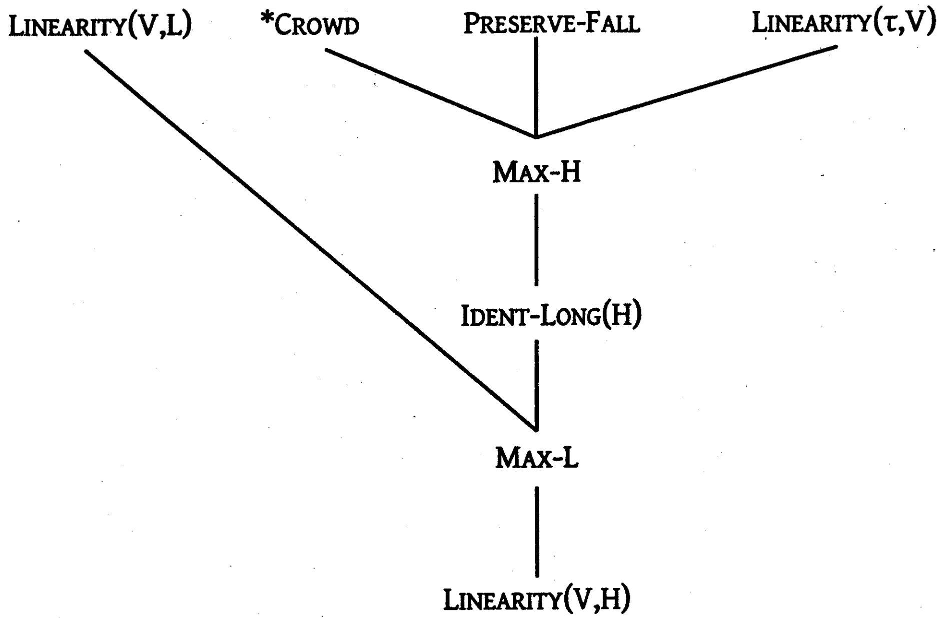
(59) A shifting long H tone shortens rather than deleting

	γ / H L / múkâkaa	*CROWD	PRESERVE-FALL	MAX-H	IDENT-LONG(H)	MAX-L	LINEARITY (V,H)
a.	☞ γ / H L / múkàkaa				*		*
b.	γ / L / mukàkaa			*! W	L		L

At this point, the analysis of leftward tone shift is complete. In (60) below, I summarize all of the rankings established in the analysis, and identify the tableaux where they are first established. These rankings are then shown graphically in the Hasse diagram in (61).

(60) Rankings for leftward shift	Tableaux
a. *CROWD, LINEARITY(τ,V), MAX-H, MAX-L » LINEARITY(V,H)	(38)
b. MAX-H » MAX-L	(40)
c. PRESERVE-FALL » LINEARITY(V,H)	(43)
d. *CROWD, PRESERVE-FALL » MAX-H	(45, 48)
e. LINEARITY(τ,V)» MAX-H	(48)
f. LINEARITY(V,L) » MAX-L	(52)
g. IDENT-LONG(H) » MAX-L	(57)
h. Max-H » IDENT-LONG(H)	(59)

(61) Summary: Grammar of leftward shift



When combined with the operation of Fall Conversion in the LP-PLPW, this grammar will correctly shift all underlying H tones one vowel to the left.

5 Comparison with previous constraint-based approaches to tone shift

In the preceding section, I have developed an analysis based on the idea that leftward tone shift consists in the leftward expansion of an input HL unit derived at the LP-PLPW. This analysis was motivated by two main considerations. First was the desire to provide a plausible motivation for tone shift. In the present analysis, this motivation is tonal crowding, formalized in the markedness constraint *CROWD. The second was to relate leftward tone shift to the presence and partially predictable distribution of lexical L tones. In briefly examining previous work, then, I will focus on how previous analyses relate to these two points.

5.1 Motivating leftward tone shift

One early attempt to analyze across-the-board bounded tone shift within OT is found in Myers (1997). There, in analyzing data from Rimi in which every H tone shifts one syllable to right, Myers proposes that bounded tone shift arises out of an interaction between ALIGN(H,R,PP,R) (62a), LOCAL (62b), and NO-LONG-T (62c).

(62) Constraints generating bounded tone shift in Myers (1997)

a.	ALIGN(H,R,PP,R)	The right edge of every H tone is aligned with the right edge of a phonological phrase (assessed gradiently).
b.	LOCAL	If an input tone T has an output correspondent T′, some edge of T must correspond with some edge of T′.
c.	NO-LONG-T	A tone may be associated with at most one syllable.

According to this analysis, the right edges of all H tones are drawn to the end of the phonological phrase, but can only travel one syllable in this direction due to higher-ranking LOCAL. In addition, high-ranking NO-LONG-T ensures that the result is tone shift rather than tone spread: when the right edge of an input H tone is pulled to the right, its left edge is too. (Input associations between tones and vowels are freely deleted and new ones are inserted as needed, due to low-ranked MAX(A) and DEP(A), which preserve underlying associations between tones and syllables).

(63) Derivation of rightward shift in (Myers 1999, tableau (51))

		rámuntu	LOCAL	NO-LONG-T	MAX-T	ALIGN(H,R,PP,R)	MAX(A)	DEP(A)
a.	☞	ramúntu				*	*	*
b.		rámuntu				**!		
c.		ramuntú	*!				*	*
d.		rámúntu		*!		*		*
e.		ramuntu			*!			

For our purposes, the main thing to notice about this analysis is that the markedness constraint which drives tone shift – ALIGN(H,R,PP,R) – is perfectly satisfied if a H tone reaches the desired edge of alignment. Therefore, any H tone which starts out at this edge should be content to stay there. This fact makes an ALIGN-style analysis unsuitable for Kinande, for as we have seen from forms like *^{H}tataa* 'father' (47), H tones which originate at the left edge are *not* content – lemming-like, they shift off the left edge into nothingness. From the perspective of ALIGN, this is completely inexplicable.

In their OT analysis of Kinande infinitive forms, Akinlabi and Mutaka (2001) posit a more effective constraint: AVOID-SPONSOR.

(64) AVOID-SPONSOR A lexical H tone is not realized on its sponsor

This constraint has the potential to force both shift and deletion, since it is satisfied either if a lexical H tone shifts or if it deletes. The chief objection to AVOID-SPONSOR is simply that it is a bizarre constraint: it compels violations of faithfulness while producing no discernable advantage. A learner might be driven to posit such a constraint if no functionally-motivated alternative were available, but in in the course of this chapter, I hope to have demonstrated that this is not the case. *CROWD, whose role in deriving tone shift is readily apparent in the assignment of intonational boundary tones, can be used to drive leftward tone shift instead.

5.2 Explaining the appearance of L tones

In analyzing tone shift as melodic expansion, I have attempted to connect the leftward shift of H tones with the appearance and distribution of lexical L tones. In this, I follow in the footsteps of Hyman and Valinande (1985) and Hyman (1990). As shown in (65), Hyman and

Valinande explicitly connect these two phenomena in their formulation of "High Tone Anticipation" (HTA).

(65) High Tone Anticipation (Hyman and Valinande 1985)[25]

V C_0 V
(L) H
↓ ↓
H L

Hyman and Valinande refer to the L tone derived from HTA as a "tonal trace," and envision it as the result of tone shift, while I envision it as its cause. Nevertheless, our analyses agree on the importance of HTA-derived L tones in blocking H_φ. Hyman (1990) shows how L tones derived from HTA can block the assignment of H_φ in words like *e-ki-kɔ́mbὲ* 'cup' (2c) and *a-ká-húkà* 'insect' (2d), assuming a very simple rule of H_φ assignment whereby H_φ is assigned to any *toneless* φ-final vowel (66). Example derivations which illustrate both the successful assignment of H_φ and its blocking by L under this analysis are given in (67).

(66) H_φ Assignment (Hyman 1990)

V → V
| / ___ $]_\varphi$
H_φ

(67) Blocking of H_φ by final L (φ-final position)

Underlying	/o-ku-gulu/	/e-ki-kombέ/	/a-ka-húká/
HTA	n/a	e-ki-kɔ́mbὲ	a-ká-húkà
H_φ Assignment	o-ku-gulú	n/a (H_φ blocked)	n/a (H_φ blocked)
Surface	[o-ku-gulú]	[e-ki-kɔ́mbὲ]	[a-ká-húkà]

[25] Curiously, though Hyman and Valinande posit that bounded leftward shift leaves behind a L tone trace in the original position of the shifted H, such a L never does any actual work in the paper. All instances in which L shows a visible effect (by blocking the assignment of H_φ) derive not from HTA, but rather from either Meeussen's Rule or a rule of *long-distance* shift which putatively moves a grammatical H tone from the ultima to the second vowel of a toneless stem. (I reanalyze this latter process as a long-distance application of Meeussen's Rule in chapter 4.)

A rather different approach is taken by Mutaka (1994). He proposes that leftward shift derives from a two step process of leftward spread (68a) followed by de-linking (68b).

(68) Tone shift (Mutaka 1994)

a. Tone Spread b. De-linking

What is crucial for the present discussion is that according to Mutaka's analysis, no L tone is left behind in the original location of an underlying H tone. Therefore, Mutaka cannot use such a L tone in order to block H_φ from surfacing on the ultima in φ-final realizations of *e-ki-kómbè* and *a-ká-húkà* (which he analyzes as simply *e-ki-kómbe* and *a-ká-húka*).

For this reason, Mutaka modifies the rule of H_φ assignment provided by Hyman (1990). Rather than assuming that H_φ is assigned to any toneless final vowel, Mutaka posits that H_φ can only be assigned to a toneless final vowel whose preceding vowel is *also* toneless (p. 158, fn. 6).

(69) H_φ Assignment (Mutaka 1994)

V → V
| / Ⓥ___]$_\varphi$ (where Ⓥ = toneless vowel)
H_φ

Translating this approach into an OT analysis, we could posit that H_φ is blocked from the penult due to the OCP: H_φ does not want to be assigned in a position where it would be adjacent to another H tone. We have, admittedly, seen forms where H_φ *is* adjacent to a lexical H tone; one example is ι-final [o-m<u>ú</u>-lúmè] 'man' (16c), in which penultimate H_φ is adjacent to the lexical <u>H</u> which has shifted onto the noun class prefix. However, as we will see in chapter 3, H_φ is not *initially assigned* to this position – it arrives there indirectly, first being assigned to the ultima, and only subsequently shifting onto the penult after the assignment of L_ι. This process is illustrated below for toneless *o-ku-gulu.*

(70) 2-step process of intonational tone assignment

Underlying	/o-ku-gulu/
H_φ Assigned to ultima	o-ku-gulú
L_ι Assigned to ultima, H_φ driven left	o-ku-gúlù
Surface	[o-ku-gúlù]

What we would need to say, then, in order to account for *o-mú-lúme* in the OCP-based analysis of H_φ blocking, is that H_φ cannot be initially assigned in positions where it violates the OCP, but it can shift into them once it is already assigned. On the other hand, if we adopt the L-based analysis of H_φ blocking, we would need to say that H_φ cannot overwrite a L tone when it is initially assigned, but can overwrite it in the course of tone shift (this is the proposal developed in chapter 3). These two analyses are contrasted below.

(71) OCP-based analyses of *e-ki-kómbe* 'cup' and *o-mú-lume* 'man'

a. Analysis of *e-ki-kómbe* 'cup'

Underlying	/e-ki-kombé/	
H Shift	e-ki-kómbe	
H_φ assignment	---	no H_φ assigned since OCP violation
L_ι assignment, H_φ driven left	e-ki-kómbè	L_ι assigned to ultima

b. Analysis of *o-mú-lume* 'man'

Underlying	/o-mu-lúme/	
H Shift	o-mú-lume	
H_φ assignment	o-mú-lumé	H_φ assigned since no OCP violation
L_ι assignment, H_φ driven left	o-mú-lúmè	L_ι assigned to ultima, triggering H_φ shift into OCP-violating position

(72) L-based analyses of *e-ki-kómbè* 'cup' and *o-mú-lùme* 'man'

a. Analysis of *e-ki-kómbè* 'cup'

Underlying	/e-ki-kombé/	
H Shift	e-ki-kómbè	L left on ultima
H_φ assignment	---	no H_φ assigned since final L
L_ι assignment, H_φ driven left	e-ki-kómbè	L_ι assigned to ultima

b. Analysis of *o-mú-lùme* 'man'

Underlying	/o-mu-lúme/	
H Shift	o-mú-lùme	L left on penult
H_φ assignment	o-mú-lùmé	H_φ assigned since no final L
L_ι assignment, H_φ driven left	o-mú-lúmè	L_ι assigned to ultima, triggering H_φ shift into L-overwriting position

At first glance, these analyses seem equivalent to one another; certainly, their predictions regarding H_φ assignment are the same. The question of which analysis should be favored, then, should turn on other considerations, such as those of learnability. Here, I believe the L-based analysis has the advantage.

In order to arrive at the OCP-based analysis, a learner must posit that the OCP blocks H_φ from being assigned after a lexical $\underline{\text{H}}$ tone, despite an abundance of information from surface forms – e.g. [o-m$\underline{\text{ú}}$-lúmè] – that the H_φ *can* occur after a $\underline{\text{H}}$ tone, and without any clear confirmation from elsewhere in the language the OCP is involved in the blocking of intonational tones.

On the other hand, the learner has incontrovertible evidence that L tones are involved in the blocking of H_φ. There is simply no other analysis of nouns like *e-ki-hekà* 'truck' (11) or verb forms like *tu-a-*[*luh-ịrè*] 'we have been tired (for a long time)' (14a), which do not have penultimate H tones which could block H_φ via the OCP. Having been forced to assume that L tones are responsible for the blocking of H_φ in these cases, it is reasonable to assume that a learner would likewise assume that L is responsible for the blocking of H_φ after a shifted H tone. Moreover, learners have direct evidence, in all forms where H_φ surfaces on the penult as a response to the assignment of L, that L tones can be responsible for tone shift. Therefore, when faced with a shifted H tone whose underlying position continues to block H_φ, a reasonable deduction is that a following L is responsible.

One further argument in favor of the L-based analysis concerns vowel contraction. We have seen that the contraction of a shifted H tone with a following low-pitched tone generally yields a *falling* tone, provided that the output of contraction occurs in a context where falling tones are phonotactically permitted. I have argued that this is because shifted H tones are always followed by L tones, and have argued further that this fact is a consequence of the fact that tone shift consists of melodic expansion. A possible reanalysis of this latter point, however, is that a rule of default L tone assignment applies to all toneless vowels before contraction takes place. This would account for the fact that L tones systematically follow H tones without invoking an underlying falling tone to explain it. But this reanalysis suffers from two drawbacks. First, it is not clear why default L assignment would apply prior to contraction but after all other phonological rules. If this were understood as a rule of phonetic implementation, we would expect it to follow contraction. If it were simply another phonological rule, we would hope to find evidence for it elsewhere. Second, the status of default L tone assignment has been seriously questioned by Myers (1998), who shows that vowels which are phonologically unspecified throughout the phonology of Chichewa remain so in the phonetics. Given this finding, a theoretically desirable result would be to ban default L tone assignment altogether, and demand that tonal movements always arise from pitch targets that are deliberately specified in the phonology. This is possible if the L tones in Kinande are provided by HL melodic units.

6 Conclusion

In this chapter, I have argued that leftward shift derives from the expansion of an underlying HL melodic unit. This allows shift to be motivated by well-attested and phonetically sensible constraints (e.g. *CROWD), and accounts for the otherwise surprising appearance of L tones after H tones. In addition, it ties the analysis of leftward shift to the analysis of intonational tone assignment, which we will examine in greater detail in chapter 3. There, it is quite clear that the presence of a L tone can drive an intonational H tone to the left, and the constraints and rankings that will be used to derive this interaction are exactly the same as those posited to derive the leftward shift of non-intonational tones in this chapter. The analysis of leftward shift developed here, then, is based upon the idea that a learner of Kinande will latch on to the phonetically sensible and phonologically transparent application of leftward shift observed in the course of boundary tone assignment, and project his or her analysis of that phenomenon onto cases of leftward shift whose analysis is not so obvious.

In addition to accounting for leftward shift itself, one additional result of the expansion-based analysis posited here, briefly noted at the end of 2.2, is that it leads to a successful statement of the distribution of falling tones in Kinande. Specifically, falling tones arise only as the result of contraction, when a H-toned vowel contracts with a L-toned vowel in a context where tonal absorption cannot apply (i.e. before a high- or falling-toned vowel, or at the end of an utterance). Their appearance, then, is restricted only by (a) the set of morphological contexts in which V́V̀ sequences arise prior to contraction, and (b) the phonotactic constraint *HL-L.[26] The expansion-based analysis developed in this chapter is crucial to this statement, since it predicts the exact range of contexts where V́V̀ sequences will arise prior to contraction.

[26] One final restriction on falling tones, specifically involving glide formation, is discussed in chapter 5, section 4.1.

In closing, it is worth noting that in many respects, the expansion-based analysis represents a return to one of the earliest generative analyses of leftward tone shift, posited by Goldsmith (1984a) in his analysis of Tonga. Goldsmith analyzes the displaced contrast between H and L in Tonga by positing autosegmental accents ("stars") to certain syllables, and then associating a HL* melody to them. According to this analysis, L associates to the starred syllable, while H associates to the vowel preceding it due to regular association conventions. As Goldsmith's autosegmental accents fell out of favor, replaced by pre-specification of tones in lexical representations (Pulleyblank 1986), the underlying HL of Tonga was reanalyzed as a simpler H tone, which moves to the left by rules of spreading and delinking. This move made sense within rule-based theory, since it resulted in a simpler representation and a simpler rule system. Within the theoretical context of Optimality Theory, however, the apparent advantages of this reanalysis disappear; while it is quite motivated to expand an underlying HL sequence, simply moving a H tone from one position to another – while very easy to state in autosegmental notation – is not.

Reanalyzing tone shift as melodic expansion, then, is part of a larger project of reconceptualizing phonological processes as resulting from motivated constraint interaction. Importantly, however, this is not simply an empty exercise in theory translation. The fact that the constraint-based approach guides us towards an expansion-based analysis of leftward tone shift is indirect evidence that this approach is on the right track, since this analysis turns out to be independently supported by empirical considerations such as the distributions of L tones. If the expansion-based analysis of tone shift proves to be supported by such considerations in other languages as well, this will provide solid support for the idea that tonal operations are best described in terms of constraint satisfaction (e.g. avoid tonal crowding) rather than operational procedures (e.g. move a tone one vowel to the left).

One phenomenon that may provide evidence along these lines is multiple tone shift, found, for example, in the Mijikenda dialect group. In Mijikenda, as described by Volk (2011), H tones typically shift to the penultimate syllable of a word, where they normally surface as part of a rising tone.[27] This may be seen by comparing the entirely toneless verbs in (73a) with those in (73b,c), which contain H tones originating either from a H-toned subject marker (73b) or a H-toned verb root (73c). (Here, all forms are from the Giryama dialect. Following the conventions of Volk (2011), vowels from which H tones originate – generally not identical to the vowels on which they surface – are underlined.)

(73) H tone shift to penult in Mijikenda (Giryama dialect: Volk 2011, pp. 16-18)

a. Entirely toneless: toneless SM (1st sg. *ni-*), toneless TAM (*na-*), toneless stem

ni-na-[βa:na]	'I am marking'
ni-na-[dege:ʒa]	'I am slackening'
ni-na-[bagari:ka]	'I am withering'
ni-na-[marigizi:ka]	'I am coming to an end'
ni-na-[ongola-ongo:la]	'I am soothing'

b. Single H tone: H-toned SM (3rd sing. *á-*), toneless TAM (*na-*), toneless stem

a̱-na-[βǎ:na]	'He is marking'
a̱-na-[degě:ʒa]	'He is slackening'
a̱-na-[bagarǐ:ka]	'He is withering'
a̱-na-[marigizǐ:ka]	'He is coming to an end'

c. Single H tone: toneless SM (1st sg. *ni-*), toneless TAM (*na*), H-toned stem

ni-na-[ně̱:na]	'I am speaking'
ni-na-[ðe̱ðě:dʒa]	'I am preserving'
ni-na-[bi̱niŋgǐ:za]	'I am covering'
ni-na-[ku̱luhirǐ:ka]	'I am trustworthy'

When two H tones are present in a verb form, one contributed by a H-toned verb root and another by a H-toned SM, what we find is that the second H shifts to the penult while the

[27] Actually, as in Kinande, tone shift is able to cross word boundaries, and H tones can appear several words to the right of their underlying positions. For more on this phenomenon, which is not crucial to the point at hand, see Volk (2011), Kisseberth (1984), and Cassimjee and Kisseberth (1998).

first shifts and/or spreads in different ways depending upon the dialect. Here, I focus on the dialect identified by Volk as Kambe$_2$. In this dialect, the first H tone shifts as far to the right as possible up until the *underlying location* of the second H. This is the TAM prefix *na-* in the forms in (74a), and the 1st singular object marker *ni-* in (74b).

(74) Multiple H tone shift in Mijikenda (Kambe$_2$ dialect: Volk 2011, pp. 22-23)
  a. 1st H shifts to TAM marker (1st vowel before underlying location of 2nd H)
     yu̠-ná-[ré:ha] ‘(s)he is giving back’
     yu̠-ná-[hi̠rǐ:ka] ‘(s)he is taking along’
     yu̠-ná-[tsu̠ŋgurǐ:ra] ‘(s)he is peeping’
  b. 2nd H shifts to OM (1st vowel before underlying location of 2nd H)
     yu̠-na-ní-[ré:ha] ‘(s)he is giving me back’
     yu̠-na-ní-[hi̠rǐ:ka] ‘(s)he is taking me along’

Volk, following Cassimjee and Kisseberth (1998), views this as evidence that tone shift involves the establishment of a H tone domain (HTD) which spans from the underlying position of a H tone to its surface position. (The establishment of this HTD produces tone *shfit* rather than tone *spread* due to a requirement that H tones surface only on the *head* of the domain, which Cassimjee and Kisseberth define as the target of shift or spread). This is shown for verbs with just one H tone in (75). Here, stem boundaries are suppressed to make the tonal domains, bounded by parentheses, easier to see.

(75) Domain-based view of tonal shift
  a. Single H tone: H-toned SM (3rd sing. *á-*), toneless TAM (*na-*), toneless stem
     (a̠-na-βǎ:)na ‘He is marking’
     (a̠-na-degě:)ʒa ‘He is slackening’
     (a̠-na-bagarǐ:)ka ‘He is withering’
     (a̠-na-marigizǐ:)ka ‘He is coming to an end’

b. Single H tone: toneless SM (1st sg. *ni-*), toneless TAM (*na*), H-toned stem

ni-na-(ně̱:)na	'I am speaking'
ni-na-(ðe̱ðě:)dʒa	'I am preserving'
ni-na-(bi̱niŋgǐ:)za	'I am covering'
ni-na-(ku̱luhirǐ:)ka	'I am trustworthy'

Under this view, the failure of the first H tone to shift further right than the underlying position of the second can be viewed as an avoidance of *domain overlap*: the right edge of the first H tone's domain cannot occur any further right than the left edge of the second H tone's domain.

(76) Tone shift restrictions explained through overlap avoidance

($_1$yu̱-ná)$_1$-($_2$ré:)$_2$ha		'(s)he is giving back'
($_1$yu̱-ná)$_1$-($_2$hi̱rǐ:)$_2$ka	*($_1$yu̱-na-($_2$hí̱)$_1$rǐ:)$_2$ka	'(s)he is taking along'
($_1$yu̱-ná)$_1$-($_2$tsu̱ŋgurǐ:)$_2$ra	*($_1$yu̱-ná-($_2$su̱ŋgú)$_1$rǐ:)$_2$ra	'(s)he is peeping'
($_1$yu̱-na-ní)$_1$-($_2$ré:)$_2$ha		'(s)he is giving me back'
($_1$yu̱-na-ní)$_1$-($_2$hi̱rǐ:)$_2$ka	*($_1$yu̱-na-ni-($_2$hí̱)$_1$rǐ:)$_2$ka	'(s)he is taking me along'

However, another possible interpretation of this fact is that rightward shift in Mijikenda consists in the rightward expansion of a (LH) melody, which leaves behind a L tone "trace" when its H tone is pulled to the right. We could then say that in the Kambe$_2$ dialect, the L tone left behind on the underlying position of the 2nd H prevents the rightward movement of the first – either through highly-ranked MAX-L or highly ranked LINEARITY(τ,τ), which penalizes tonal metathesis – without needing to posit the additional structure of high tone domains.

(77) Tone shift restrictions explained with L tone trace

		yǔ-na-[tsǔŋguri:ra]	MAX-L	LINEARITY(τ,τ)	ALIGN(H,R,PP,R)
a.	☞	yù-ná-[tsùŋgurǐ:ra]			** (ǐ) ***** (á)
b.		yù-ná-[tsuŋgúrǐ:ra]	*!		** (ǐ) *** (á)
c.		yù-ná-[tsùŋgúrǐ:ra]		*!	** (ǐ) *** (á

Whether an expansion-based analysis of tone shift provides the best explanation of these particular facts, of course, remains to be seen. The facts of other Mijikenda dialects are considerably more complicated, and it is not clear whether an expansion-based story could also be extended to them. If not, however, this would not necessarily provide evidence against the expansion-based analysis of Kinande: while I propose that tonal expansion is *one* reason why a tone might move, I do not mean to suggest that it is the *only* reason. *Unbounded* tone shift of the sort seen in Mijikenda seems to involve the attraction of tones to particular vowels or prosodic edges, and *bounded rightward* shift can arise through the phonologization of peak delay. It is therefore quite possible that shift in these cases does not involve the expansion of a contour tone (though learners might infer an underlying or intermediate contour in these cases as well). However, since neither of these explanations can be applied to *bounded leftward shift*, I do predict all cases of bounded leftward shift should arise from contour expansion, and should therefore show evidence that a shifting H tone leaves behind a L tone trace. An important task for future work, then, is to determine whether or not this is the case.

3 Stratal evaluation in sentence phonology

1 Introduction

In the last chapter, we saw some of the workings of Kinande's postlexical phonology (PLP) while examining the important process of leftward tone shift. In this chapter, we will examine the PLP in more detail, focusing on the *intonational boundary tones* which are assigned there in order to gain a better understanding of its organizational structure. I will argue that in order to successfully account for the way that these tones surface in words with different underlying tone patterns and different prosodic shapes, we must allow a certain amount of serialism within the postlexical phonology. In particular, we must allow the initial linking of a boundary tone to a domain-final vowel to precede its subsequent shift to another vowel, and we must allow all intonational tone assignment to take place before vowel contraction. The central theoretical question that emerges from this, particularly within the context of Optimality Theory, is how these orderings arise.

I will argue that two distinct ordering mechanisms are at work: *cyclic evaluation* and *constraint reranking*. These two mechanisms, and the data that motivate their role in the postlexical phonology of Kinande, are discussed in 1.1 and 1.2 below.

1.1 Evidence for postlexical cyclicity

By *cyclic evaluation*, what I mean is the application of a *single constraint ranking* to successively larger and more inclusive domains. This introduces ordering into the phonology in two ways. First, if a single process is triggered within multiple domains, it will apply within smaller domains before it applies within larger ones. Second, if a process is triggered by an input which arises only in some domain δ, it will necessarily follow processes that apply within domains smaller than δ and precede processes that apply within domains larger than δ.

This second means of establishing orderings between phonological processes will be particularly important to the analysis of Kinande boundary tones. I will argue that the postlexical phonology of Kinande involves the cyclic evaluation of two phrase-level prosodic domains: the *phonological phrase* (φ) and the *intonational phrase* (ι). These domains are each marked by boundary tones, which are assigned when their associated domains are submitted for phonological evaluation. Crucially, then, as a result of cyclic evaluation, the φ-level boundary tone $H_φ$ is always assigned *before* the ι-level boundary tones $L_ι$ and $H_ι$.

Evidence in favor of a cyclic analysis of boundary tone assignment, and against a fully parallel analysis in which all boundary tones are assigned at the same time, comes from the way that $H_φ$ interacts with lexical L tones. To see this, consider first how $H_φ$ is assigned in the underlyingly toneless noun *o-ku-gulu* 'leg.'[1] When this noun occurs in φ-final, ι-nonfinal position (henceforth simply "φ-final position"), $H_φ$ appears on its *final* vowel (1a). However, when *o-ku-gulu* occurs in φ-final, ι-final position (henceforth simply "ι-final position"), $H_φ$ appears on its *penultimate* vowel, with the final vowel occupied by either $L_ι$ (at the end of a

[1] In the course of discussion, I will often need to refer to a word without committing to any one of its phrasal variants. In that case, I provide the form of the word that is observed in the absence of any boundary tones. In general, this form is *not* identical to the underlying representation, since while it does not show the effects of intonational tone assignment, it does show the effects of leftward shift and all processes that apply within the LP.

statement: 1b) or H_ι (at the end of a question: 1c). This pattern, which I will refer to as the *canonical pattern of intonational tone assignment* (or just *canonical tone* for short), is observed in all words whose final vowels are toneless prior to the assignment of intonational boundary tones.

(1) Canonical tone: final H_φ in φ-final position, penultimate H_φ in ι-final position

a.		b.		c.	
	H_φ | o-ku-gulú $)_\varphi$ ... $)_\iota$		H_φ L_ι | | o-ku-gúlù $)_\varphi$ $)_\iota$		$H_\varphi H_\iota$ | | o-ku-gúlú $)_\varphi$ $)_\iota$

By contrast, words that have final L tones prior to intonational tone assignment, such as *e-ki-hekà* 'truck,' show *non-canonical tone.* In these words, the realization of H_φ is much simpler: it never surfaces at all, regardless of phrasal context. It does not appear on the final vowel in φ-final position (2a), and it does not appear on the penultimate vowel in ι-final position (2b,c). Thus, in words that show non-canonical tone, the only effect of intonational tone assignment is the appearance of an ι-final L_ι or H_ι tone (2b,c).

(2) Non-canonical tone: H_φ is absent in both φ-final and ι-final position

a.		b.		c.	
	L | e-ki-hekà $)_\varphi$ ... $)_\iota$		L_ι | e-ki-hekà $)_\varphi$ $)_\iota$		H_ι | e-ki-heká $)_\varphi$ $)_\iota$

Even with this little data, problems begin to emerge for a fully parallel account of intonational tone assignment. In particular, while we can readily attribute the failure of H_φ to surface on the final vowel in (2a) to the presence of a final L tone, it is not clear why H_φ should be blocked from the penultimate vowel in (2b) and (2c). Intuitively, the final L tone blocks H_φ in these forms as well, but in a fully parallel account there does not seem to be any way to capture this: since the final L tone is deleted, overwritten by either L_ι or H_ι, there is no way for it to block H_φ from appearing on the penult, just as it does in ι-final *o-ku-gulu* (1b, c).

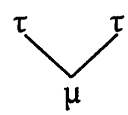
To see this point more clearly, let us consider what a fully parallel analysis of *o-ku-gulu* and *e-ki-hekà* would require. If we assume that intonational boundary tones are floating in the postlexical input, ordered after all other segments and tones, and with H_φ preceding L_ι/H_ι, then we can construct a fully parallel analysis of ι-final *o-ku-gulu* using the constraints in (3).[2] We have already encountered most of these constraints in chapter 2; the only new ones are *FLOAT, which penalizes output tones which are not associated to any vowel, MAX-T_ι, which specifically protects ι-level boundary tones, and LINEARITY(τ,τ), which penalizes tonal metathesis.

(3) Basic constraints for boundary tone assignment

a. LINEARITY(V,H) = LIN(V,H) — If an input vowel V has an output correspondent V′, and if an input high tone H has an output correspondent H′, then if V < H then V′ < H′.

b. LINEARITY(V,L) = LIN(V,L) — If an input vowel V has an output correspondent V′, and if an input low tone L has an output correspondent L′, then if V < L then V′ < L′.

c. *CROWD — Violated once for each instance of the structure



d. *FLOAT — Each output tone must be associated with some vowel.

e. MAX-H — Each input H tone must have an output correspondent.

f. MAX-L — Each input L tone must have an output correspondent

g. MAX-T_ι — Each ι-level boundary tone must have an output correspondent.

h. LINEARITY(τ,τ) = LIN(τ,τ) — If an input tone τ_1 has an output correspondent τ_1', and if an input tone τ_2 has an output correspondent τ_2', then if $\tau_1 < \tau_2$ then $\tau_1' < \tau_2'$.

Ranking LIN(V,H) and LIN(V,L) below the other constraints in (3) ensures that boundary tones will move in from the right edge of a domain-final word just enough for all of them to associate to their own moras. In (4), this is shown for *o-ku-gulu* in φ-final position, where just H_φ is assigned (as in (2a)). Here, LIN(V,H) is violated just enough to satisfy *FLOAT and MAX-H,

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[2] The main points developed here do not depend on these particular assumptions about the input. For a presentation which assumes that boundary tones are not present in the postlexical input, see Jones (2014).

but gratuitous violations of LIN(V,H) caused by associating H_φ to a nonfinal vowel are fatal (4b). (To save space, *FLOAT is excluded from all tableaux. However, it is assumed to be undominated, so that all candidates that violate it are ungrammatical.)

(4) φ-final position: H_φ associates to the final vowel

	o-ku-gulu H_φ L_ι	MAX-T$_\iota$	*CROWD	MAX-H	LIN(τ,τ)	MAX-L	LIN(V,L)	LIN(V,H)
a.	☞ H_φ o-ku-gulú							*
b.	o-ku-gulu			*! W				L
c.	H_φ o-ku-gúlu							**! W

The tableau in (5) shows a more complicated case, in which both H_φ and L_ι are assigned at the end of a statement (as in (2b)). Here, associating H_φ to a nonfinal vowel is not fatal, because this is necessary in order to preserve both H_φ and L_ι without violating *CROWD.

(5) ι-final position: H_φ associates to the penultimate vowel, L_ι associates to the final vowel

	o-ku-gulu H_φ L_ι	MAX-T$_\iota$	*CROWD	MAX-H	LIN(τ,τ)	MAX-L	LIN(V,L)	LIN(V,H)
a.	☞ H_φ L_ι o-ku-gúlù						*	**
b.	H_φ o-ku-gulú	*! W				* W	L	* L
c.	HL_ι o-ku-gulǔ		*! W				* ~	* L
d.	L_ι o-ku-gulù			*! W			* ~	L
e.	L_ι H_φ o-ku-gùlú				*! W		** W	* L

We can now turn to the problems raised by L-final *e-ki-hekà* 'truck.' In (6), we see that we can account for the fact that φ-final *e-ki-hekà* does not show a final $H_φ$ tone by ranking MAX-H below *CROWD, LIN(τ,τ), MAX-L, and LINEARITY(V,L). With this ranking, deleting $H_φ$ (6a) is better than realizing both L and $H_φ$ on the final vowel (6b), skipping over the final L tone to place $H_φ$ on the penult (6c), overwriting the final L tone (6d), or shifting the final L tone to the left (6e).

(6) Blocking of $H_φ$ by final L tone

	L e-ki-hekà $H_φ$	MAX-$T_ι$	*CROWD	LIN(τ,τ)	MAX-L	LIN(V,L)	MAX-H	LIN(V,H)
a.	☞ L e-ki-hekà						*	
b.	$LH_ι$ e-ki-hekǎ		*! W				L	* W
c.	$H_φ$ L e-ki-hékà			*! W			L	** W
d.	$H_φ$ e-ki-heká				*! W		L	* W
e.	L $H_φ$ e-ki-hèká					*! W	L	* W

We can also account for the fact that the final L tone of *e-ki-hekà* is overwritten by an ι-level boundary tone, so long as we temporarily ignore the fact that an ι-final noun should also be assigned $H_φ$. As shown in (7), which shows the evaluation of *e-ki-hekà* in question-final position, where it is assigned $H_ι$, this is handled by a ranking of MAX-L below MAX-$T_ι$, *CROWD, LIN(τ,τ), and LIN(V,L). With this ranking, it is better to overwrite a final L tone (7a) than to delete an ι-level boundary tone (7b), realize both an ι-level boundary tone and the final L tone on the same vowel (7c), skip over the final L tone and realize the ι-level boundary tone on the penult (7d), or shift the final L tone leftwards onto the penult (7e).

(7) Overwriting of final L tone by H_ι

	L e-ki-hekà H_ι	MAX-T_ι	*CROWD	LIN(τ,τ)	LIN(V,L)	MAX-L	MAX-H	LIN(V,H)
a.	☞ H_ι e-ki-heká					*		*
b.	L e-ki-hekà	*! W				L	* W	L
c.	LH_ι e-ki-hekǎ		*! W			L		* ~
d.	H_ι L e-ki-hékà			*! W		L		** W
e.	L H_ι e-ki-hèká				*! W	L		* ~

The problem comes when we remember H_φ. If all boundary tones are assigned at the same time, we should expect that once an ι-level boundary tone overwrites a final L tone, that L tone should no longer be able to block the assignment of H_φ. In (6) above, we see that the main impediment to assigning H_φ to the penult when L is present is LINEARITY(τ,τ): since H_φ follows the final L tone in the input, it must follow it in the output as well. Once the final L tone is deleted, however, LINEARITY(τ,τ) is vacuously satisfied, so that the only constraint which penalizes the association of H_φ to the penult is low-ranked LINEARITY(V,H). We therefore predict that H_φ should appear on the penult rather than delete.

(8) Parallel analysis: H_φ incorrectly assigned to the penult of ι-final *e-ki-hekà*

	L e-ki-hekà H_φ H_ι	MAX-T_ι	*CROWD	LIN(τ,τ)	LIN(V,L)	MAX-L	MAX-H	LIN(V,H)
a.	☞ H_ι e-ki-heká					*	*!	*
b.	💣 $H_\varphi H_\iota$ e-ki-héká					*		* **

Crucially, the failure of (8a) does not indicate a problem with the constraint ranking that derives it. As shown in (7), this ranking *correctly* selects this candidate when we assume that H_ι is assigned to *e-ki-hekà* by itself, without H_φ. The problem with (8) results instead from how its constraint ranking is applied. By assigning H_φ at the same time as L_ι or H_ι, we incorrectly predict that the assignment of an *ι-level* boundary tone should be able to influence how a *φ-level* boundary tone interacts with an *underlying* L tone.

On the other hand, if we assume that φ and ι are evaluated cyclically, so that the assignment of H_φ precedes the assignment of L_ι, this prediction disappears. In this case, when ι-final *e-ki-hekà* is evaluated, its final L tone will first block the assignment of H_φ in a φ-level evaluation, just as in (6). The φ-level output [e-ki-hekà] will then become the input to an ι-level evaluation where, just as in (7), the final L tone is overwritten by either L_ι or H_ι. In a cyclic analysis, we need not worry about candidate (8b): since H_φ has already been deleted in the φ-level evaluation, there is no way for it to emerge on the penult in the ι-level evaluation.

The interaction of H_φ with final L tones, then, is our first indication that the assignment of boundary tones proceeds cyclically. Our second clue comes from the interaction of H_φ with *penultimate* L tones. Since we have just seen that a final L tone blocks the assignment of H_φ to the final vowel, our naive expectation should be that a penultimate L tone will block the assignment of H_φ to a penultimate vowel. However, as shown in (9), this is not the case. When nouns with penultimate L tones, like *o-mú̲-lùme* 'man,' appear in ι-final position, they show penultimate H_φ tones just like toneless *o-ku-gulu* 'leg' (1b,c).

(9) Canonical tone in words with penultimate L (e.g. *o-mú̲-lùme* 'man')

a. $\underline{H}$ L H_φ	b. $\underline{H}$ H_φ L_ι	c. H H_φ H_ι
| | |	| | |	| | |
o-mú̲-lùmé $)_\varphi$ ... $)_\iota$	o-mú-lúmè $)_\varphi$ $)_\iota$	o-mú̲-lúmé $)_\varphi$ $)_\iota$

Once again, if all boundary tones are assigned at the same time, this fact is rather mysterious: if a H_{φ} boundary tone is blocked by a final L tone, due to a ranking of MAX-L above MAX-H, we should expect it to be blocked by a penultimate L tone as well. We therefore expect the ι-final form *[o-mú-lùmè] (10b), where only the ι-level boundary tone is assigned.

(10) Parallel analysis: H_{φ} incorrectly blocked by the penultimate L of ι-final *o-mú-lùme*

	o-mú-lùme H_{φ} L_{ι}	MAX-T_{ι}	*CROWD	LIN(τ,τ)	LIN(V,L)	MAX-L	MAX-H	LIN(V,H)
a.	☞ H H_{φ} L_{ι} o-mú-lúmè				*	*!		**
b.	💣 H L L_{ι} o-mú-lùmè				*		*	

However, this situation becomes more tractable if intonational tone assignment takes place cyclically, so that the assignment of H_{φ} precedes the assignment of L_{ι} or H_{ι}. Under cyclic tone assignment, H_{φ} always links first to the *final* vowel, during the evaluation of φ, and shifts to the *penultimate* vowel only later, when L_{ι} or H_{ι} is assigned in the evaluation of ι.

(11) Two-step intonational tone assignment in *o-ku-gulu* 'leg'

		(a) φ-level evaluation		(b) ι-level evaluation
		H_{φ}		$H_{\varphi}L_{\iota}$
		|		| |
/o-ku-gulu/	→	o-ku-gulú $)_{\varphi}$	→	o-ku-gúlù $)_{\varphi}$ $)_{\iota}$

With this two-step process of intonational tone assignment, we can begin to make sense of the fact that H_{φ} is blocked by a final L tone (L_{FV}) but not by a penultimate L tone (L_{Pen}) by noting that the competition between H_{φ} and L_{FV} and the competition between H_{φ} and L_{Pen} take place at *different times*, and that the *input status* of H_{φ} at these two times is different.

When H_φ competes with L_{FV} for control over the ultima, it does so in the initial φ-level evaluation, where H_φ is initially *floating*. By contrast, when H_φ competes with L_{Pen} for control over the penult, it does so in the later ι-level evaluation, which it enters *already linked* to the φ-final/ι-final vowel. These contrasting situations are shown in (12) below, where the competition between H_φ and L_{FV} is exemplified in the derivation of *e-ki-hekà* 'truck' while the competition between H_φ and L_{Pen} is exemplified in the derivation of *o-mú-lùme* 'man.' Within each derivation, boxed tones in input forms represent tones that compete with one another for control over some vowel, while boxed tones in the output indicate the tone that emerges victorious. In this way, we can see clearly two important and related facts. First, the competition between H_φ and L_{FV} takes place *earlier* than the competition between H_φ and L_{Pen}. Second, H_φ defeats L tones when it is linked to a vowel in the input (12b), but loses to them when it is not (12a).

(12) H_φ competes w/ final L in evaluation of φ, but w/ penultimate L in evaluation of ι

<table>
<tr><td></td><td></td><td></td><td>e-ki-hekà</td><td>o-mú-lùme</td></tr>
<tr><td rowspan="2">a.</td><td rowspan="2">φ-level evaluation</td><td>input</td><td>[L]
| + [H_φ]
e-ki-hekà</td><td>H L
| | + H_φ
o-mú-lùme</td></tr>
<tr><td>output</td><td>[L]
|
e-ki-hekà</td><td>H L H_φ
| | |
o-mú-lùmé</td></tr>
<tr><td rowspan="2">b.</td><td rowspan="2">ι-level evaluation</td><td>input</td><td>L
| + L_ι
e-ki-hekà</td><td>H [L] [H_φ]
| | | + L_ι
o-mú-lùmé</td></tr>
<tr><td>output</td><td>L_ι
|
e-ki-hekà</td><td>H [H_φ] L_ι
| | |
o-mú-lúmè</td></tr>
</table>

The key moral to emerge from (12) is that within a cyclic analysis of tone assignment, the representational status of a boundary tone can change over time, and as a result its phonological properties can change as well. Specifically, H_φ can become "stronger" over the course of a derivation by transitioning from a *floating* tone protected only by general MAX-H to a *linked* tone protected by the more specific and more highly ranked MAX-H[LINKED]. As a result, while H_φ cannot be initially placed on a vowel which bears a L tone, it can *shift* onto one once it is assigned elsewhere. This general point is illustrated in the tableaux in (13) below, which show how H_φ's competition with L can produce different results depending on its input status.

(13) Floating H_φ cannot overwrite L, but linked H_φ can

a. The toneless vowel of φ-final *o-mú-lùme* permits the assignment of floating H_φ

H L o-mú-lùme H_φ	MAX-H[LINKED]	MAX-L	MAX-H	LINEARITY(V,H)
☞ H L H_φ o-mú-lùmé				*
H L o-mú-lùme			*!	

b. The final L-toned vowel of φ-final *e-ki-hekà* blocks the assignment of floating H_φ

L e-ki-hekà H_φ	MAX-H[LINKED]	MAX-L	MAX-H	LINEARITY(V,H)
☞ L e-ki-hekà			*	
H_φ e-ki-heká		*!		*

c. The penultimate L tone of ι-final *o-mú-lùmé* is overwritten when *linked* H_φ shifts left

H L H_φ o-mú-lùmé L_ι	MAX-H[LINKED]	MAX-L	MAX-H	Linearity(V,H)
☞ H H_φ L_ι o-mú-lùmé		*		*
H L L_ι o-mú-lùmè	*!		*	

This delayed victory of H_φ over L is an example of a "toehold effect," in which a phonological element cannot be inserted directly into some inhospitable position, but can arrive there indirectly if it is first assigned elsewhere, gaining a toehold into the representation on more welcoming ground. This effect is predicted to emerge in any serial system where the status of an element with respect to a highly ranked I-O faithfulness constraint can change over the course of a derivation. It is not predicted, however, in a fully parallel system where each phonological derivation contains just one input-output mapping. For this reason, the emergence of toehold effects in the assignment of Kinande boundary tones provides strong evidence that the cyclic analysis pursued here is on the right track.

1.2 Evidence for postlexical constraint reranking

As we just saw, some orderings between phonological processes arise automatically as a consequence of cyclic evaluation. In particular, certain processes apply before others simply because the inputs which trigger them – i.e. their structural descriptions – arise sooner in the phonological derivation. For example, φ-level boundary tones are assigned before ι-level boundary tones simply because inputs with floating H_φ arise sooner than inputs with floating L_ι or H_ι. However, not all orderings can be explained in this way. In some cases, one phonological process follows another even though its structural description arises *sooner.*

To explain such cases, I appeal to constraint reranking. If some phonological process with the structural description SD and the structural change SC does not apply when SD first arises, the simplest explanation is that at that time, whatever markedness constraint penalizes SD, M_{SD}, must be ranked below whatever faithfulness constraint penalizes SC, F_{SC}.[3] If the

[3] An alternate possiblity, which I ignore here because it is irrelevant to the analysis of Kinande, is that a *markedness* constraint which penalizes the outcome of SC outranks M_{SD}.

process then applies later, then the ranking of M_{SD} and F_{SC} must be reversed. These general ranking conditions are given below.[4]

(14) General conditions for delayed application
  a. When SD first arises: $F_{SC} \gg M_{SD}$
  b. When SC occurs: $M_{SD} \gg F_{SC}$

In the postlexical phonology of Kinande, this mechanism is crucial to explaining the way in which intonational tone assignment interacts with vowel contraction. Here, the basic observation is that although long vowels and sequences of adjacent vowels are present underlyingly, they must not shorten to a single monomoraic vowel until the very end of the postlexical phonology. This is because shortening is sensitive to the presence of boundary tones which are not inserted until this point.

The basic fact of vowel contraction, discussed in detail in section 5, is that underlying long vowels and underlying vowel-vowel sequences regularly shorten to form a single monomoraic vowel *unless* this contraction would produce a monomoraic short vowel associated with two distinct tones. Thus, for example, the contraction of two toneless [a] vowels in (15a) produces a short toneless [a], but the contraction of H-toned [á] with L-toned [à] in (15b) produces a long falling-toned [â:].[5]

(15) Tone-sensitive vowel shortening (penultimate lengthening ignored)

a.	e-ri-n*a*-[*a*hírà]	→	[erin*a*hírà]	'to indeed scream'	[a]+[a] → [a]
b.	e-ri-n*á*-[*à*húlà]	→	[erin*â:*húlà]	'to indeed name'	[á]+[à] → [â:]

[4] If multiple markedness constraints penalize SD, or if multiple faithfulness constraints penalize SC, then these statements become more complicated. When SD first arises, *all* markedness constraints penalizing SD must be ranked below *at least one* faithfulness constraint penalizing SC. When SC applies, *all* faithfulness constraints penalizing SC must be ranked below *at least one* markedness constraint penalizing SD.

[5] The contraction of a H-toned vowel and a L-toned vowel does not *always* lead to a surface falling tone. Due to *tonal absorption* (cf. chapter 2, section 2.2.2), if the contracted vowel precedes a L-toned vowel, what would be a HL-L sequence simplifies to H-L.

To capture these facts, we can posit that *LONGV (16a) is ranked above MAX-μ (16b), but that *CROWD, MAX-H[LINKED], and MAX-L are ranked above *LONGV. With this ranking, vowels will shorten unless shortening would cause a violation of *CROWD. In (17), we see how this ranking produces shortening in (15a) but not in (15b).

(16) Constraints regulating vowel length

a. *LONGV — Violated once for each vowel associated with multiple moras.

b. MAX-μ — Violated once for each input mora which has no output correspondent.

(17) *CROWD, MAX-H[LINKED], MAX-L » *LONGV » Max-μ

a. Toneless vowels resulting from contraction are short (15a)

e-ri-*na*-*a*hírà	*CROWD	MAX-H[LINKED]	MAX-L	*LONGV	MAX-μ
☞ erin*a*hira					*
erin*a:*hírà				*! W	L

b. Falling-toned vowels resulting from contraction are long (15b)

e-ri-n*á*-*à*húlà	*CROWD	MAX-H[LINKED]	MAX-L	*LONGV	MAX-μ
☞ erin*â:*húla				*	
erin*â*húlà	*! W			L	* W
erin*à*húlà		*! W		L	* W
erin*á*húlà			*! W	L	* W

Vowel contraction interacts with intonational tone assignment in words with final long vowels or final vowel-vowel sequences. In these words, ι-final H_φ-L_ι or H_φ-H_ι sequences do not surface on the penultimate and final vowels, as in ι-final *o-ku-gulu* (1b,c) or *o-mú-lùme* (9b,c), but instead surface entirely on the final vowel, which resists shortening in order to accommodate them. Below, this is demonstrated with the toneless noun *e-ki-kome:* 'snail.' In (18a), where *e-ki-kome:* is only assigned a single H_φ tone, its final vowel shortens. However, in (18b) and (18c), where it is assigned both H_φ and L_ι/H_ι, its final vowel remains long.

(18) Tone assignment and vowel contraction in words w/ final long Vs (e.g. *e-ki-kome:* 'snail')

a.		b.		c.	
	H_φ		H_φ L_ι		H_φ H_ι
	|		\/		\/
	e-ki-komé $)_\varphi$ ... $)_\iota$		e-ki-komê: $)_\varphi$ $)_{\iota\text{-D}}$		e-ki-kome̋: $)_\varphi$ $)_{\iota\text{-I}}$

In order to derive these patterns, we must assume that vowel contraction happens after the assignment of L_ι or H_ι, since it is the presence of these tones that prevents the final vowels of (18b) and (18c) from incorrectly shortening. This is shown for *e-ki-kome:* 'snail' in (19) below: if the ranking for shortening established in (17) above were active in the φ-level evaluation, before ι-level boundary tones are assigned, then this evaluation would produce the incorrect φ-final output *[e-ki-komé] (19a), with a final short vowel. If this output were then submitted to the ι-level evaluation, the resulting ι-final output would be incorrect *[e-ki-kómè] (19b).

(19) Incorrect derivation of ι-final *e-ki-kome:* if vowel shortening occurs before ι

a. φ-level evaluation: final vowel receives just H_φ and shortens

e-ki-kome: H_φ	MAX-T_ι	*CROWD	MAX-H [LINKED]	*LONGV	MAX-μ	LIN(V,L)	LIN(V,H)
☞ H_φ *e-ki-komé				*			*
H_φ e-ki-komé:					*!		*

b. ι-level evaluation: H_φ shifts to the left upon the assignment of L_ι

H_φ e-ki-komé L_ι	MAX-T_ι	*CROWD	MAX-H [LINKED]	*LONGV	MAX-μ	LIN(V,L)	LIN(V,H)
☞ H_φ L_ι *e-ki-kómè						*	*
H_φ e-ki-komé	*! W					L	L
LH_ι e-ki-komě		*! W				* ~	L
L_ι e-ki-komè			*! W			* ~	L

On the other hand, if vowel shortening is delayed until the ι-level evaluation, then the attested output of ι-final *e-ki-kome:* is derived correctly. In this case, in the φ-level evaluation, the final vowel does not shorten due to a ranking of Max-μ above *LongV (20a). This allows the final long vowel to survive until the presence of multiple boundary tones can protect it from shortening in the ι-level stratum, where *LongV is ranked above Max-μ (20b). (As shown by the third candidate in (20b), this also requires a ranking of *LongV below Linearity(V,H); this ensures that when an ι-level boundary tone is assigned, it is better to realize both it and H_φ on a final long vowel than to shorten the final vowel and shift H_φ to the left.)

(20) Correct derivation of ι-final *e-ki-kome:* if vowel shortening does not occur before ι

a. φ-level evaluation: final vowel does not shorten due to ranking of Max-μ above *LongV

e-ki-kome: H_φ	Max-T_ι	*Crowd	Max-H [linked]	Lin(V,L)	Lin(V,H)	Max-μ	*LongV
☞ H_φ e-ki-komé:					*		*
H_φ e-ki-komé					*	*! W	L

b. ι-level evaluation: final vowel does not shorten due to its H_φ+L_ι falling tone

H_φ e-ki-komé: L_ι	Max-T_ι	*Crowd	Max-H [linked]	Lin(V,L)	Lin(V,H)	*LongV	Max-μ
☞ $H_\varphi L_\iota$ e-ki-komê:					*	*	
HL e-ki-komê		*! W			* ~	L	* W
H_φ L_ι e-ki-kómè					**! W	L	* W

Finally, note that *LongV *does* need to dominate Max-μ in the ι-level evaluation: this is what ensures that long vowels or vowel sequences associated with only one tone, such as the final vowel of φ-final *e-ki-kome:*, do undergo shortening. This is shown in (21).

(21) Correct derivation of φ-final *e-ki-kome:* if vowel shortening does not occur before ι

a. φ-level evaluation: final vowel does not shorten due to ranking of MAX-μ above *LONGV

e-ki-kome: H_φ	Max-T_ι	*CROWD	MAX-H [LINKED]	LIN(V,L)	LIN(V,H)	MAX-μ	*LONGV
☞ H_φ e-ki-komé:					*		*
H_φ e-ki-komé					*	*! W	L

b. ι-level evaluation: final vowel *does* shorten due to ranking of *LONGV above MAX-μ

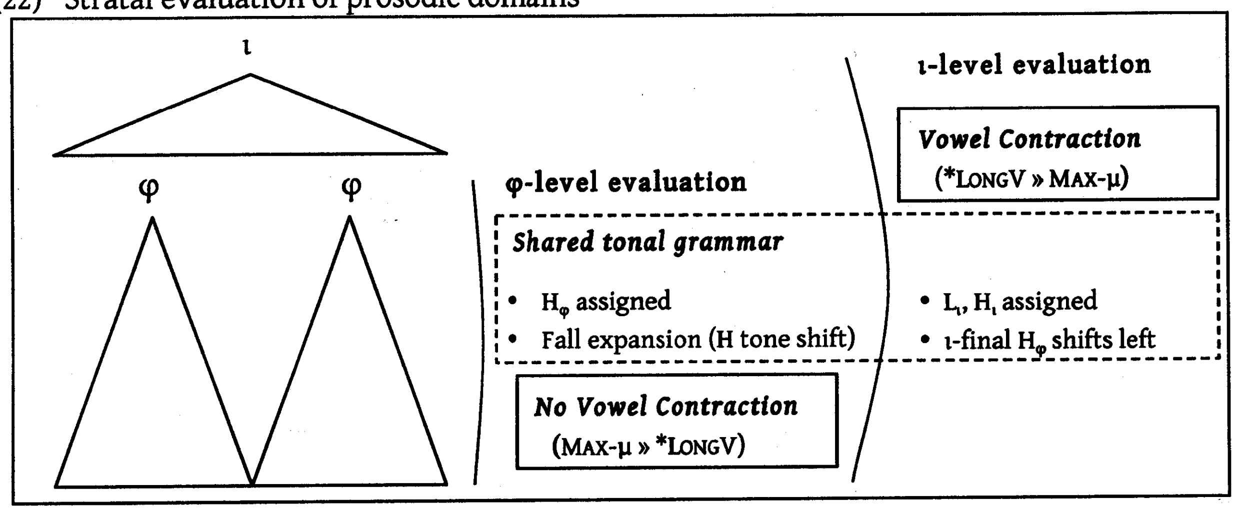
H_φ e-ki-komé:	Max-T_ι	*CROWD	MAX-H [LINKED]	LIN(V,L)	LIN(V,H)	*LONGV	MAX-μ
☞ H_φ e-ki-komé							*
H_φ e-ki-komé:						*! W	L

We have just seen that MAX-μ must dominate *LONGV in the φ-level evaluation in order to correctly derive ι-final *e-ki-kome:* (20), while *LONGV must dominate MAX-μ in order to correctly derive φ-final *e-ki-kome:* (21). Constraint reranking, then, appears to be crucial to the interaction between boundary tone assignment and vowel contraction.

1.3 Overview of PLP

When we combine the evidence for cyclic evaluation with the evidence for constraint reranking, we arrive at postlexical grammar with two strata whose grammars are almost entirely identical, but crucially differ in the ranking of *LONG and MAX-V. As we will see in the sections to follow, this appears to be the *only* ranking that differs between strata, and rankings which are common to both strata are responsible for all tonal behavior apart from contraction. In the φ-level evaluation, they ensure that H_φ is assigned to the φ-final vowel (in the absence of a final L tone), and that all lexical and grammatical H tones shift leftwards as part of the melodic expansion process discussed in chapter 2. In the ι-level evaluation, they ensure that either $L_ι$ or $H_ι$ is assigned to the ι-final vowel, and that any $H_φ$ tone previously assigned there shifts to the left. The rankings which differ between the strata are then responsible only for the fact that vowel-vowel sequences undergo contraction when ι is evaluated, but not before. This general structure of the PLP is summarized in (22).

(22) Stratal evaluation of prosodic domains



In the remainder of this chapter, the various components of the PLP summarized above are examined in more detail as a fuller analysis of the postlexical phonology is constructed. First, in section 2, I formalize the basic framework of a stratal analysis of intonational tone assignment while accounting for the realization of boundary tones in toneless nouns. Here, I show that a single, cyclically evaluated grammar is able to account both for the initial assignment of $H_φ$ to the final vowel in the φ-level evaluation, and for the assignment of ι-level boundary tones and the consequent leftward shift of $H_φ$ in the ι-level evaluation. I therefore posit a unified grammar of φ-level/ι-level tone assignment. Section 3 then merges this grammar with the grammar of leftward tone shift developed in Chapter 2. This merger is motivated by the observation that leftward tone shift is bounded by the phonological phrase. I interpret this as evidence that leftward shift is first triggered within the evaluation of φ, and therefore incorporate the constraint rankings which govern it into the shared φ-level/ι-level grammar of tone. This merger facilitates the analysis of forms with underlying H and L tones in section 4. There, we will see that when grammar resulting from the merger is evaluated cyclically, it easily accounts for the fact that H_φ is blocked by a final L tone but able to overwrite a penultimate one, unlike the parallel grammar considered in 1.1 above. This success demonstrates the importance of cyclic evaluation within the postlexical phonology. Section 5 then examines the interaction of tone assignment and vowel contraction in more detail, and looks once more at how the successful analysis of their interaction requires constraint reranking. Section 6 concludes.

2 Intonational Tone Assignment in Toneless Nouns and Verbs

This section establishes the core framework of a stratal analysis of intonational tone assignment, which will be only slightly modified as we consider additional data in sections 3 and 4. In 2.1, I provide basic data on how intonational boundary tones surface in toneless nouns and verbs, and review how the assignment of these tones is conditioned by prosodic structure. I then develop a formal analysis of this data in 2.2, laying out grammars for φ and ι that are responsible for the behavior of φ-level and ι-level boundary tones. In 2.3, I review all rankings established up to that point, and show that since the rankings needed for the φ-level grammar and those needed for the ι-level gramamar are entirely compatible with one another, they can both be merged into a single φ-level/ι-level grammar.

2.1 Canonical tone in underlyingly toneless nouns

A basic property of Kinande tone is that a word's tone pattern can vary according to its position within a sentence. This may be observed, for example, in the tonal variation of *o-ku-gulu* 'leg' presented in (23) below. This noun is underlyingly toneless, and surfaces as such when it occurs before an underlyingly toneless adjective (23a). In other contexts, however, non-underlying high and low tones surface on its final and penultimate vowels (23b-d). This pattern of tone assignment defines what I will call the *canonical pattern of intonational tone*, or simply *canonical tone* for short. The basic properties of canonical tone in nouns are summarized in (24).

(23) Tonal variation of underlyingly toneless *o-ku-gulu* 'leg'[6]

a.	Pre-adjectival	**o-ku-gulu**	ku-lį́tò	'the heavy leg'
		AUG-NC.15-LEG	NC.15-HEAVY	
b.	Pre-verbal	**o-ku-gulú**	ku-ká-langirawâ	'The leg is seen.'
		AUG-NC.15-LEG	SM.15-IMPV-BE.SEEN	
c.	Statement-final	u-ká-langir'	**o-ku-gúlù**	'You see the leg.'
		SM.2S-IMPV-SEE	AUG-NC.15-LEG	
d.	Question-final	u-ká-langir'	**o-ku-gúlú**	'You see the leg?'
		SM.2S-IMPV-SEE	AUG-NC.15-LEG	

(24) A noun shows canonical tone when

a. In pre-verbal subject position, a H tone surfaces on its final vowel
b. At the end of a declarative statement, a H tone surfaces on its penultimate vowel while a L tone surfaces on its final vowel
c. At the end of a yes/no question, a H tone surfaces on its penultimate vowel while another H tone surfaces on its final vowel

[6] All noun forms contain a noun stem (glossed by its meaning), a noun class prefix (glossed by NC, together with a number identifying the noun's class), and an initial augment vowel (glossed by AUG). The stem and the NC prefix are obligatory components of all nouns, but whether a noun contain AUG is determined by a combination of meaning and the noun's syntactic context. In all forms, AUG and NC are underlyingly toneless.

Canonical tone is observed in all underlyingly toneless nouns, regardless of length, so that we see it not just in *o-ku-gulu* 'leg,' but also in *a-ba-ndu* 'people' (25) and *o-bu-hulula* 'chain' (26). In the discussion to follow, however, most examples will involve *o-ku-gulu* because it is conveniently short.

(25) Tonal variation of underlyingly toneless *a-ba-ndu* 'people'

a.	Pre-adjectival	**a-ba-ndu**	ba-lį́tò	'the heavy people'
		AUG-NC.2-PERSON	NC.2-HEAVY	
b.	Pre-verbal	**a-ba-ndú**	ba-ká-langirawâ	'The people are seen.'
		AUG-NC.2-PERSON	SM.3P-IMPV-BE.SEEN	
c.	Statement-final	u-ká-langir'	**a-bá-ndù**	'You see the people.'
		SM.2S-IMPV-SEE	AUG-NC.2-PERSON	
d.	Question-final	u-ká-langir'	**a-bá-ndú**	'You see the people?'
		SM.2S-IMPV-SEE	AUG-NC.2-PERSON	

(26) Tonal variation of underlyingly toneless *o-bu-hulula* 'chain'

a.	Pre-adjectival	**o-bu-hulula**	bu-lį́tò	'the heavy chain'
		AUG-NC.14-CHAIN	NC.14-HEAVY	
b.	Pre-verbal	**o-bu-hululá**	bu-ká-langirawâ	'The chain is seen.'
		AUG-NC.14-CHAIN	SM.14-IMPV-BE.SEEN	
c.	Statement-final	u-ká-langir'	**o-bu-hulúlà**	'You see the chain.'
		SM.2S-IMPV-SEE	AUG-NC.14-CHAIN	
d.	Question-final	u-ká-langir'	**o-bu-hulúlá**	'You see the chain?'
		SM.2S-IMPV-SEE	AUG-NC.14-CHAIN	

I follow much previous work on Kinande tone (e.g. Hyman and Valinande 1985, Hyman 1990, Mutaka 1994, Akinlabi and Mutaka 2001, Kenstowicz 2008) in assuming that the tonal alternations of forms showing canonical tone result from the fact that in different sentential contexts, words occupy different positions within prosodic structure, and therefore receive different combinations of intonational boundary tones. I follow the specific proposal of Hyman (1990), who argues that boundary tones are assigned according to the generalizations in (27).

(27) Intonational tone assignment (Hyman 1990)[7]

a. The right edge of every φ is marked with H_φ.
b. The right edge of every final declarative ι (= ι_D) is marked with L_ι.
c. The right edge of every nonfinal or interrogative ι (= ι_I) is marked with H_ι.

According to this analysis, the different tonal realizations of *o-ku-gulu* in (23) above result from its placement within the prosodic structures in (28). When *o-ku-gulu* stands before an adjective (28a), it is neither ι-final nor φ-final, and is therefore assigned no boundary tones; this allows it to surface (faithfully) as entirely toneless. When it stands before a verb in subject position (28b), it is φ-final but not ι-final, and is therefore assigned H_φ but not L_ι or H_ι. In this case, H_φ surfaces on the ultima. Finally, when *o-ku-gulu* occurs at the end of a statement (28c) or at the end of a question (28d), it is both φ-final and ι-final. It is therefore assigned both H_φ, which surfaces on the penult, and either L_ι or H_ι, which surfaces on the ultima.[8]

(28) Prosodic conditioning of tone in *o-ku-gulu* 'leg'[9]

a. φ-medial
((**o-ku-gulu** ku-lịto $)_\varphi$ $)_\iota$ → ((**o-ku-gulu** ku-lị́tò $)_\varphi$ $)_\iota$

b. φ-final
((**o-ku-gulu** $)_\varphi$ (ku-ká-langirawa$)_\varphi$ $)_\iota$ → ((**o-ku-gulú** $)_\varphi$ (ku-ká-langirawâ$)_\varphi$ $)_\iota$

c. ι_D-final (statement)
((u-ká-langir' **o-ku-gulu** $)_\varphi)_{\iota\text{-D}}$ → ((u-ká-langir' **o-ku-gúlù** $)_\varphi)_{\iota\text{-D}}$

d. ι_I-final (question)
((u-ká-langir' **o-ku-gulu** $)_\varphi)_{\iota\text{-I}}$ → ((u-ká-langir' **o-ku-gúlú** $)_\varphi)_{\iota\text{-I}}$

Thinking of intonational tone assignment in these terms, we can draw two clear generalizations about how boundary tones relate to prosodic boundaries and how they relate

[7] Hyman refers to the tones that I am calling H_φ, L_ι and H_ι as H%, $L_{//}$ and $H_{//}$, respectively.

[8] See Hyman (1990) for a discussion of how prosodic domains are derived from syntactic structure in Kinande.

[9] Intonational H_φ and L_ι tones are also responsible for the tones marked on *-lị́tò* and *-langirawâ*. The H tone which surfaces *ká* is not intonational; its provenance is discussed in chapter 5.

to each other. First, boundary tones always surface as close as possible to the prosodic boundaries that they mark: L_ι always surfaces on the last vowel of ι_D (28c), H_ι always surfaces on the last vowel of ι_I (28d), and H_φ always surfaces on the last vowel of a non-final φ (28b). Second, no vowel may be associated with more than one tone. This second generalization is responsible for the only departure from the first: when H_φ marks a φ whose right edge coincides with the right edge of some ι, it surfaces on the penultimate vowel rather than the last (28c,d) so that it does not share the φ-final/ι-final vowel with L_ι or H_ι. In the next section, I account for these conflicting generalizations within a stratal OT analysis of intonational tone.

2.2 Constraint-based analysis of canonical tone

As discussed in 1.1, I analyze boundary tone assignment as a 2-stage process spanning the evaluations of φ and ι. First, when φ is evaluated, its final vowel is assigned H_φ (29a). Second, when ι is evaluated, its final vowel is assigned either L_ι or H_ι, and if this vowel has previously been assigned H_φ, then this H_φ shifts back onto the penult (29b). In 2.2.1 and 2.2.2, I consider each of these stages in turn.

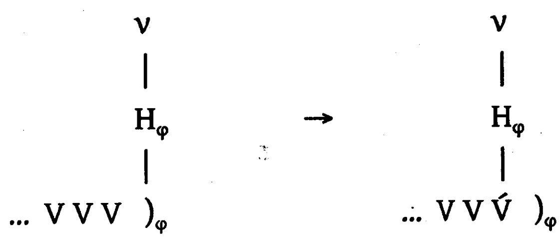
(29) φ-level (a) and ι-level (b) evaluation of *o-ku-gulu* 'leg'

		(a)		(b)
		H_φ		$H_\varphi L_\iota$
		|		| |
/o-ku-gulu/	→	$($o-ku-gulú$)_\varphi$	→	$(($o-ku-gúlù$)_\varphi)_\iota$

2.2.1 φ-level evaluation

I begin the analysis by assuming that intonational boundary tones are present in the input to the evaluations in which they are assigned, having been inserted, together with the domains that they mark, at the LP-PLP Watershed (cf. chapter 2, section 4).[10] I assume moreover that these boundary tones are initially associated to the right edge of their prosodic domains, so that they follow all domain-internal segments or tones. From this perspective, the assignment of H_φ to the φ-final vowel consists of a simple tone-to-vowel association which minimally disrupts the linearity relations obtaining between input vowels and tones: in the input, H_φ follows *all* φ-internal vowels, and in the output, it follows all but one. This is illustrated in (30) below.

(30) Association of H_φ to a φ-final vowel



The association of H_φ to the φ-final vowel violates LINEARITY(V,H) (31a), which demands that if a H tone follows a vowel in the input, it must follow it in the output as well. This violation is compelled in the course of boundary tone assignment, I assume, because LINEARITY(V,H) is dominated by both *FLOAT (31b) and MAX-H (31c).

(31) Constraints involved in tonal association

a. LINEARITY(V,H) = LIN(V,H) — If an input vowel V has an output correspondent V′, and if an input high tone H has an output correspondent H′, then if V < H then V′ < H′.

b. *FLOAT — Each output tone must be associated with some vowel.

c. MAX-H — Each input H tone must have an output correspondent.

[10] The alternative is to assume that the phonology inserts the boundary tones at the same time that it assigns them to a particular vowel. For an analysis illustrating this possibility, see Jones (2014).

The tableau in (32) shows how ranking *FLOAT and MAX-H above LINEARITY(V,H) derives the assignment of H_φ to φ-final *o-ku-gulu*. There, we see that disrupting the underlying LINEARITY relation between H_φ and the φ-final vowel (32a) is better than allowing H_φ to remain floating in the output (32b) or deleting it (32c). Moreover, we see that H_φ will not associate to any φ-nonfinal vowel, since this will incur gratuitous violations of LINEARITY(V,H) (32d).

(32) φ-level evaluation: *FLOAT, MAX-H » LINEARITY(V,H)

		o-ku-gulu H_φ $)_\varphi$	*FLOAT	MAX-H	LINEARITY(V,H)
a.	☞	H_φ o-ku-gulú $)_\varphi$			*
b.		o-ku-gulu H_φ $)_\varphi$	*! W		L
c.		o-ku-gulu $)_\varphi$		*! W	L
d.		H_φ o-ku-gúlu $)_\varphi$			**! W

Note that as a general consequence of the fact that H_φ does not associate to φ-nonfinal vowels, words that are φ-medial will not surface with a final H_φ tone. Thus, we predict that in the output of the φ-level evaluation, every φ-final vowel (but no other) is associated with H_φ. This output then becomes the input to the ι-level evaluation.

2.2.2 ι-level evaluation

In the evaluation of ι, L_ι is assigned to the final vowel of a declarative ι (ι_D) while H_ι is assigned to the final vowel of an interrogative ι (ι_I); in either case, a H_φ tone which occupies an ι-final vowel in the input shifts back onto the penult. Just as in the analysis of H_φ assignment, I assume that L_ι and H_ι are present in the input to the ι-level evaluation, and that their association to the ι-final vowel constitutes a minimal disruption of vowel-to-tone linearity relations. This means that the association of L_ι to the ι_D-final vowel is penalized by

LINEARITY(V,L) (33a), while the association of H_ι to the ι_f-final vowel is penalized by LINEARITY(V,H). In the ι-level evaluation, then, LINEARITY(V,L) and LINEARITY(V,H) must be dominated by (a) *FLOAT and (b) one or more MAX constraints which seek to preserve L_ι and H_ι.

However, these MAX constraints cannot be simple MAX-L and MAX-H. Ranking both of these above LINEARITY(V,L) and LINEARITY(V,H) would predict that both H tones and L tones will, as a matter of general principle, shift to the left rather than delete. This is true of H tones: we see this, for example, in the fact that H_φ shifts to the left instead of deleting when L_ι or H_φ is assigned. However, it is *not* generally true of L tones: all L tones other than L_ι delete rather than shift to the left, indicating a ranking of LINEARITY(V,L) above MAX-L.[11] Therefore, to derive the fact that L_ι links to the ι-final vowel instead of deleting, I propose undominated MAX-T_ι (33b), which specifically penalizes the deletion of ι-level boundary tones.[12]

(33) ι-level faithfulness s constraints

a.	LINEARITY(V,L)	If an input vowel V has an output correspondent V′, and if an input low tone L has an output correspondent L′, then if V < L then V′ < L′.
b.	MAX-T_ι	Violated once for each ι-level boundary tone without an output correspondent.

---

[11] We saw in chapter 2 that this ranking obtains at the time of leftward tone shift, i.e. when $(HL)_v$ melodic units created at the LP-PLPW expand to the left. There, we saw that if L tones could shift left to escape leftward-shifting H tones to their right, they would ultimately drive *preceding* H tones too far to the left (cf. chapter 2, example (52d)). In section 3, I argue that the expansion of $(HL)_v$ occurs during the φ-level evaluation, so that the ranking of LINEARITY(V,L) above MAX-L established on the basis of this evidence can be incorporated into our φ-level grammar. Comparable evidence that this ranking *also* obtains during the ι-level evaluation comes from nouns like *o-mú̲-kàl̀ì* 'woman.' This noun contains the underlying stem /-ká̲l̀ì/, with an initial H tone and a final L tone. In the ι-level input, after its stem-initial H tone has shifted to the left, it has the intermediate form /o-mú̲-kàl̀ì/. If L tones could shift left to escape deletion, then we would expect the assignment of H_ι to ι_f-final /o-mú̲-kàl̀ì/ to trigger a chain reaction of leftward shift, whereby the final L tone shifts onto the penult, the penultimate L tone shifts onto the antepenult, and the antepenultimate H tone shifts onto the pre-antepenult, producing *[ó̲-mù-kàlʃ]. Since this does not happen – the attested ι_f-final form is [o-mú̲-kàlʃ], with the final L tone simply overwritten by H_ι – we can conclude that LINEARITY(V,L) is undominated throughout the phonology of Kinande.

[12] Since ι-level (but not φ-level) boundary tones are associated with intonational meaning (e.g. marking whether a given utterance is intended as a statement or a question), it may be better to think of these as tonal morphemes. In that case, the high-ranked faithfulness constraint that protects them could be identified as REALIZE-MORPH.

In (34), we see how ranking *FLOAT, MAX-T_ι, and LINEARITY(V,L) correctly derives the fact that L_ι associates to the ι-final vowel rather than remaining floating (34b) or deleting (34c).

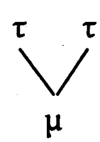
(34) Evaluation of ι_D-final *o-ku-gulu* 'leg': *FLOAT, LINEARITY(V,L) compel L_ι to link to final vowel

	H_φ o-ku-gulú L_ι $)_{\iota\text{-D}}$	*FLOAT	MAX-T_ι	LINEARITY(V,L)
a.	☞ $H_\varphi L_\iota$ o-ku-gúlù $)_{\iota\text{-D}}$			*
b.	H_φ o-ku-gulú L_ι $)_{\iota\text{-D}}$	*! W		L
c.	H_φ o-ku-gulú $)_{\iota\text{-D}}$		*! W	L

We can now address the fact that the association of L_ι or H_ι to the φ-final/ι-final vowel causes any H_φ tone which is already assigned there to shift to the left, in violation of LINEARITY(V,H). Since H_φ is not simply overwritten, and since it does not just share the φ-final/ι-final vowel with L_ι, we can conclude that LINEARITY(V,H) is dominated both by *CROWD (35a) and by some MAX constraint protecting H_φ. In anticipation of section 4, where we will see that we must distinguish faithfulness to H tones that are *linked* in the input from faithfulness to H tones in general, I propose that this MAX constraint is MAX-H[LINKED] (35b). In (36), we see how ranking MAX-H[LINKED] and *CROWD above LINEARITY(V,H) correctly derives the leftward shift of H_φ.

(35) Constraints involved in the derivation of leftward shift

a. *CROWD Violated once for each instance of the structure



b. MAX-H[LINKED] Violated once each time a H tone that is linked to a vowel in the input has no output correspondent.

(36) Evaluation of ι_D-final *o-ku-gulu* 'leg': *Crowd, *Max-H compel final H_φ to shift to the penult

		H_φ o-ku-gulú L_ι $)_{\iota\text{-D}}$	*Float	Max-T_ι	*Crowd	Max-H [Linked]	Linearity (V,L)	Linearity (V,H)
a.	☞	$H_\varphi L_\iota$ o-ku-gúlù $)_{\iota\text{-D}}$					*	*
b.		$H_\varphi L_\iota$ o-ku-gulû $)_{\iota\text{-D}}$			*! W		* ~	L
c.		L_ι o-ku-gulù $)_{\iota\text{-D}}$				*! W	* ~	L

As shown in (37), the same ranking of constraints also correctly derives the assignment of H_ι to an ι_I-final vowel, and the accompanying shift of H_φ from the penult to the ultima.

(37) Derivation of ι_I-final *o-ku-gulu* 'leg': H_ι assigned to final vowel, H_φ shifts to the left

		H_φ o-ku-gulú H_ι $)_{\iota\text{-D}}$	*Float	Max-T_ι	*Crowd	Max-H[Linked]	Linearity (V,L)	Linearity (V,H)
a.	☞	$H_\varphi H_\iota$ o-ku-gúlú $)_{\iota\text{-D}}$						**
b.		H_φ o-ku-gulú H_ι $)_{\iota\text{-D}}$	*! W					L
c.		H_φ o-ku-gulú $)_{\iota\text{-D}}$		*! W				L
d.		$H_\varphi H_\iota$ o-ku-gulű $)_{\iota\text{-D}}$			*! W			* L
e.		H_ι o-ku-gulú $)_{\iota\text{-D}}$				*! W		* L

2.2.3 Summary and Resynthesis: Canonical tone in toneless nouns

At this point, all of the rankings necessary for the analysis of intonational boundary tone assignment in toneless nouns have been established. Those relevant to the evaluation of φ are given in (38), while those relevant to the evaluation of ι are given in (39).

(38) φ-level grammar

*FLOAT, MAX-H » LINEARITY(V,H)	[Tableau 32]
a. *FLOAT » LINEARITY(V,H)	(32b)
b. MAX-H » LINEARITY(V,H)	(32c)

(39) ι-level constraint ranking:

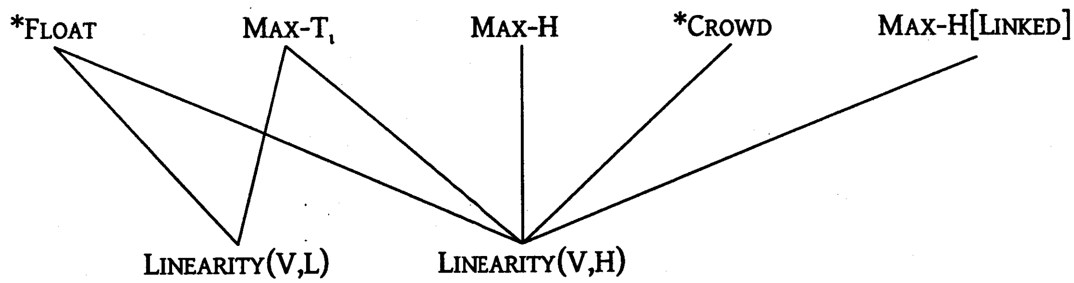
*FLOAT, MAX-$T_ι$ » LINEARITY(V,L)	[Tableau 34]
a. FLOAT» LINEARITY(V,L)	(34b)
b. MAX-$T_ι$ » LINEARITY(V,L)	(34c)
*CROWD, MAX-H[LINKED] » LINEARITY(V,H)	[Tableaux 36, 37]
c. *CROWD » LINEARITY(V,H)	(36b, 37d)
d. MAX-H[LINKED] » LINEARITY(V,H)	(36c, 37e)
*FLOAT, MAX-$T_ι$ » LINEARITY(V,H)	[Tableau 37]
e. *FLOAT » LINEARITY(V,H)	(37b)
f. MAX-$T_ι$ » LINEARITY(V,H)	(37c)

When we compare these two grammars, we observe that their rankings do not conflict in any way. One ranking, *FLOAT » LINEARITY(V,H), is shared by both grammars (38a, 39e), and those rankings that are not shared are largely orthogonal to one another. To begin with, all five of the rankings which occur in the ι-level grammar but not the φ-level grammar can be harmlessly included in φ-level grammar as well because they involve constraints (namely MAX-$T_ι$, *CROWD or MAX-H[LINKED]) which refer to structures that simply do not arise during the φ-level evaluation of *o-ku-gulu*. In addition, the one ranking which occurs in the φ-level grammar but not the ι-level grammar – MAX-H » LINEARITY(V,H) – can be incorporated into the ι-level grammar without effect, since the results of that ranking are already produced by the more specific rankings of MAX-$T_ι$ above LINEARITY(V,H) (39f) and MAX-H[LINKED] above LINEARITY(V,H) (39d). It is therefore possible to posit a unified grammar for both φ and ι, given in (40) below.

(40) Unified grammar of boundary tone assignment for both φ and ι

a. *FLOAT, MAX-T$_{\iota}$, MAX-H, *CROWD, MAX-H[LINKED] » LINEARITY(V,H)

b. *FLOAT, MAX-T$_{\iota}$ » LINEARITY(V,L)



As a demonstration that this unified ranking derives the correct placement of boundary tones in toneless nouns, the full derivations of φ-final, ι$_{D}$-final, and ι$_{I}$-final *o-ku-gulu* are shown in (41)-(43) below. First, in (41), we see how φ-final *o-ku-gulu* surfaces with a final H$_{\varphi}$ tone. At the φ-level evaluation, H$_{\varphi}$ links to the final vowel in order to satisfy *FLOAT and MAX-T (41a). It then stays on the final vowel in the ι-level evaluation, since no ι-level tone forces it off (41b).

(41) Derivation of φ-final *o-ku-gulu*

a. φ-level evaluation: *FLOAT, MAX-H compel association of H$_{\varphi}$ to φ-final vowel

	o-ku-gulu H$_{\varphi}$)$_{\varphi}$	*FLOAT	MAX-T$_{\iota}$	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞	H$_{\varphi}$ o-ku-gulú)$_{\varphi}$							*
	o-ku-gulu H$_{\varphi}$)$_{\varphi}$	*! W						L
	o-ku-gulu)$_{\varphi}$					*! W		L

b. ι-level evaluation: Input perfectly faithful and perfectly unmarked

	H$_{\varphi}$ o-ku-gulú)$_{\varphi}$ ...)$_{\iota}$	*FLOAT	MAX-T$_{\iota}$	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞	H$_{\varphi}$ o-ku-gulú)$_{\varphi}$							

In (42), we see how ι_D-final *o-ku-gulu* surfaces with a penultimate H_φ tone and a final L_ι tone. H_φ first links to the final vowel at the φ-level evaluation, just as in (41a). At the subsequent ι-level evaluation, L_ι links to the final vowel in order to satisfy MAX-T_ι and *FLOAT. H_φ therefore shifts one vowel to the left, violating LINEARITY(V,H) to satisfy *FLOAT, MAX-T_ι, *CROWD, and MAX-H[LINKED].

(42) Derivation of ι_D-final *o-ku-gulu*

a. φ-level evaluation: *FLOAT, MAX-H compel association of H_φ to φ-final vowel

o-ku-gulu H_φ)$_\varphi$	*FLOAT	MAX-T_ι	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞ H_φ o-ku-gulú)$_\varphi$							*
o-ku-gulu H_φ)$_\varphi$	*! W						L
o-ku-gulu)$_\varphi$					*! W		L

b. ι-level evaluation: L_ι associates to ι-final vowel, H_φ shifts left

H_φ o-ku-gulú L_ι)$_\iota$	*FLOAT	MAX-T_ι	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞ $H_\varphi L_\iota$ o-ku-gúlù)$_\iota$						*	*
H_φ o-ku-gulú L_ι)$_\iota$	*! W					L	L
H_φ o-ku-gulú)$_\iota$		*! W				L	L
$H_\varphi L_\iota$ o-ku-gulû)$_\iota$			*! W			* ~	L
L_ι o-ku-gulù)$_\iota$				*! W	* (!) W	* ~	L

Finally, (43) shows the full derivation of ι_I-final *o-ku-gulu*. This is identical to that of ι_D-final *o-ku-gulu*, except that the assignment of H_ι rather than the assignment of L_ι forces the leftward shift of H_φ.

(43) Derivation of ι_I-final *o-ku-gulu*

a. φ-level evaluation: *FLOAT, MAX-H compel association of H_φ to φ-final vowel

o-ku-gulu H_φ $)_\varphi$	*FLOAT	MAX-T_ι	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞ H_φ o-ku-gulú $)_\varphi$							*
o-ku-gulu H_φ $)_\varphi$	*! W						L
o-ku-gulu $)_\varphi$					*! W		L

b. ι-level evaluation: H_ι associates to ι-final vowel, H_φ shifts left

H_φ o-ku-gulú H_ι $)_\iota$	*FLOAT	MAX-T_ι	*CROWD	MAX-H [LINKED]	MAX-H	LINEARITY (V,L)	LINEARITY (V,H)
☞ $H_\varphi H_\iota$ o-ku-gúlú $)_\iota$							**
H_φ o-ku-gulú H_ι $)_\iota$	*! W						L
H_φ o-ku-gulú $)_\iota$		*! W			* (!) W		L
$H_\varphi H_\iota$ o-ku-gulű $)_\iota$			*! W				* L
H_ι o-ku-gulú $)_\iota$				*! W	* (!) W		* L

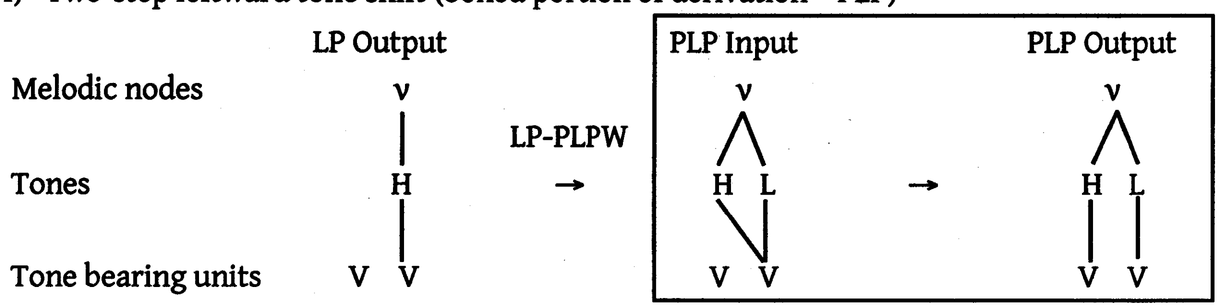
A unified grammar for boundary tone assignment, therefore, correctly assigns boundary tones in both the φ-level and ι-level strata. Since this unified grammar is possible, I assume that it is in fact preferred by the language learner, who conservatively assumes that constraint rankings in all evaluations are identical in the absence of evidence to the contrary. In other words, the learner expects his or her grammar to be cyclic, with the same constraint ranking successively applied to larger and larger morphological and/or prosodic constituents, and posits reranking between strata only when necessary.

One ranking of note in this shared φ-level/ι-level grammar is that *CROWD dominates LINEARITY(V,H). The presence of this ranking – i.e. the one that drives leftward tone shift – in the *φ-level* evaluation derives from our effort to unify φ-level and ι-level grammars as much as possible, even though we have not yet seen any evidence that leftward tone shift occurs during the evaluation of φ. However, we know from chapter 2 that the input to the φ-level evaluation will contain falling tones, namely those that the LP-PLPW has created from the high tones emerging from the LP. Our grammar in (40), the, predicts that these contours will expand in the φ-level evaluation. In the next section, we see evidence that this is correct.

3 The phonological phrase (φ) as the domain of leftward tone shift

In chapter 2, we saw how intermediate falls derived from lexical and grammatical H tones at the LP-PLPW are expanded via leftward shift within the PLP.

(44) Two-step leftward tone shift (boxed portion of derivation = PLP)



In this section, I argue that this expansion takes place specifically within the evaluation of φ. This position is motivated by the fact that leftward tone shift applies freely between words within the same φ, but not between words belonging to different φ's. In the stratal framework that I am adopting, where the domain of a phonological process is necessarily limited by the material that is visible to it at the derivational stage at which it applies, the most natural interpretation of this fact is that leftward shift takes place during the evaluation of φ.

We have already seen in chapter 2 (ex. (8)) that tone shift can cross word boundaries *within* φ. We saw, for example, that if a noun's first vowel bears a lexical H tone underlyingly, then that H tone will surface on the final vowel of a preceding verb. This point is demonstrated again in (45), where we see that when unaugmented *é-n-gòkò* 'chicken' or *é-m-bènè* 'goat' follow *e-ri-*[*huma*] 'to hit,' their lexical H tones surface on its final vowel.

(45) Leftward shift across word boundaries, within φ[13]

a.	((e-ri-humá	ŋ-gòkò	$)_{\varphi})_{\iota}$	'to hit a *chicken*'	/-kókò/ 'chicken'
b.	((e-ri-humá	m-bènè	$)_{\varphi})_{\iota}$	'to hit a *goat*'	/-hénè/ 'goat'

In these examples, a lexical H tone shifts onto a vowel that is underlyingly toneless. However, it can also shift onto a vowel that bears a L tone, and thereby overwrite it. This is shown in (46), where *é-n-gòkò* and *é-m-bènè* are preceded not by an underlyingly toneless infinitive, but rather by a fully conjugated form which ends in a final L tone (cf. chapter 4).

(46) Leftward H tone shift onto a preceding L tone vowel

a.	((tu-ang**á**-[h**ú**m-ìr-**à**] SM.1P-POT-[HIT-APP-FV]		$)_{\varphi})_{\iota}$	'we should for'
b.	((tu-ang**á**-[h**ú**m-ìr-á] SM.1P-POT-[HIT-APP-FV]	ŋ-gòkò NC.9-CHICKEN	$)_{\varphi})_{\iota}$	'we should hit for the chicken'

We see, then, that lexical H tones are able to shift onto the final vowel of a preceding word within the same φ, regardless of whether its final vowel is toneless or L-toned. This appears to be the maximal domain of leftward shift, however, for H tones do *not* shift between words in different phonological phrases. To see this, first recall that a subject noun and an immediately following verb belong to separate φ's; this is the reason why a toneless noun

[13] The absence of an augment vowel gives the object nouns in these sentences contrastive focus.

surfaces with a final H_{φ} boundary tone in subject position (cf. (28)). Therefore, if shift can occur across φ boundaries, we should expect that any H tone that originates on a verb's first vowel should shift leftward (via Fall Conversion and Fall Expansion) onto the last vowel of a preceding noun. This does not seem to happen. In particular, while there is reason to believe that most subject markers in Kinande bear underlyingly H tones, they never cause H tones to surface on nouns which precede them.

Evidence that the subject marker is underlyingly H-toned is presented in (47). Here, we see five different verb forms, each with the class 7 subject marker *ki-*. In (47a), *ki-* is the first morpheme of the verb. In other forms, however, *ki-* is preceded by some other morpheme: the focus marker *mo-* (47b), the negation marker *si-* (47c), the relative marker *e-* (47d), or the counterfactual marker *nga* (47e). As shown, *all* of these morphemes surface with a H tone. Given the generalization that non-intonational H tones in Kinande always surface one vowel to the left of their underlying or initially-assigned positions, our first assumption should be that these H tones originate from the subject marker, and subsequently shift to the left.

(47) Pre-SM morphemes surfacing as H-toned

a. ((ki-ká-[langirawâ] $)_{\varphi})_{\iota\text{-D}}$ 'It (cl. 7) is seen (habitually).'
SM.7-IMPV-[BE.SEEN]

b. ((mó-ki-ká-[langirawâ] $)_{\varphi})_{\iota\text{-D}}$ 'It (class 7) was seen (recently).'
FOC-SM.7-TAM-[BE.SEEN]

c. ((sí-ki-li-[langirawâ] $)_{\varphi})_{\iota\text{-D}}$ 'It (class 7) is not seen (habitually)'
NEG-SM.7-TAM-[BE.SEEN]

d. ((e-ki-tabw' é-ki-ká-[langirawâ] $)_{\varphi})_{\iota\text{-D}}$ 'the book which is seen (habitually)'
AUG-NC.7-BOOK REL-SM.7-IMPV-[BE.SEEN]

e. ((ngá kí-ka-[langirawâ] $)_{\varphi})_{\iota\text{-D}}$ 'if it were seen (habitually) ...'
CFACT SM.7-IMPV-[BE.SEEN]

Additional data suggesting an underlying H tone on the SM are provided by Mutaka (1994: p. 52, note 2). He notes that *momo* 'although' bears a final H tone when it immediately precedes a subject marker (48a), but not when it precedes a full subject noun (48b).

(48) Variable tone of *momo* (Mutaka 1994: p. 52, note 2)

a.	momó		tu-ká-na-[hum-áà]	'even when we hit'
	ALTHOUGH		SM.1P-IMPV-AFF-[HIT-DES]	
b.	momo	Kigulu	ki-ká-na-[hum-áà]	'even when Kigulu hits'
	ALTHOUGH	KIGULU	SM.7-IMPV-AFF-[HIT-DES]	

I will assume, then, that the SM is indeed H-toned in Kinande.[14] With this established, we can now test to see if the underlying H tone of the subject marker will shift across a φ boundary onto a preceding noun. Not just any noun will allow us to test this, however. In particular, a noun whose final vowel is underlyingly toneless (e.g. *o-ku-gulu* 'leg') will not help us: such a noun will show a final H tone in pre-verbal position regardless of the properties of tone shift, due to the fact that *pre-verbal* position is a *φ-final* position where H_{φ} is assigned. We must therefore look at words with final L tones (e.g. *e-ki-hekà* 'truck'). As we saw in section 1, the final L tones of these words systematically block the assignment of H_{φ}. However, as we just saw in (48), they do *not* block lexical H tones from shifting from a following word. Therefore, if leftward tone shift can apply across a φ boundary, then in pre-verbal position, these nouns should show a final H tone originating from the subject marker. As seen in (49), however, they do not. Instead, the H tone of the SM simply deletes.

(49) H-toned SMs do not expand leftward onto a L-toned noun

a.	((e-ki-hekà $)_{\varphi}$	(ki-ká-[langirawâ] $)_{\varphi}$ $)_{\iota\text{-D}}$	'The truck is seen (habitually).'
	AUG-NC.7-TRUCK	SM.7-IMPV-[BE.SEEN]	

[14] This actually appears to vary by tense. See chapter 5, note 10.

We saw in chapter 2 that underlying H tones which are utterance-initial (e.g. the initial underlying H tone of *tataa* 'father' in ch. 2, ex. (39)) delete because after they are converted to falling tones at the LP-PLPW, there is no place for them to shift to once those falling tones are forced to expand. Here, we are seeing that the same thing happens utterance-medially at the beginning of a phonological phrase. We can make sense of this if leftward H tone shift occurs during the evaluation of φ, where only φ-internal material is visible to the phonology. In that case, just as in utterance-initial position, a H tone at the beginning of φ is forced to delete because there is no vowel to its left that it can shift onto.

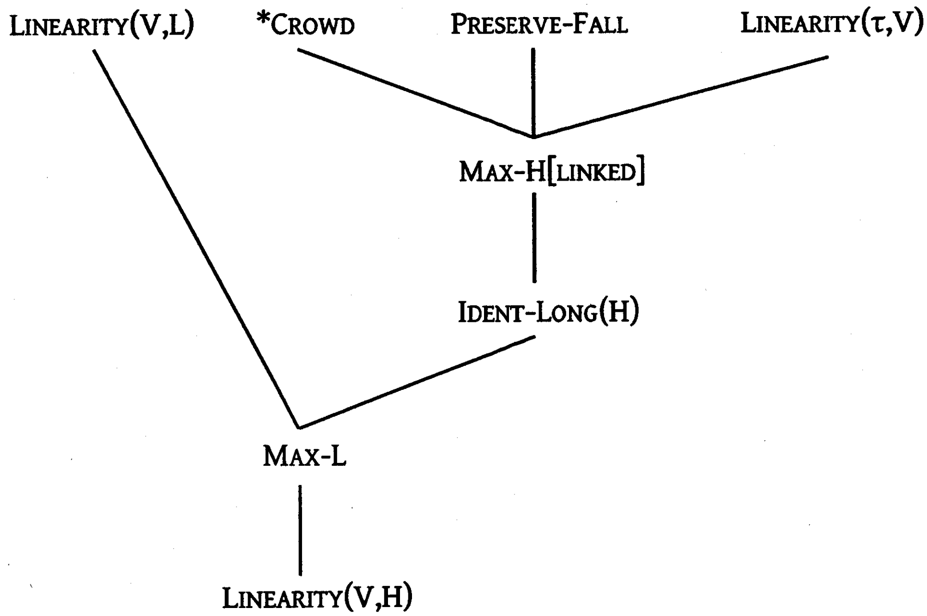
As we saw in the previous section, this is just what we expect from our unification of the φ-level and ι-level grammars: since leftward shift driven by *CROWD occurs in the ι-level evaluation, it should also occur in the φ-level evaluation. Therefore, all falling tones created by the LP-PLPW should expand during φ. Assuming that this is correct, we should incorporate the grammar of tone shift developed in chapter 2 into our current constraint hierarchy.

In (50) below, I repeat the definitions for all contraints which appeared in the grammar of tone shift in chapter 2, but which have not yet featured in this chapter. The tone shift grammar itself is then presented in (51); there, I have replaced chapter 2's MAX-H with MAX-H[LINKED], since all cases of tone shift examined in chapter 2 involved underlyingly linked Hs. Our current φ-level grammar is then repeated in (52).

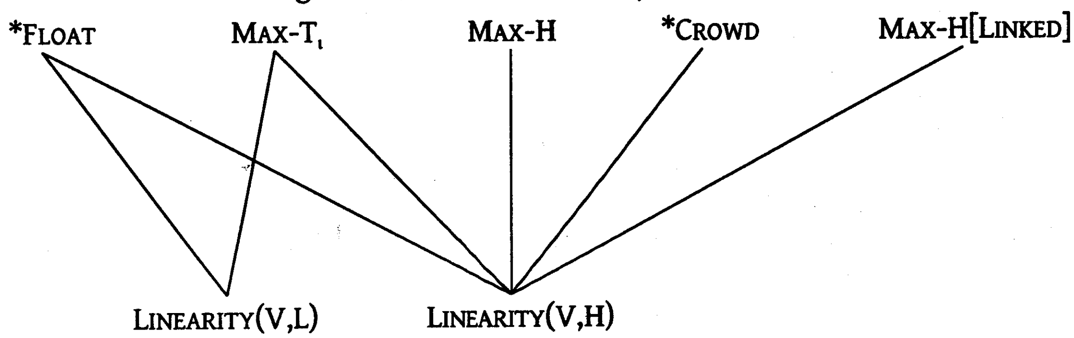
(50) Constraints present in tone shift grammar

a.	MAX-L	Each input L tone must have an output correspondent.
b.	PRESERVE-FALL	Violated once if an input H tone is followed by L within its melodic unit while its output correspondent is not.
c.	LINEARITY(τ,V)	If an input vowel V has an output correspondent V′, and if an input tone τ has an output correspondent τ′, then if τ < V then τ′ < V′.
d.	IDENT-LONG(H)	The length of a H tone, as measured by the number of vowels it is associated to, is identical in the input and the output.

(51) Grammar of Leftward Shift (repeated from chapter 2, ex. (50))



(52) Grammar of tone assignment, shared between φ-level and ι-level evaluations

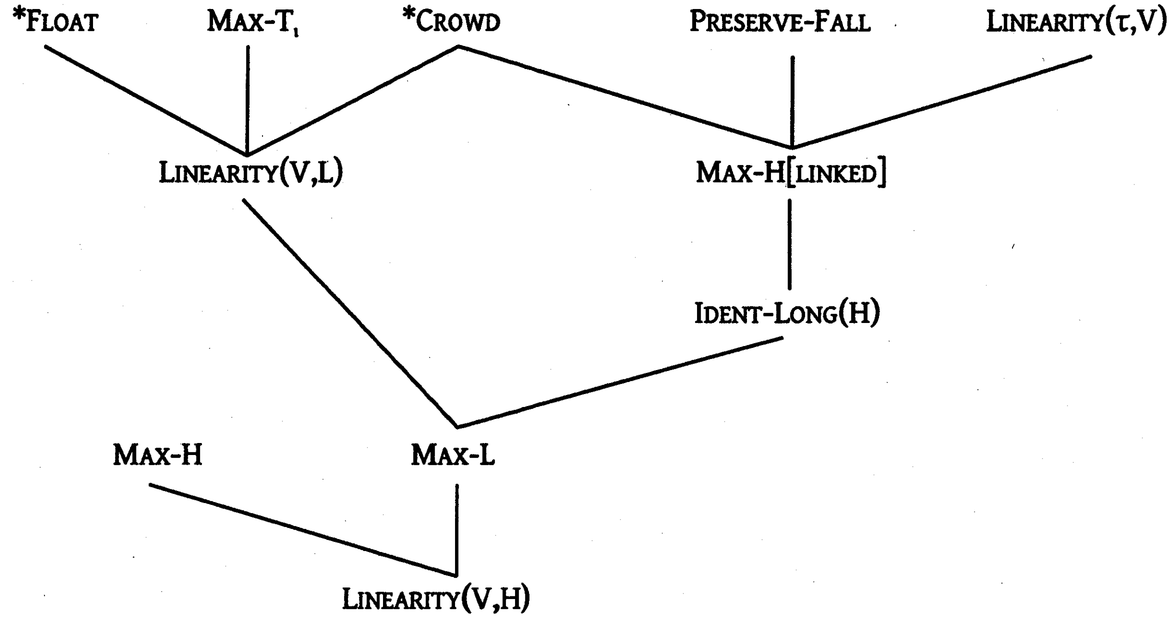


In (53), I extract the the rankings which are present in the grammar established for tone shift but not in our current φ-level grammar established for boundary tone assignment. In (54), we see the results of merging these two grammars.

(53) Rankings present in tone shift grammar but not in boundary tone grammar

a. LINEARITY(V,L) » MAX-L
b. MAX-L » LINEARITY(V,H)
c. *CROWD » MAX-H[LINKED]
d. PRESERVE-FALL » MAX-H[LINKED]
e. LINEARITY(τ,V) » MAX-H[LINKED]

(54) Grammar of boundary tone assignment and tone shift



One important new ranking to emerge from the merger of these grammars is the ranking of MAX-T_ι above MAX-L, which results from combining the MAX-T_ι » LINEARITY(V,L) ranking of the boundary tone assignment grammar with the LINEARITY(V,L) » MAX-L ranking of the tone shift grammar. This ranking leads us to expect that an ι-level boundary tone will be able to overwrite a lexical L tone. As we saw in section 1, this prediction is correct.

4 Intonational tone assignment and lexical tones

Now that we have developed a grammar that (a) correctly assigns intonational boundary tones in toneless words and (b) correctly derives leftward tone shift, we can examine the assignment of intonational boundary tones in words with lexical H and L tones. In 4.1 and 4.2, we will examine the assignment of boundary tones in words with *final* L tones, and in 4.3 we will examine the assignment of boundary tones in words with *penultimate* L tones. The main fact to be accounted for in these sections is that the assignment of H_φ is blocked by a final L tone, but not by a penultimate L tone. In 1.1, we saw that this fact posed significant difficulties for a fully parallel account of intonational tone assignment. We will see in this section that they fall out naturally as a consequence of cyclic evaluation.

4.1 Lexical L tones, and their interactions with intonational boundary tones

Alongside toneless nouns which show the *canonical* pattern of intonational tone analyzed in section 2, there are also nouns that show *non-canonical* tone. These nouns systematically fail to show a final H_φ tone in φ-final position, and they also fail to show a penultimate H_φ tone in ι-final position. In the latter context, however, they do show final L_ι or H_ι tones. Several examples of such nouns are given in (55).[15]

(55) Nouns that fail to show H_φ

	clay (cl. 3)	cup (cl. 5)	island (cl. 7)	bag (cl. 9)	dish (cl. 11)	gecko (cl. 12)
a. φ-medial	o-mu-nonè	e-rį-handà	e-ki-sangà	e-ŋ-gunzà	o-lu-kerà	a-ka-kutù
b. φ-final	o-mu-nonè	e-rį-handà	e-ki-sangà	e-ŋ-gunzà	o-lu-kerà	a-ka-kutù
c. ι_D-final	o-mu-nonè	e-rį-handà	e-ki-sangà	e-ŋ-gunzà	o-lu-kerà	a-ka-kutù
d. ι_I-final	o-mu-noné	e-rį-handá	e-ki-sangá	e-ŋ-gunzá	o-lu-kerá	a-ka-kutú

Following previous work (Hyman 1990, Mutaka and Hyman 1990, Mutaka 1994, Hyman and Valinande 1985, Kenstowicz 2008), I assume that H_φ cannot surface in these forms due to the presence of a final L tone. More specifically, I assume that within the φ-level evaluation, a final L tone prevents H_φ from linking to the φ-final vowel and therefore causes it to delete, in violation of MAX-H. Since alternatives to deletion include (a) remaining floating, (b) sharing

[15] It is worth noting that the final syllables of many of these nouns have NC onsets. Kenstowicz (2008) points out that such onsets commonly cause lowering of a following H tone in Bantu, and posits that this may be the diachronic source for many L-final nouns in Kinande.

the final vowel with L, (c) forcing L to shift to the left and (d) overwriting L, MAX-H must be dominated by *FLOAT, *CROWD, LINEARITY(V,L) and MAX-L. In addition, since H_φ cannot simply leap over the final L tone and link to the *penultimate* vowel, I assume that MAX-H is dominated by LINEARITY(τ,τ) (56), which demands that tones occur in the output in the same order that they occur in the input. The tableau in (57) shows how these rankings correctly derive the failure of H_φ to surface on L-final *e-ki-hekà* 'truck'.

(56) LINEARITY(τ,τ) = LIN(τ,τ) If an input tone τ_1 has an output correspondent τ_1', and if an input tone τ_2 has an output correspondent τ_2', then if $\tau_1 < \tau_2$ then $\tau_1' < \tau_2'$.

(57) Final L tone blocks assignment of H_φ in φ-level evaluation

	L e-ki-hekà $H_\varphi)_\varphi$	*FLOAT	LIN(τ,τ)	*CROWD	LIN(V,L)	MAX-L	MAX-H
a.	☞ L e-ki-hekà $)_\varphi$						*
b.	e-ki-hekà $H_\varphi)_\varphi$	*! W					L
c.	H_φ L e-ki-hékà $)_\varphi$		*! W				L
d.	LH_φ e-ki-hekǎ $)_\varphi$			*! W			L
e.	L H_φ e-ki-hèká $)_\varphi$				*! W		L
f.	H_φ e-ki-heká $)_\varphi$					*! W	L

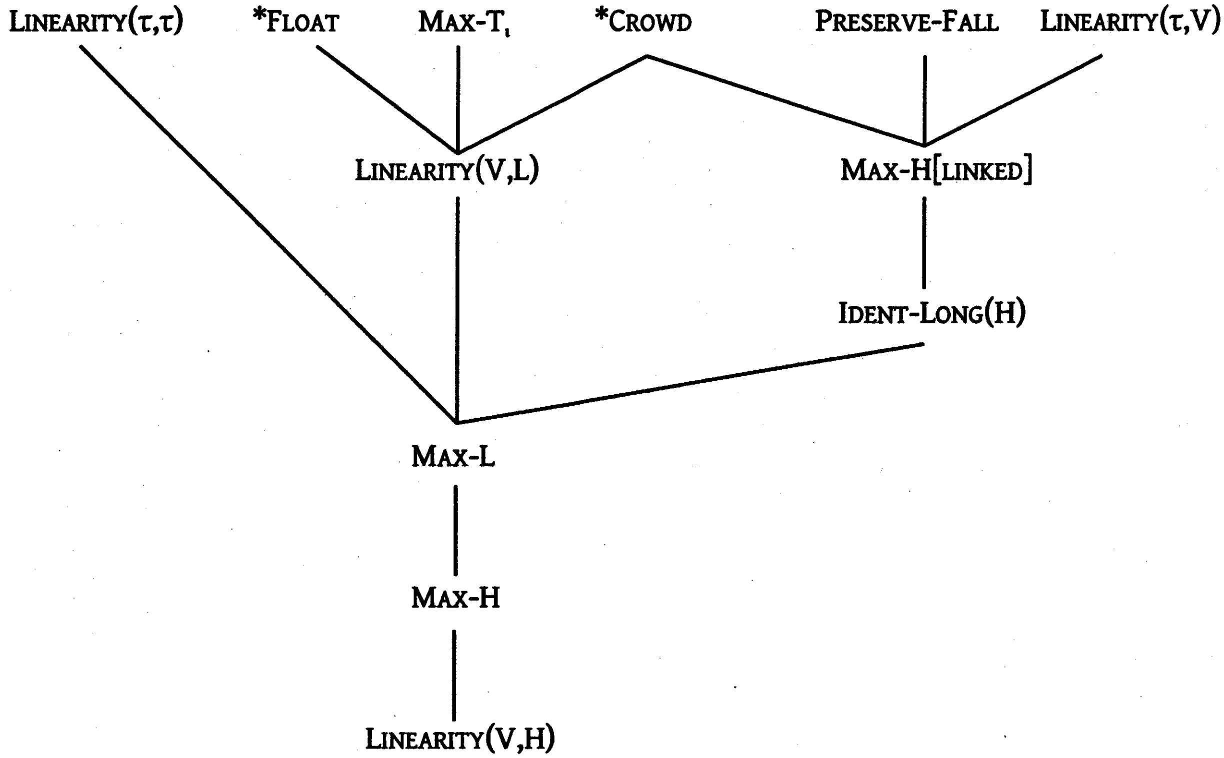
In the ι-level evaluation, our previously established rankings of MAX-T_ι, *FLOAT, *CROWD, and LINEARITY(V,L) above MAX-L – whose presence in the grammar in (54) is motivated either directly through the analysis of intonational tone assignment in section 2 or indirectly through the merger of this analysis with that of tone shift in section 3 – ensure that L_ι or H_ι will overwrite a final L tone rather than delete (58b), remain floating (58c), share the final vowel with L (58e), or force L to shift to the left (58f). In addition, by ranking LINEARITY(τ,τ) above MAX-L, we ensure that overwriting the final L tone with $L_ι$ or $H_ι$ is better than assigning either to the penult, skipping over the final L (58d).

(58) Final L tone overwritten by $L_ι/H_ι$ in ι-level evaluation

	L e-ki-hekà $H_ι$)$_ι$	MAX-$T_ι$	*FLOAT	LIN(τ,τ)	*CROWD	LIN(V,L)	MAX-L
a.	☞ $H_ι$ e-ki-heká)$_ι$						*
b.	L e-ki-hekà)$_ι$	*! W					L
c.	e-ki-hekà $H_ι$)$_ι$		*! W				L
d.	$H_φ$ L e-ki-hékà)$_ι$			*! W			L
e.	L$H_ι$ e-ki-hekǎ)$_ι$				*! W		L
f.	L $H_ι$ e-ki-hèká)$_ι$					*! W	L

The only rankings established in the tableaux above that were not already present in our postlexical grammar are (a) the rankings of MAX-L above MAX-H and (b) the ranking of LIN(τ,τ) above MAX-H and MAX-L. Incorporating these new rankings into our existing grammar for boundary tone assignment and tone shift gives us the final grammar of postlexical tone interaction in (59).

(59) Grammar for postlexical tone interaction



4.2 Nouns with underlying final H tones

In addition to nouns with underlying final L tones, there are also nouns with underlying final H tones. One example is *e-ki-kómbè* 'cup,' which has the underlying representation /e-ki-kombé/. As described in chapter 2, I assume that the underlying final H tones of such nouns are converted to falling tones in the LP-PLPW, so that in the input to the φ-level derivation, 'cup' has the representation /e-ki-kombê/. Crucially, this has a final L tone just as *e-ki-hekà* 'truck' does; it just also happens to have a H tone that will shift to the left in order to avoid violating *CROWD. Therefore, *e-ki-kómbè* will fail to realize H_φ for the same reasons that *e-ki-hekà* does: failing to realize H_φ is better than deleting its final L tone, shifting its final L tone, or realizing both its final L tone and H_φ on the same vowel. Similarly, it will show the same behavior as a L-final noun with respect to L_ι and H_ι: these will overwrite the final L rather than force it to shift or share the final vowel with another tone. These interactions are illustrated with the φ-level and ι-level evaluations of *e-ki-kómbè* in (60).

(60) Postlexical derivation of ι_f-final *e-ki-kómbè*

a. φ-level: Final L tone blocks assignment of H_φ

	HL e-ki-kombê H_φ)$_\varphi$	MAX-T$_\iota$	*FLOAT	LIN (τ,τ)	*CROWD	LIN (V,L)	MAX-L	MAX-H	LIN (V,H)
☞	H L e-ki-kómbè)$_\varphi$							*	*
	H L e-ki-kómbè H_φ)$_\varphi$		*! W					L	* ~
	H_φ H L e-kí-kómbè)$_\varphi$			*! * W				L	* *** W
	H LH_φ e-ki-kómbě)$_\varphi$				*! W			L	* * W
	H L H_φ e-kí-kòmbé)$_\varphi$					*! W		L	** * W
	H H_φ e-ki-kómbé)$_\varphi$						*! W	L	* * W

b. ι_f-level: Final L tone overwritten by H_ι

	H L e-ki-kómbè H_ι)$_\iota$	MAX-T$_\iota$	*FLOAT	LIN (τ,τ)	*CROWD	LIN (V,L)	MAX-L	MAX-H	LIN (V,H)
☞	H H_ι e-ki-kómbé)$_\iota$						*		*
	H L e-ki-kómbè)$_\iota$	*! W					L		L
	H L e-ki-kómbè H_ι)$_\iota$		*! W				L		L
	H_ι H L e-kí-kómbè)$_\varphi$			*! * W			L		*** W
	H LH_ι e-ki-kómbě)$_\iota$				*! W		L		* ~
	H L H_ι e-kí-kòmbé)$_\iota$					*! W	L		** W

4.3 Nouns with underlying penultimate H tones

Finally, we turn to nouns like *o-mú-lùme* 'man.' Underlyingly, this noun has a H tone on its penultimate vowel. By hypothesis, this H tone is converted to a falling tone at the LP-PLPW, which, after tone shift, surfaces on the antepenultimate vowel. For present purposes, however, our main interest in this form is the L tone that, after tone shift, remains on its penult. We saw in section 1 that the presence of this L tone – argued for extensively in chapter 2 – raises problems for a fully parallel account of intonational tone assignment because, as demonstrated again in (61c,d), it fails to block the assignment of H_φ to the penult in ι-final forms. In this section, we see how our cyclic account handles this fact without difficulty.

(61) Tonal variation of underlyingly toneless *o-mú-lùme* 'man'

a.	Pre-adjectival	((**o-mú-lùme** AUG-NC.1-MAN	mu-lḭtò $)_\varphi$ $)_\iota$ NC.1-HEAVY	'the heavy man'
b.	Pre-verbal	((**o-mu-lumé** $)_\varphi$ AUG-NC.1-MAN	(a-ká-langirawâ $)_\varphi$ $)_\iota$ SM.1-IMPV-BE.SEEN	'The man is seen.'
c.	Statement-final	((u-ká-langir' SM.2S-IMPV-SEE	**o-mú-lúmè** $)_\varphi$ $)_{\iota\text{-D}}$ AUG-NC.1-MAN	'You see the man.'
d.	Question-final	((u-ká-langir' SM.2S-IMPV-SEE	**o-mú-lúmé** $)_\varphi$ $)_{\iota\text{-I}}$ AUG-NC.1-MAN	'You see the man?'

First, we see in (62) that the φ-level evaluation of *o-mú-lùme* is entirely straightforward: since the final vowel of *o-mú-lùme* is toneless, the simple ranking of MAX-H and *CROWD above LINEARITY (V,H) correctly predicts that H_φ links to the final vowel. In addition, due to the ranking of *CROWD above LINEARITY(V,H), the form's penultimate falling tone (created at the LP-PLPW from its underlying penultimate H tone) expands leftward, placing its H tone on the antepenult while its L tone remains on the penult.

(62) φ-level evaluation of *o-mú-lùme* 'man'

	HL o-mu-lûme H_φ $)_\varphi$	*FLOAT	*CROWD	LIN (V,L)	MAX-L	MAX-H	LIN (V,H)
a.	☞ H L H_φ o-mú-lùmé $)_\varphi$						**
b.	H L o-mú-lùme H_φ $)_\varphi$	*! W					* L
c.	H L o-mú-lùme $)_\varphi$					*! W	* L

In the subsequent ι-level evaluation, the assignment of an ι-level tone to the ultima forces H_φ to retract to the penult. What is interesting here is that in this step, H_φ overwrites a L tone that would have blocked it had it been on the ultima. The reason it is able to do this is that in the φ-level evaluation, H_φ is protected not just by MAX-H, which is ranked below MAX-L, but also by MAX-H[LINKED], which is ranked above it. This is shown in (63).

(63) ι-level derivation of *o-mú-lùme*: penultimate L tone overwritten by H_φ

	H L H_φ o-mú-lùmé L_ι $)_\iota$	*FLOAT	*CROWD	MAX-H [LINKED]	LIN (V,L)	MAX-L	MAX-H	LIN (V,H)
a.	☞ H H_φ L_ι o-mú-lúmè $)_\iota$				*	*		*
b.	H L H_φ o-mú-lùmé L_ι $)_\iota$	*! W			L	L		
c.	H L $H_\varphi L_\iota$ o-mú-lùmê $)_\iota$		*! W		* ~	L		
d.	H L L_ι o-mú-lùmè $)_\iota$			*! W	* ~	L	* W	
e.	H L H_φ L_ι ó-mù-lúmè $)_\iota$				**! W	L		**

4.4 Moving onwards

In this section, we have seen how a cyclic analysis of boundary tone assignment is able to overcome the difficulties encountered by a fully parallel analysis in section 1. First, we saw in 4.1 that the cyclic analysis can correctly assign ι-level boundary tones to L-final nouns without predicting that this will cause H_φ to opportunistically emerge on the penult. This is because in the cyclic analysis, the fate of H_φ is always determined in its own φ-level evaluation before ι-level tones are assigned. Thus, H_φ will always be missing from L-final nouns because it is always forced to delete in their φ-level evaluations. While ι-level boundary tones may eventually remove the L tones which force H_φ to delete, this happens too late to affect whether or not H_φ can surface. In this way, then, the fact that ι-level boundary tones eliminate the contexts which force the deletion of H_φ can be viewed as an instance of counterfeeding opacity: if only the ι-level tones were assigned sooner, H_φ could be assigned as well. The ability to account for this opaque interaction is precisely the advantage that the cyclic analysis provides.

In addition, we saw in 4.3 that the cyclic analysis is able to account for the fact that H_φ is able to overwrite a penultimate L tone, even though it is blocked by a final L tone, by appealing to the *varying input status* of H_φ. Because H_φ is first assigned to the final vowel, and shifts to the penult only later, it is able to receive the protection of MAX-H[LINKED] even though it is underlyingly *floating*. This, of course, is a possibility that is made available within a serial analysis, in which a form's *input* representation in any given evaluation may differ from its *underlying* representation. This possibility is not available, however, in a fully parallel analysis, in which the underlying and input representations are necessarily identical. Thus, the derivational nature of the analysis developed here is integral to its success, because it provides us with a crucial intermediate stage in which H_φ can acquire the status of an input tone.

Finally, before proceeding to the next section, it is worth emphasizing that although we have looked so far only at how boundary tones are assigned in nouns, the analysis developed in this section is not at all restricted to them: verbs and adjectives (as well as adverbs and various function words) realize intonational boundary tones in exactly the same way as tonally comparable nouns.

To begin with, we see in (64) that the tone patterns shown by the inceptive verb *tu-limu-[hum-a]* 'we are starting to hit' (whose stem, enclosed in square brackets, consists of the toneless root *-hum-* 'hit' and the toneless final vowel *-a*) are the same as those observed in toneless *o-ku-gulu*. In (64a), where *tu-limu-[hum-a]* appears before an object noun, it is φ-medial and therefore surfaces without any boundary tones. In (64b) and (64c), where it occurs at the end of a statement or question, it is ι-final and therefore shows penultimate H_{φ} and final L_{ι}/H_{ι}.

(64) Canonical tone in *tu-limu-[hum-a]* 'we are starting to hit'[16]

a.	((**tu-limu-[hum-a]** SM.1P-INC-[HIT-FV]	Valinándè VALINANDE	$)_{\varphi}$ $)_{\iota\text{-D}}$	'We are starting to hit Valinande'
b.	((**tu-limu-[húm-à]** SM.1P-INC-[HIT-FV]		$)_{\varphi}$ $)_{\iota\text{-D}}$	'We are starting to hit.'
c.	((**tu-limu-[húm-á]** SM.1P-INC-[HIT-FV]		$)_{\varphi}$ $)_{\iota\text{-I}}$	'We are starting to hit?'

We also see canonical tone in infinitive forms. In (65), for example, we see how canonical tone surfaces in the underlyingly toneless infinitive *e-ri-[hum-a]* 'to hit.' Future discussions of intonational tone assignment in verbs will generally be based on infinitives, since they are morphologically simpler than finite forms and show the same tone patterns.

[16] Here, I give an incomplete analysis of this verb's morphology for expositional ease. For a full account, see ch. 5 (section 5.2).

(65) Canonical tone in *e-ri-[hum-a]* 'to hit'

a.	Pre-object = φ-medial	((**e-ri-[huma]** Valinándè $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-HIT VALINANDE	'to hit Valinande'
b.	Subject position = φ-final	((**e-ri-[humá]** $)_{\varphi}$ (ry-Ø-[owénè] $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-HIT SM.5-STAT-[BE.GOOD]	'to hit is good'
c.	Statement-final = ι_D-final	((**e-ri-[húmà]** $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-HIT	'to hit'
d.	Question-final = ι_I-final	((**e-ri-[húmá]** $)_{\varphi}$ $)_{\iota\text{-I}}$ AUG-NC.5A-HIT	'to hit?'

In (66), we see that infinitives with disyllabic *H-toned stems* also show canonical tone. This is just what we expect based on the behavior of tonally comparable *o-mú-lùme* 'man.'

(66) Canonical tone in *e-rí-[tùm-a]* 'to send'

a.	Pre-object = φ-medial	((**e-rí̲-[tùma]** Valinándè $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-SEND VALINANDE	'to send Valinande'
b.	Subject position = φ-final	((**e-rí̲-[tùmá]** $)_{\varphi}$ (ry-Ø-[owénè] $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-SEND SM.5-STAT-[BE.GOOD]	'to send is good'
c.	Statement-final = ι_D-final	((**e-rí̲-[túmà]** $)_{\varphi}$ $)_{\iota\text{-D}}$ AUG-NC.5A-SEND	'to send'
d.	Question-final = ι_I-final	((**e-rí̲-[túmá]** $)_{\varphi}$ $)_{\iota\text{-I}}$ AUG-NC.5A-SEND	'to send?'

Finally, in (67), we see that verbs with final L tones, like past tense *mó-tu-á-[húm-irir-à]* 'we hit on purpose (long ago),' systematically fail to show H_{φ}, just like *e-ki-hekà.*

(67) H_φ systematically blocked in *mó-tu-á-[húm-irir-à]* 'we hit on purpose (long ago)'

a. ((**mó-tu-á-[húm-irir-à]** Valinándè $)_\varphi$ $)_{\iota\text{-D}}$ 'We hit Valinande on purpose.'
FOC-SM.1P-PAST-[HIT-PURP-FV] VALINANDE

b. ((**mó-tu-á-[húm-irir-à]** $)_\varphi$ $)_{\iota\text{-D}}$ 'We hit on purpose.'
FOC-SM.1P-PAST-[HIT-PURP-FV]

c. ((**mó-tu-á-[húm-irir-á]** $)_\varphi$ $)_{\iota\text{-I}}$ 'We hit on purpose?'
FOC-SM.1P-PAST-[HIT-PURP-FV]

The analysis of boundary tone assignment developed in the preceding sections, then, is a fully general one. Intonational tone assignment applies the same in every word regardless of syntactic category, and is affected only by the tone of the final vowel. If a word's final vowel is toneless, it will show canonical tone and realize H_φ. If a word's final vowel is L-toned, it will show non-canonical tone and fail to realize H_φ. In the chapters to follow, this fact will help us to reliably diagnose the tone of a verb's final vowel.

5 Canonical tone and vowel shortening/contraction

As we have just seen, the facts from boundary tone assignment alone do not require reranking between the φ-level and ι-level evaluations. Instead, the unified grammar in (59) can derive the correct assignment of boundary tones in both. Evidence for reranking – i.e. for a *stratal* analysis rather than a simply *cyclic* one – comes instead from the interaction of tone assignment and vowel contraction.

Many nouns have the same φ-medial and φ-final tone patterns as *o-ku-gulu* 'leg,' but show different patterns in ι-final position due to the fact that their vowels are underlyingly long. In these nouns, the assignment of both H_φ and L_ι/H_ι produces not a H_φ-L_ι or a H_φ-H_ι tone sequence realized over the final two syllables, but rather a single falling tone or a single high tone realized just on the ultima. This occurs, for example, in the noun *e-ki-kome:* 'snail.'

(68) Tonal variation of underlyingly toneless *e-ki-komee* 'snail'

a.	Pre-adjectival	((**e-ki-kome** kḭ-lḭ́tò)$_{\varphi}$)$_{\iota\text{-D}}$ AUG-NC.7-SNAIL NC.7-HEAVY		'the heavy snail'
b.	Pre-verbal	((**e-ki-komé**)$_{\varphi}$ (ki-ká-langirawâ)$_{\varphi}$)$_{\iota\text{-D}}$ AUG-NC.7-SNAIL SM.7-IMPV-BE.SEEN		'The snail is seen.'
c.	Statement-final	((u-ká-langir' **e-ki-komê**)$_{\varphi}$)$_{\iota\text{-D}}$ SM.2S-IMPV-SEE AUG-NC.7-SNAIL		'You see the snail.'
d.	Question-final	((u-ká-langir' **e-ki-komé̋**))$_{\iota\text{-I}}$ SM.2S-IMPV-SEE AUG-NC.7-SNAIL		'You see the snail?'

As shown in (69), similar patterns arise in infinitive forms in which CV roots like *-tá̱-* 'bury' are immediately followed by the final vowel *–a*.

(69) Canonical tone in *e-rḭ́-[tà-a]* 'to hit'

a.	Pre-object = φ-medial	((**e-rḭ́-[tà]** Valinándè)$_{\varphi}$)$_{\iota}$ AUG-NC.5A-BURY VALINANDE		'to bury Valinande'
b.	Subject position = φ-final	((**e-rḭ́-[tá̋]**)$_{\varphi}$ (ry-Ø-[owénè])$_{\varphi}$)$_{\iota}$ AUG-NC.5A-BURY SM.5-STAT-[BE.GOOD]		'to bury is good'
c.	Statement-final = ι_D-final	((**e-rḭ́-[tâ]**)$_{\varphi}$)$_{\iota\text{-D}}$ AUG-NC.5A-BURY		'to bury'
d.	Question-final = ι_I-final	((**e-rḭ́-[tá̋]**)$_{\varphi}$)$_{\iota\text{-I}}$ AUG-NC.5A-BURY		'to bury?'

In analyzing these patterns, Mutaka (1994: pp. 41-42; 163) proposes that the final long vowels of nouns like *e-ki-kome:* 'snail' and the final vowel-vowel sequences of infinitives like *e-rḭ́-[tà-a]* 'to bury' remain long until all intonational tones are assigned, at which point they reduce to a single short vowel. This is is illustrated for *e-ki-kome:* 'snail' in (70), and for *e-rí̱-[tà-a]* ‘to bury’ in (71). (In these derivations, the ‘input’ represents the input to boundary tone assignment.[17])

(70) Deriving phrasal variants of *e-ki-kome:* ‘snail’

		Input		H_φ Assigned		L_ι, H_ι Assigned		Shortening
a.	φ-medial	e-ki-komee	→	....	→	...	→	e-ki-kome
b.	φ-final	e-ki-komee	→	e-ki-komeé	→	...	→	e-ki-komé
c.	ι_D-final	e-ki-komee	→	e-ki-komeé	→	e-ki-koméè	→	e-ki-komê
d.	ι_I-final	e-ki-komee	→	e-ki-komeé	→	e-ki-koméé	→	e-ki-komé̋

(71) Deriving phrasal variants of *e-rí̱-[tà-a]* ‘to bury’

		Input		H_φ Assigned		L_ι, H_ι Assigned		Shortening
a.	φ-medial	e-rí̱-[tà̱-a]	→	....	→	....	→	e-rí̱-[ta]
b.	φ-final	e-rí̱-[tà̱-a]	→	e-rí̱-[tà-á]	→	....	→	e-rí̱-[tá]
c.	ι_D-final	e-rí̱-[tà̱-a]	→	e-rí̱-[tà-á]	→	e-rí̱-[tá-à]	→	e-rí̱-[tâ]
d.	ι_I-final	e-rí̱-[tà̱-a]	→	e-rí̱-[tà-á]	→	e-rí̱-[tá-á]	→	e-rí̱-[tá̋]

I will generally follow Mutaka’s proposal that the final long vowels and final vowel-vowel sequences do not contract until all boundary tones are assigned. However, the details of vowel contraction are somewhat more complicated than Mutaka’s account suggests. According to Mutaka, all long vowels and vowel-vowel sequences undergo shortening. This derives the generalization, asserted throughout the literature on Kinande phonology, that surface vowels of Kinande do not contrast in length (e.g. Valinande 1984, Mutaka and Hyman 1990, Mutaka 1994). Surface long vowels, it is claimed, occur only as a result of *penultimate lengthening* (PL), which targets the penultimate syllable of an intonational phrase (72).

[17] As we saw in section 3, the assignment of H_φ and the leftward shift of lexical H̲ tones (via the expansion of intermediate falls) happens simultaneously, so that the proper input to boundary tone assignment here should actually be /*e-ri-[tâ-a]*/. I treat leftward tone shift as preceding the assignment of H_φ purely for ease of exposition; this does not affect the analysis in any way.

(72) Penultimate lengthening: V → V: / __σ)$_\iota$

I have ignored PL until now, and will generally continue to do so, since it does not affect the assignment of tone in any way. However, I provide a brief illustration of its effects in (73). There, note that it always targets the penultimate syllable, regardless of the final syllable's underlying length. This is shown by the fact that it targets the stem-initial vowel not just in *o-ku-gulu* and *e-ri-*[*hum-a*] (73a,b), but also in *e-ki-kome:* and *e-rí̱-*[*ta-a*] (73c,d).[18]

(73) Penultimate lengthening (ι_D-final)

a. o-ku-gulu → o-ku-gú:lù	'leg'	b. e-ri-[hum-a] → e-ri-[hú:mà]	'to hit'
c. e-ki-kome: → e-ki-ko:mê	'snail'	d. e-rí-[ta-a] → e-ri:-[tâ]	'to bury'

Now, one potential challenge to the claim that surface vowel length arises only from penultimate lengthening comes from the fact that ι-final vowels derived from underlying long vowels or underlying vowel-vowel sequences are pronounced much longer than those derived from underlying short vowels. This may be seen, for example, by comparing the final vowel durations of ι-final *e-ri-ná-*[*tà-a*] 'to indeed bury' (74) and ι-final °*e-ri-*[*yas-a*], a nonce form constructed from the hypothetical verb root °*-yas-* (75).[19] As is readily apparent from the waveforms and spectrograms of these forms, the realization of underlying final [*Ca-a*] (= [â]) is approximately twice as long as the realization of underlying final [*Ca*] (= [à]).

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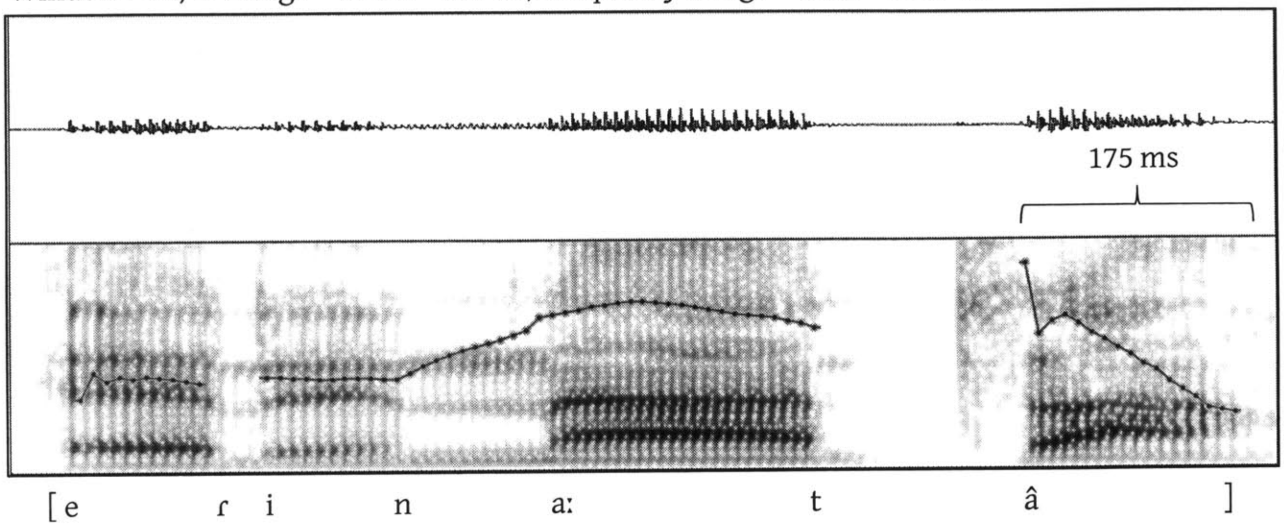
[18] The one exception to this generalization concerns verbs that end in the desinence *-a-a* or *-a-e*. These descend from historical *-ay-a* and *-ay-e*, and are still treated as disyllabic for the purposes of Penultimate Lengthening. Thus, a verb like *tw-á-*[*húm-a-à*] 'we hit (recently)' is pronounced as [twáhúmà:].

[19] The discussion to follow makes extensive use of phonetic data from nonce forms, which I indicate by a preceding superscript circle (°). These are used in order to control for segmental differences between forms, which can potentially influence both vowel length and f0 contours. Obviously, segmental differences are *not* controlled in the comparison between *e-ri-ná-*[*ta-à*] and °*e-ri-*[*yas-a*]; these forms simply make the clearest comparison set among forms recorded at the time of writing.

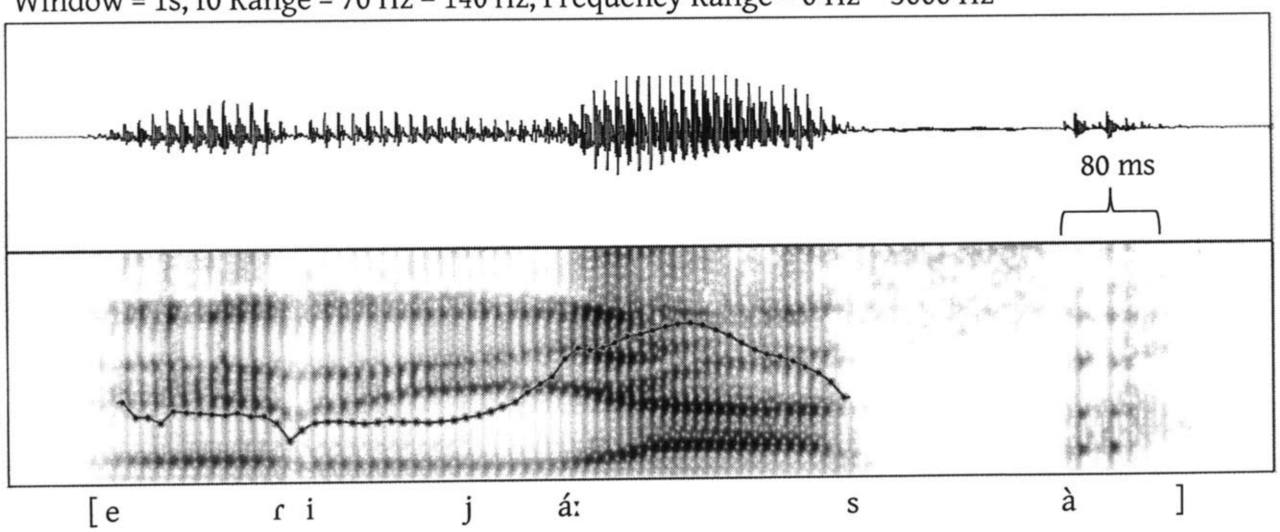
(74) $ι_D$-final *e-ri-ná-[ta-a]* 'to indeed bury' [e.ɾi.náː.tâ]

Window = 1s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



(75) $ι_D$-final *°e-ri-yasa* [e.ɾi.jáː.sà]

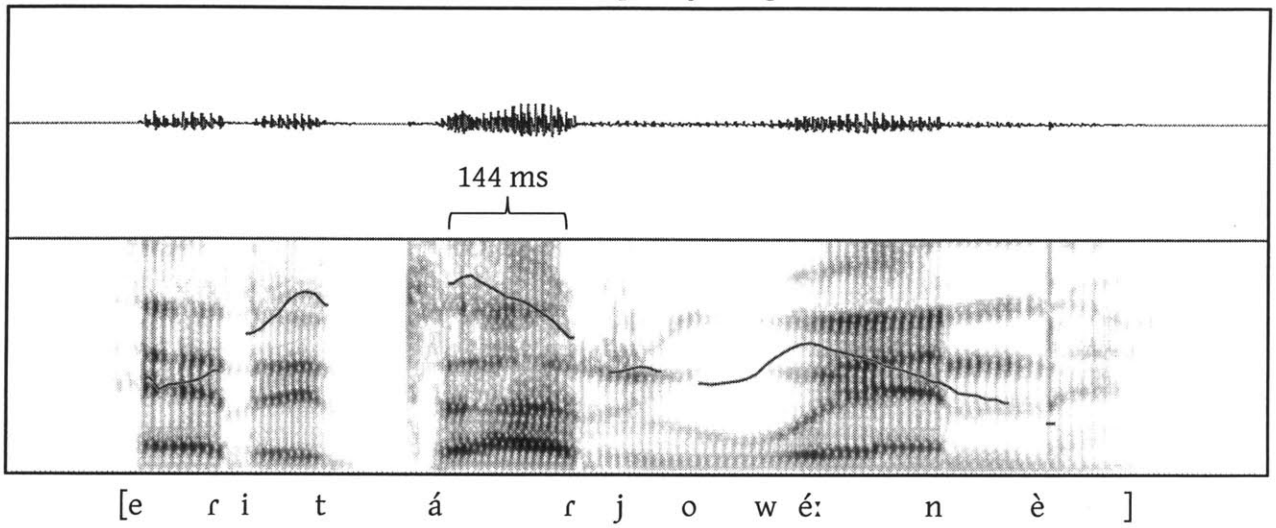
Window = 1s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



What should we make of this difference? Does it show that, contrary to previous accounts, underlying length is preserved on the surface? If so, then we should expect the final [*aa*] of *e-rí-[tà-a]* to be longer than the final [*a*] of *°e-ri-[yas-a]* not just $ι_D$-finally but also φ-finally, where both vowels surface with a single H tone. However, as shown below, this is not the case. When *e-rí-[ta-a]* and *°e-ri-[yas-a]* occur in φ-final position, in the sentence frame [___ *ry-owénè*] '____ is good,' the dramatic length difference in their final vowels disappears.

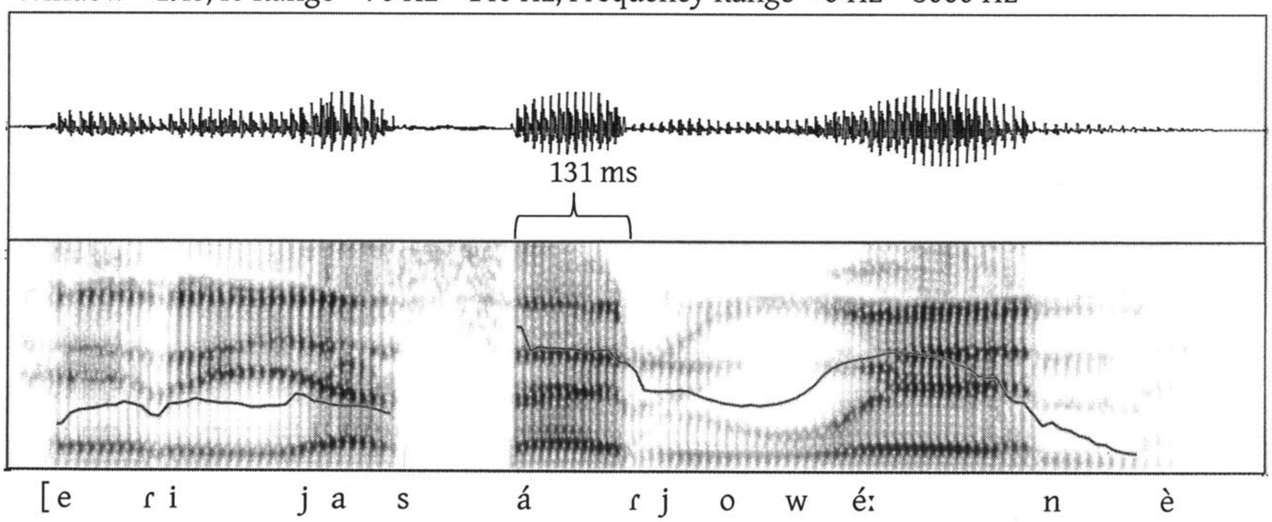
(76) φ-final *e-rí-[tà-a]* 'to bury' [e.ɾí̠.tá]

Window = 1.4s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



(77) φ-final °*e-ri-yasa* [e.ɾi.ja.sá]

Window = 1.4s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz

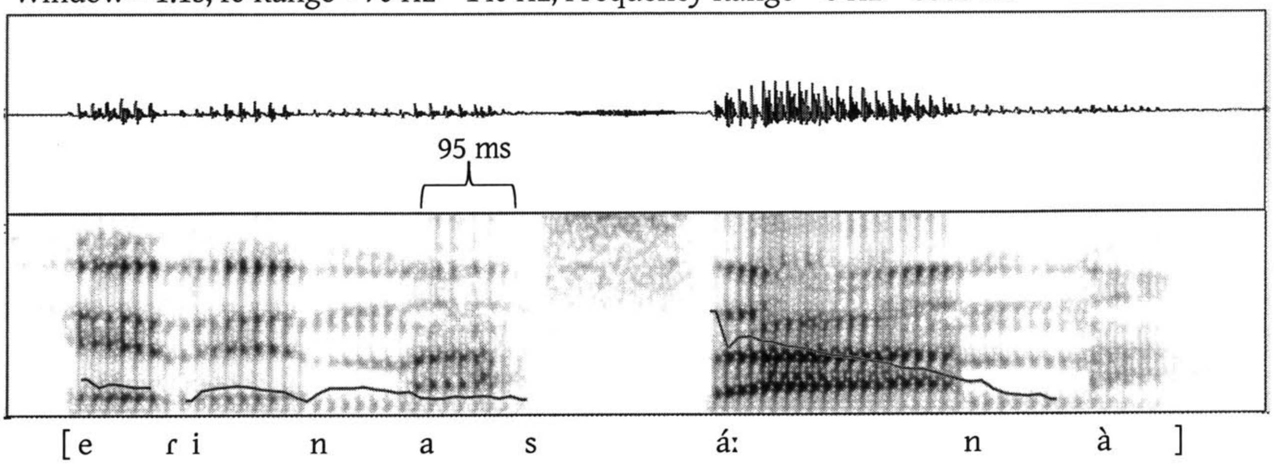


There are two possible explanations for this. First, underlying length might be protected ɩ-finally but not φ-finally. In that case, the fact that the final [â] of ɩ-final *e-rí-[tà-a]* (74) is so much longer than the final [à] of ɩ-final °*e-ri-[yas-a]* (75) would be purely a reflection of the former's underlying length. The second possibility is that underlying length is preserved indirectly through tone assignment. That is, it might be the case that an underlying long vowel surfaces as long only if, at some point in its derivation, it is associated with more than one tone. In that case, its surface length would represent not the faithful preservation of underlying length, but rather a strategy for maintaining a sufficiently long sonorous duration for all of its tones to be distinctly realized without overly rapid transitions in f0 (Zhang 2002).

Though this latter explanation is more complicated, there are two sources of evidence that it is correct. First, even in ι-medial position, segmentally identical vowel-vowel sequences that are assigned multiple tones surface as much longer than otherwise identical sequences that are not. This is demonstrated in (78) and (79). In (78), we see a toneless [a] vowel derived from the word-medial /a-a/ sequence of °*e-ri-na-*[*asan-a*], a nonce infinitive with an underlyingly toneless root. In (79), we see a falling-toned [â] vowel derived from the word-medial /á-à/ sequence of °*e-ri-ná̱-*[*àsan-a*], a nonce infinitive with an underlyingly H-toned root. (In these forms, *na-* is a prefix meaning approximately 'indeed.') As shown, the falling-toned vowel derived from /á-à/ is about 1.5 times as long as the toneless vowel derived from /a-a/. Here, then, we see evidence that even when both underlying duration and sentential context are controlled for, tone assignment alone can produce dramatic differences in phonetic duration.

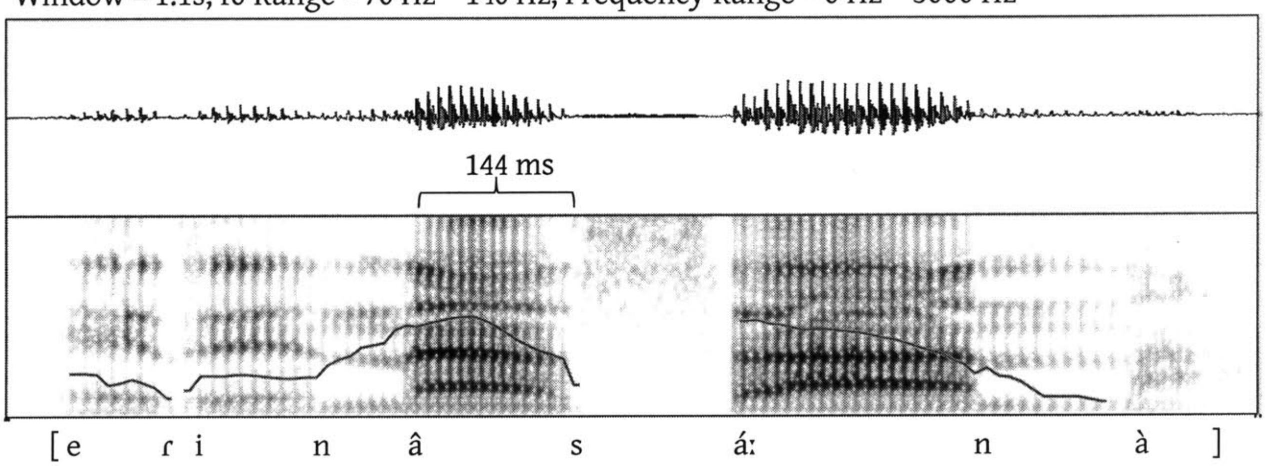
(78) /aa/ → [a]: /e-ri-na-asánà/→ °[e-ri-na-sá:nà]

Window = 1.1s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



(79) /áà/ → [â]: /e-ri-ná-àsánà/→ °[e-ri-nâ-sá:nà]

Window = 1.1s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



The second source of evidence that tone assignment rather than underlying length *per se* is responsible for the increased phonetic duration of underlying long vowels is that even in ι-final position, vowel length contrasts are never observed independently of tonal differences. The fact that there is an underlying contrast between final V and final VV in underlyingly toneless nouns seems to be directly related to the fact that this contrast will lead to a difference in tone: ι-final words with final V will realize H_{φ} on the penult, while ι-final words with final VV will realize it on the the ultima. However, as we have already extensively discussed, certain nouns (e.g. *e-ki-hekà* 'truck') systematically fail to realize H_φ because they bear a final L tone. Strikingly, all of these nouns end in *short* vowels. Thus, an underlying contrast between final V and final VV is licensed in Kinande only when this contrast would be made salient through the differential realization of H_φ. This is just what we should expect if phonetic vowel length is an indirect consequence of tone assignment rather than a direct reflection of underlying quantity.

Taking this basic idea as its starting point, my formal analysis of words like *e-ki-kome:* and *e-rí̱-[ta-a]* has two main parts. First, like Mutaka, I assume that underlying long vowels and vowel-vowel sequences do not shorten until all boundary tones are assigned. This means that the earliest that vowel contraction may apply is the ι-level evaluation. Second, I assume that shortening is either greatly reduced or blocked outright whenever a vowel must realize multiple tones, since in that case a sufficiently long sonorous duration must be maintained in order for all of its tones to be realized distinctly and without overly rapid movements in f0. These joint assumptions allow us to maintain the generalization that vowel length is not contrastive in Kinande while still accounting for the dramatic phonetic differences sometimes observed between ι-final short vowels and ι-final long vowels: though vowel length is not itself contrastive on the surface, it does vary non-contrastively according to tone, which is in turn affected by underlying vowel length.

Here, I will abstract away from the gradient nature of shortening, and treat it as a categorical process which consists in a reduction from two moras to one. This reduction is accomplished by a ranking of *LongV (80a) over Max-μ (80b).

(80) Constraints governing vowel length

a.	*LongV	Violated once for each vowel that is associated with more than one μ.
b.	Max-μ	Violated once for each input μ that has no output correspondent.

In (81) and (82), we see how this ranking achieves shortening in word-medial vowel-vowel sequences which surface as either phonetically low-toned or phonetically high-toned. In (81), we see the derivation of the nonce toneless infinitive *°e-ri-na-[asana]* as it would be realized in φ-medial position. Since the [a-a] sequence in this form surfaces as phonetically low-toned, it surfaces as short.

(81) A low-toned vowel resulting from contraction is short

		e-ri-na-[asana] ...)$_{\varphi}$	*LONGV	MAX-μ
a.	☞	°e.ri.na.sana		*
b.		e.ri.naː.sana	*! W	L

In (82), we see the derivation of the H-toned nonce infinitive *°e-ri-ná-[àsana]* in φ-medial position. Here, note that the contraction of [ná-à] results in a *high*-toned vowel rather than a falling-toned vowel. This is due to the process of tonal absorption, discussed in chapter 2 (section 2.2.2) whereby (what should be) a falling tone surfaces as a high tone before a (phonetically) low-toned vowel. Because tonal absorption causes just a single H tone to occur on the contracted vowel, it surfaces as short.

(82) A high-toned vowel resulting from contraction is short

		e-ri-ná-[àsana] ...)$_{\varphi}$	*LONGV	MAX-μ
a.	☞	°e.ri.ná.sana		*
b.		e.ri.náː.sana	*! W	L

The fact that shortening is *blocked* in vowels that surface with *falling* tones indicates that *LONGV is dominated by *CROWD. Given this ranking, any vowel-vowel sequence that gives rise to a surface falling tone cannot reduce to a single mora because if it did, it would violate *CROWD. Of course, since *LONG could be satisifed without violating *CROWD if an input tone were deleted, we must also assume that *LONG is also dominated by MAX-H[LINKED] and MAX-L. This is shown below for ι_D-final °*e-ri-ná-[àsana]*. Note that in this form, unlike that in (82), the contraction of [á-à] is able to yield a falling tone because the vowel following the contracted [á-à] sequence bears a H tone. The surface falling tone is therefore not banned by undominated *HL-L, which enforces tonal absorption by banning a falling tone before a low tone (cf. chapter 2, example (24)).

(83) A falling-toned vowel resulting from contraction is *long*

		HL $H_\varphi L_\iota$ e-ri-ná-[àsáná] $)_\iota$	*HL-L	*CROWD	MAX-H[LINKED]	MAX-L	*LONGV	MAX-μ
a.	☞	°e.ri.nâ:.sá.nà					*	
b.		e.ri.nâ.sá.nà		*! W			L	*
c.		e.ri.nà.sá.nà			*! W		L	*
d.		e.ri.ná.sá.nà				*! W	L	*

Returning now to φ-medial *e-ri-ná-[àsan-a]* (82), we see how *HL-L crucially contributes to its shortening: by forcing the contraction of [á-à] to yield high-toned [á] rather than falling-toned [â], it allows *LONG to be satisfied via shortening without fatally violating *CROWD.

(84) A high-toned vowel resulting from contraction (and tonal absorption) is short

		e-ri-ná-[àsana] ... $)_\varphi$	*HL-L	*CROWD	MAX-H[LINKED]	MAX-L	*LONGV	MAX-μ
a.	☞	°e.ri.ná.sana				*		*
b.		e.ri.ná:.sana				*	*!	
c.		e.ri.nâ:.sana	*! W			L	*	
d.		e.ri.nà.sana			*! W	L		*

We see, then, that if a falling tone is not forbidden by *HL-L, then its presence can force a vowel or vowel-vowel sequence to remain long in the output; if a vowel has a falling tone, it is better that it violate *LONG rather than *CROWD. At this point, however, note that *LONG could be satisfied without violating *CROWD if the contracted V́V̀ sequence shortened and its H tone shifted to the left. Since this does not happen, we must assume that LINEARITY(V,H) is ranked above *LONGV.[20]

(85) LINEARITY(V,H) » *LONGV

	HL H_φ e-ri-ná-[àsaná] L_ι $)_\iota$	*CROWD	LINEARITY(V,H)	*LONGV	MAX-µ
a.	☞ °e.ri.nâ:.sá.nà			*	
b.	e.rí.nà.sá.nà		*! W	L	* W

Though violations of LINEARITY(V,H) are avoided by maintaining underlying length, they are never avoided by *lengthening* a vowel that is underlyingly short. If this were possible, then the assignment of both H_φ and L_ι to the φ-final/ι-final mora would always result in lengthening of the final vowel rather than in the shift of H_φ from the final vowel to the penult. As shown in (86), this unwanted possibility is correctly ruled out by ranking LINEARITY(V,H) below DEP-µ.

(86) Short vowels do not lengthen to accommodate contours

	H_φ o-ku-gulú L_ι $)_\iota$	DEP-µ	*CROWD	LINEARITY(V,H)	*LONGV	MAX-µ
a.	☞ $H_\varphi L_\iota$ o-ku-gúlù $)_\iota$			*		
b.	$H_\varphi L_\iota$ o-ku-gulû: $)_\iota$	*! W		L	* W	
c.	$H_\varphi L_\iota$ o-ku-gulû $)_\iota$		*! W	L		

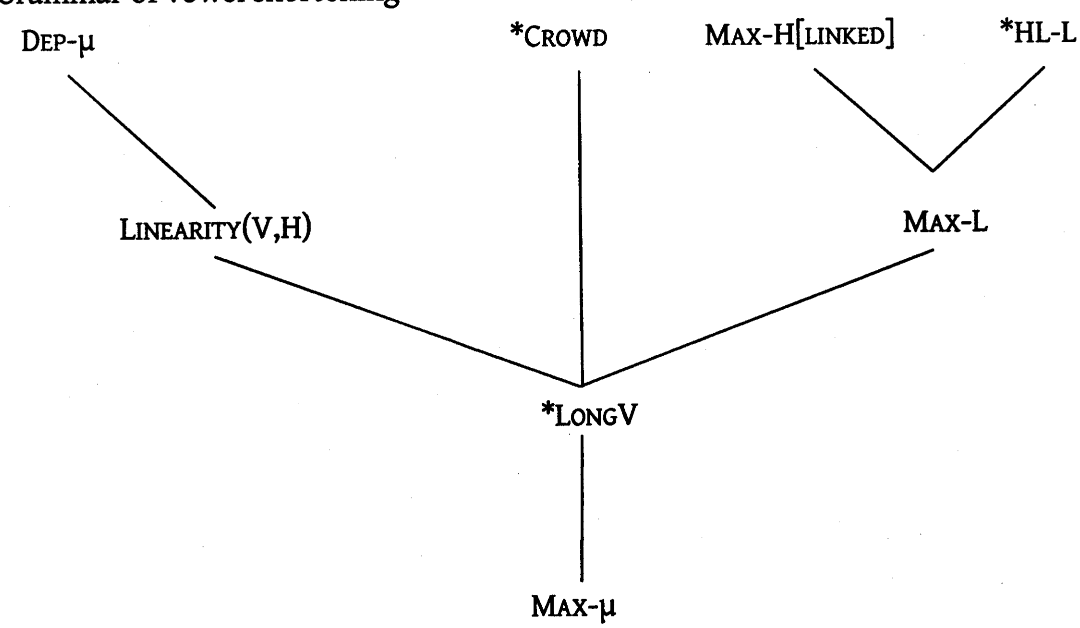
[20] Note that if the opposite ranking obtained, words with final long vowels would surface with exactly the same tone patterns as words with final short vowels. Since their different ι-final tone patterns are all that keep these words apart, we would then no longer have any reason to posit underlying long vowels at all.

All of the generalizations concerning vowel shortening and tone discussed just above are summarized in (87) below, and combined into a mini-grammar of vowel contraction in (88).

(87) Generalizations concerning vowel shortening and tone

a. *LongV » Max-μ	In the absence of a contour tone, vowels shorten.
b. *Crowd » *LongV	Lengthening is blocked if it would cause tonal crowding.
c. Max-H[linked], Max-L » *LongV	Tones cannot be deleted simply so that shortening can proceed without violating *Crowd.
d. *HL-L, Max-H[linked] » Max-L	A low tone (and not a H tone) is deleted to ensure that no falling tone immediately precedes a (phonetically) low-toned vowel.
e. Linearity(V,H) » *LongV	Falling tones are realized without violating *Crowd by maintaining underlying vowel length (if present), not by leftward shift of H tones.
f. Dep-μ » Linearity(V,H)	In the absence of underlying vowel length, *Crowd must be satisfied through leftward shift, and not through the creation of non-underlying long vowels.

(88) Grammar of vowel shortening



With the grammar of vowel shortening established, we can now finally turn to the most important point: vowel shortening can only apply in the ι-level evaluation, and not in the φ-level evaluation. This is made clear by the incorrect derivation of $ι_D$-final *e-ki-kome:* 'snail' in (89) below. There, we see that if shortening applies in the φ-level evaluation, then we would expect it to apply immediately after the assignment of $H_φ$ to *e-ki-kome:*. This would produce a short vowel, since the resulting vowel would bear only a single tone (89a). The subsequent assignment of $L_ι$ in the ι-level evaluation would then drive $H_φ$ from the final short vowel onto the penultimate syllable, just as in *o-ku-gulu* 'leg' (89b).

(89) Incorrect derivation of final contours if *LongV » Max-μ in φ stratum

a. φ stratum: final long vowel shortens after being assigned only one tone

	e-ki-kome: $H_φ$ $)_φ$	Dep-μ	*Crowd	Linearity(V,H)	*LongV	Max-μ
☞	e-ki-komé $)_φ$			*		*
	e-ki-komé: $)_φ$			*	*!	

b. ι stratum: final $H_φ$ shifts from final short vowel to penultimate syllable

	e-ki-komé $L_ι$ $)_ι$	Dep-μ	*Crowd	Linearity(V,H)	*LongV	Max-μ
☞	e-ki-kómè $)_ι$			*		
	e-ki-komê $)_ι$		*!			
	e-ki-komê: $)_ι$	*!			*	

On the other hand, simply by switching the ranking of *LongV and Max(μ) in the transition from the φ-level evaluation to the ι-level one, keeping all other constraint rankings constant, the tone pattern of *e-ki-kome:* is derived correctly. This is shown in (90). In the φ-level evaluation in (90a), $H_φ$ is assigned to the final long vowel, which does not undergo shortening. As a result, in the ι-level evaluation in (90b), $H_φ$ and $L_ι$ can share a final long vowel without violating Dep-μ.

(90) Correct derivation of ι-final *e-ki-komee* with reranking of *LongV and Max(μ)

a. φ stratum: Correct non-shortening of final vowel upon assignment of H_φ

e-ki-kome: H_φ)$_\varphi$	Dep-μ	*Crowd	Linearity(V,H)	Max-μ	*LongV
☞ e-ki-komé:)$_\varphi$					*
e-ki-komé)$_\varphi$				*!	

b. ι-stratum: Correct non-shortening of final vowel upon assignment of L_ι

e-ki-komé: L_ι)$_\iota$	Dep-μ	*Crowd	Linearity(V,H)	*LongV	Max-μ
☞ e-ki-komê:)$_\iota$				*!	
e-ki-komê)$_\iota$		*!			*
e-ki-kómè)$_\iota$			*!		

Note that the reranking approach also correctly derives the fact that in the absence of a contour tone, shortening *will* apply at the ι stratum. This is shown for φ-final *e-ki-kome:*, which is asigned H_φ but not L_ι or H_ι, in (91).

(91) Correct derivation of φ-final *e-ki-komee* with reranking of *LongV and Max(μ)

a. φ stratum: Correct non-shortening of final vowel upon assignment of H_φ

e-ki-kome: H_φ)$_\varphi$	Dep-μ	*Crowd	Linearity(V,H)	Max-μ	*LongV
☞ e-ki-komé:)$_\varphi$					*
e-ki-komé)$_\varphi$				*! W	L

b. ι-stratum: Correct shortening of final vowel upon non-assignment of L_ι

e-ki-komé: ....)$_\iota$	Dep-μ	*Crowd	Linearity(V,H)	*LongV	Max-μ
☞ e-ki-komé ...)$_\iota$					*
e-ki-komé: ...)$_\iota$				*! W	L

I therefore conclude that while the φ stratum and the ι stratum have almost identical rankings, and completely identical rankings so far as tone assignment is concerned, they differ minimally in that Max-μ dominates *LongV in the φ stratum, blocking shortening, while *LongV dominates Max-μ in the ι stratum, triggering shortening.

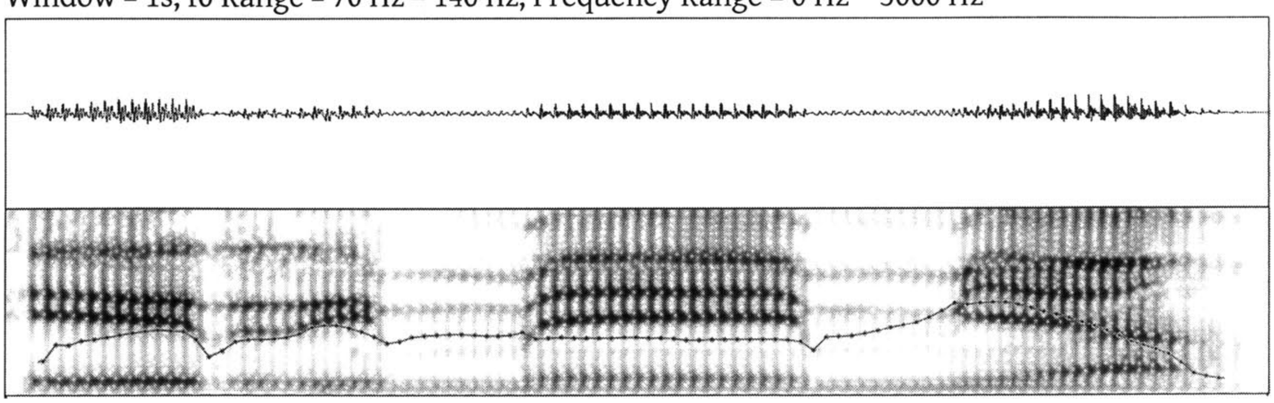
One last point concerns glide formation. In addition to words with final long Vs or identical V-V sequences, Kinande also has words that end underlyingly in non-identical V-V sequences that undergo glide formation. As seen below, these words also realize both H_φ and L_ι/H_ι on the ultima in ι-final position.

(92) Tonal variation of underlyingly toneless *e-ki-koki̯o* 'crust'

a.	Pre-adjectival	**e-kḭ-kokyo** AUG-NC.7-CRUST	kḭ-lḭ́tò NC.7-HEAVY	'the heavy crust'
b.	Pre-verbal	**e-kḭ-kokyó** AUG-NC.7-CRUST	ki-ká-langirawâ SM.7-IMPV-BE.SEEN	'The crust is seen.'
c.	Statement-final	u-ká-langir' SM.2S-IMPV-SEE	**e-kḭ-kokyô** AUG-NC.7-CRUST	'You see the crust.'
d.	Question-final	u-ká-langir' SM.2S-IMPV-SEE	**e-kḭ-kokyő** AUG-NC.7-CRUST	'You see the crust?'

What is most interesting about these forms is that while their penultimate vowels undergo glide formation, they nevertheless appears to bear tone. This may be seen in (93). Here, we see the realization of ι_D-final *e-ri-[mem-i̯-a]*, a nonce infinitive with causative morphology built from the hypothetical root *-mem-*. While this infinitive's final syllable bears a falling tone, it is clearly realized over the glide as well as the following vowel.

(93) ι_D-final °*e-ri-[mem-i̯-a]*
Window = 1s; f0 Range = 70 Hz – 140 Hz; Frequency Range = 0 Hz – 5000 Hz



e ɾ i m eː m i̯ a

I will assume, then, that glide formation does not affect the moraic status of vowels in Kinande, so that these "glides" are perhaps best thought of as the initial components of diphthongs.[21] Under this analysis, the ι-final tone patterns shown by words with final CGV sequences clearly satisfy *CROWD, since their final $H_{\varphi}L_{\iota}$ and $H_{\varphi}H_{\iota}$ contours are realized over two moras. Moreover, since no vowel is associated with more than one mora, they also satisfy *LONGV. Therefore, their tone patterns are derived just as in words with final long vowels.

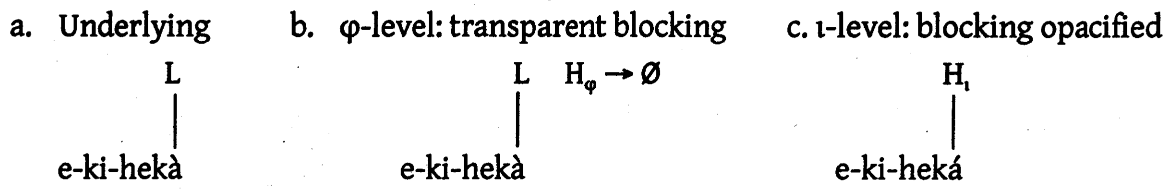
6 Conclusion

In this chapter, I have argued that the postlexical phonology of Kinande is partially derivational in that some processes crucially precede others, and that this is made possible by the complementary mechanisms of cyclic evaluation and constraint reranking.

On its own, cyclic evaluation of the phonological phrase and the intonational phrase ensures that the φ-level boundary tone H_{φ} is always assigned before the ι-level boundary tones L_{ι} and H_{ι}. As we saw in section 1, and then again in section 4, this ensures two key results. First, it provides us with a means of accounting for the fact that H_{φ} is blocked by the presence of an underlying (or, in the case of verbs, previously assigned) word-final L tone, even when this L tone does not appear on the surface. In order to capture this opaque fact within an output-oriented framework such as OT, we must appeal somehow to a phonological evaluation in which H_{φ} is blocked transparently. I have proposed that this representation is provided by cyclicity: since H_{φ} is always assigned *before* the ι-level boundary tones that overwrite final L tones, final L tones always have an opportunity to block H_{φ} before they are removed from the representation (94b).

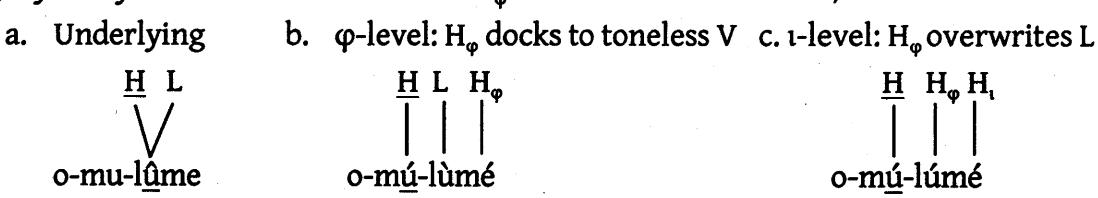
[21] This is also suggested by the fact that vowels that have undergone glide formation continue to contrast in [ATR] (Jones 2012).

(94) Cyclicity derives opaque blocking of H_φ in L-final nouns (e.g. *e-ki-hekà* 'truck') ι-finally



Intermediate representations are also crucial to deriving the fact that H_φ is able to overwrite a penultimate L tone in forms like *o-mú-lùme* 'man', even though *final* L tones in nouns like *e-ki-hekà* 'truck' block it. In particular, the φ-level evaluation provides an opportunity for H_φ to associate to the toneless final vowel before crowding from L_ι or H_ι forces it onto the L-toned penult. It therefore provides a crucial safe harbor for H_φ, in which it can be assigned without immediately competing with a lexical L tone for realization. This delay means that when H_φ *does* confront the L tone in the following ι-level evaluation, it does so with the status of a linked input tone. Since we know from our study of lexical tone shift from chapter 2 that *linked* H tones have the ability to overwrite lexical L tones when they shift to the left, this automatically ensures that H_φ will be able to overwrite L in the ι-level evaluation.

(95) Cyclicity derives "toehold effect": H_φ links first to toneless FV, then overwrites L on penult



Now, one potential alternative to the cyclic account of intonational tone assignment in *e-ki-hekà* and *o-mú-lùme* is output-output correspondence: instead of relying on an intermediate stage in which H_φ is assigned but not L_ι or H_ι, we could instead rely on the fact that there is a *surface* form with these properties – namely the tonal variant that appears in φ-final, ι-nonfinal position. In particular, we could demand that the presence of H_φ in the ι-final form depend upon the presence of $H_φ$ in the φ-final form, using output-output (OO) constraints similar to the Base-Derivative correspondence constraints posited by Benua (1997).

(96) Output-Output Correspondence constraints for opaque intonational tone

a. OO-MAX-$H_φ$ Any $H_φ$ tone in a φ-final, ι-nonfinal form should have a correspondent in the φ-final, ι-final form

b. OO-DEP-$H_φ$ Any $H_φ$ tone in a φ-final, ι-final form should have a correspondent in the φ-final, ι-nonfinal form

In (97) below, we see how OO correspondence might handle the opaque blocking of $H_φ$ in question-final *e-ki-hekà*. Here, we see a competition between the attested candidate [e-ki-heká], in which $H_φ$ is opaquely blocked, and an alternative candidate [e-ki-héká], in which $H_φ$ opportunistically emerges on the penult once the final L tone is overwritten by $H_ι$. By ranking OO-DEP-$H_φ$ above (IO)-MAX-H, we correctly predict the emergence of the attested form, with opaque blocking of $H_φ$. The alternative candidate is ruled out by highly-ranked OO-DEP-$H_φ$ because it shows a $H_φ$ tone when φ-final [e-ki-hekà] does not.

(97) Derivation of ι-final *e-ki-hekà*, assuming OO-Correspondence with φ-final [e-ki-hekà]

	L e-ki-hekà $H_φ$ $H_ι$	OO-Dep-$H_φ$	MAX-H	LIN(V,H)
a.	☞ $H_ι$ e-ki-heká $)_φ)_ι$		*	*
b.	$H_φ$ $H_ι$ e-ki-héká $)_φ)_ι$	*! W	 L	*** W

Similarly, as shown in (98), OO correspondence can derive the fact that $H_φ$ overwrites a penultimate L tone with a ranking of OO-MAX-$H_φ$ above (IO)-MAX-L. This allows $H_φ$ to overwrite the penultimate L of ι-final *o-mú-lùme* simply because $H_φ$ is present in φ-final [o-mú-lùmé].

Although the candidate in (98b) fares better with respect to the ranking of MAX-L above MAX-H, it is eliminated because it lacks the H_φ tone present in the φ-final, ι-nonfinal form, and thereby violates OO correspondence.

(98) Derivation of ι-final *o-mú-lùme*, assuming OO-Correspondence with φ-final [o-mú-lùmé]

		OO-Max-H_φ	MAX-L	MAX-H
	H L o-mú-lùme H_φ H_ι			
a.	☞ H H_φ H_ι o-mú-lúmé		*	
b.	H L H_ι o-mú-lùmé	*! W	 L	* W

The cyclic approach and the OO correspondence approach are, in many ways, very similar. Both explain the unexpected behavior of H_φ in an ι-final surface representation by appealing to another representation in which its behavior is expected. In the cyclic approach, this is an *intermediate* representation of the *ι-final* form, while in the OO correspondence approach it is a *surface* representation of a related *φ-final* form. As a result, the empirical predictions of the two approaches appear to be the same.

My primary reasons for favoring the cyclicity-baesd approach, then, are conceptual. Underlying the proposal of transderivational correspondence is an independently motivated theory of morphological derivation and what it means to be a morphological base. This is what establishes the OO correspondence relation between two forms, and it is also crucial to establishing "base priority," which ensures that derivative forms adopt the phonological properties of base forms but not vice-versa. However, it is not clear what independently motivated principle other than cyclic evaluation would explain why the φ-final realization of a form should serve as a phonological base for the ι-final one.

Indeed, in most cases where OO correspondence constraints have been proposed to enforce similarity between phrasal variants, it is the utterance-final *isolation* form that serves as the model to which non-final forms must adapt. For example, Gordon (2000) proposes that in English, the preference for penultimate rather than final stress has its origins in the fact that stressed syllables attract H-toned pitch accents which, if they occurred on the final syllable of a word in isolation, would be crowded by an utterance-final L boundary tone. According to this analysis, stress is retracted from the final vowel to the penult in order to remove the potential conflict between the H pitch accent and the L boundary tone. Crucially, however, since stress assignment in English is a strictly word-level phenomenon, where the stress pattern of a word does not vary according to whether or not it is utterance-final (and thereby potentially subject to tonal crowding), Gordon proposes that the stress patterns of utterance-nonfinal words are determined through OO correspondence to their utterance-final variants.

Another case in point is final obstruent devoicing, which is particularly well-motivated in utterance-final position, but commonly extended to utterance-medial position where its phonetic motivation is not as strong. In utterance-final position, both articulatory and perceptual factors favor obstruent devoicing: relatively low subglottal pressure makes airflow across the glottis (and therefore voicing) particularly difficult to sustain (Westbury and Keating 1986), and since utterance-final stops necessarily lack a following vowel, many of the cues that help to identify a consonant's voicing (e.g. the Voice Onset Time (VOT) of a following sonorant, the consonant's burst duration, etc.) will be absent, making the difference between voiced consonants and voiceless consonants particularly difficult to perceive (Steriade 1999). In utterance-nonfinal position, these conditions do not necessarily hold. If a consonant-final word occurs relatively early in the utterance (though not utterance-initially), sub-glottal pressure will be relatively high, so that airflow across the glottis and therefore voicing is easier to sustain. In addition, in utterance-nonfinal position a word-final consonant might be immediately followed by a word-initial vowel, whose VOT could provide a strong cue to the consonant's voicing. On purely phonetic grounds, then, we might expect final obstruent devoicing to be purely an utterance-final phenomenon. However, in many languages it occurs in all words, regardless of phrasal context. One way to account for this is through OO correspondence. Steriade (1999), for example, proposes that word final, utterance-medial consonants in Lithuanian are compelled via OO faithfulness to mimic the voicing of their utterance-final counterparts.

In both Gordon's account of stress retraction and Steriade's account of obstruent devoicing, then, it is crucial that an utterance-medial form be faithful to an utterance-final form, and not vice-versa. Since this seems to be the normal direction of phrasal neutralization, it is not clearly why OO correspondence in Kinande should produce the opposite pattern, where utterance-final forms conform to utterance-medial ones. In the cyclic account, on the other hand, the fact that utterance-final forms adopt properties of utterance-medial forms is expected, since the utterance-medial forms are intermediate representations through which utterance-final forms must pass.

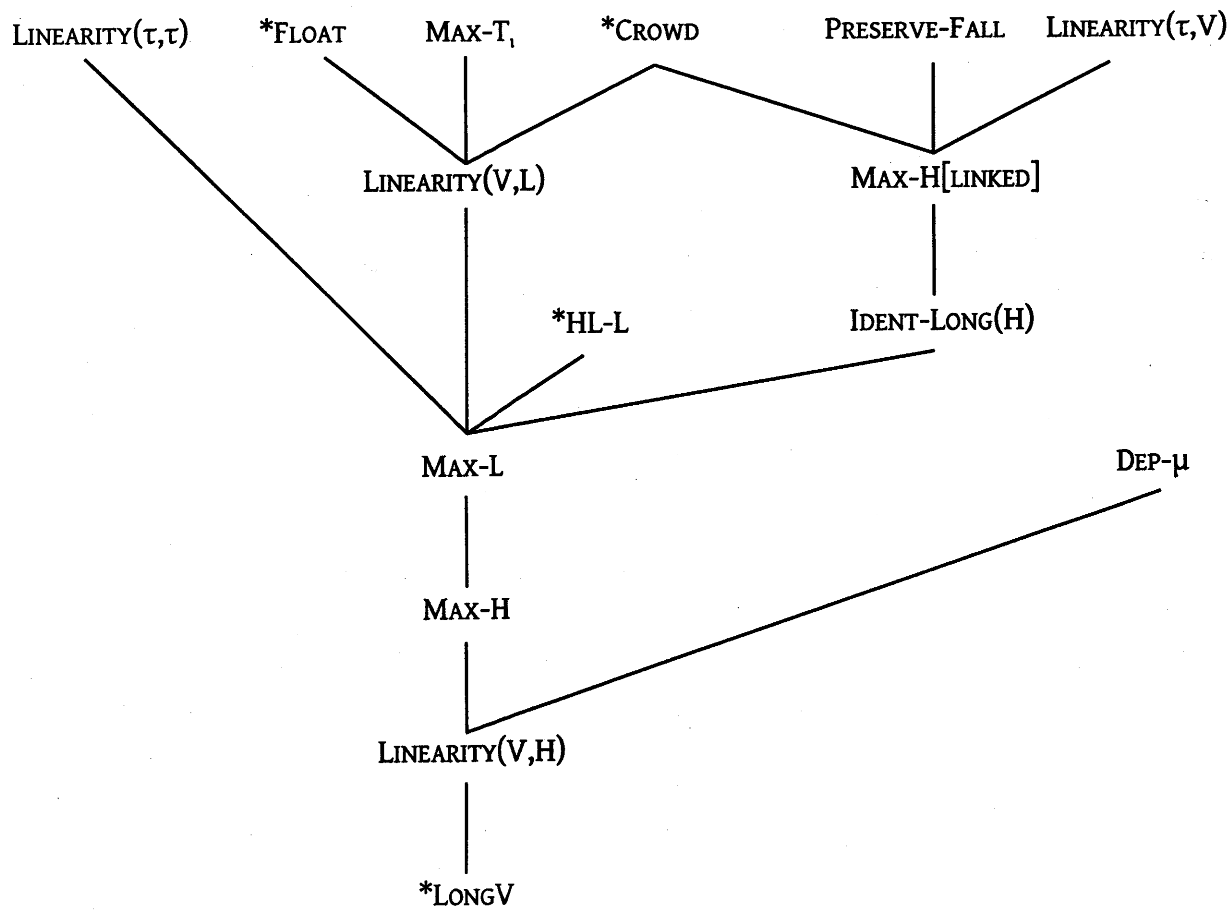
Note also that the main theoretical benefit provided by the parallel, transderivational faithfulness account – the elimination of serial derivation – is considerably mitigated by the fact that serial derivation in the postlexical phonology is needed anyway in order to account for the interaction between intonational tone assignment and vowel contraction. Having already invested in serial derivation as a necessary means of accounting for certain opaque interactions, it makes sense to use it wherever possible instead of permitting both it and alternative theoretical devices which can do the same work.

Finally, while I have argued that cyclicity alone derives many of the crucial orderings between postlexical processes, some amount of constraint reranking is necessary as well. In particular, the relative ranking of Max-μ and *LongV must be reversed in the final stratum in order to account for the fact that vowel contraction does not apply until the very end of the postlexical phonology.

Combining the rankings derived for tonal interaction (59) with the rankings derived for vowel contraction (88), we arrive at the final postlexical grammar in (99). Rankings in (99a) hold for the entire postlexical phonoogy, while those in (99b) hold only in specific strata.

(99) Grammar for postlexical tone interaction

a. Shared φ-level/ι-level grammar



b. Limited reranking between φ and ι

φ-level: MAX-μ ≫ *LONGV

ι-level: *LONGV ≫ MAX-μ

φ-level:	*ι-level:*
MAX-μ	*LONGV
|	|
*LONGV	MAX-μ

4 The analysis of Complex tone

1 Introduction

1.1 Simple tone and Complex tone

So far, the verb forms we have seen have primarily consisted of infinitive forms, whose tonal characteristics are fairly straightforward: they show the properties in (1), which define a Kinande-specific version of what Goldsmith (1987) calls the "Simple Stem Tone Pattern." (I will generally refer to this as just "Simple tone," for short.)

(1) Characteristics of Simple tone in Kinande

a. Lexical $\underline{H}$ tones surface on the first vowel before the verb root, immediately followed by the L tones which are responsible for their leftward shift (cf. chapter 2).

b. Any intonational tones which are assigned – including H_φ, L_ι, and H_ι – stack at the verb's right edge, with ι-level tones following φ-level tones when both are present

This pattern is exemplified by the infinitive forms in (2), which are given in three different prosodic contexts to show how different combinations of boundary tones are assigned. Here, lexical $\underline{H}$ tones and the vowels which bear them are underlined, while all intonational tones are labeled with subscripts. (L tones introduced via tone shift are not marked in any way.)

(2) Infinitive forms showing Simple Tone (in 3 prosodic contexts)

		ι_D-final: H_φ, L_ι assigned	φ-final: H_φ assigned	φ-medial
a.	*toneless stem* 'to hit for'	H_φ L_ι | | e-ri-[hum-ír-à]	H_φ | e-ri-[hum-ir-á]	e-ri-[hum-ir-a]
b.	*H-toned stem* 'to send for'	$\underline{H}$ L H_φ L_ι | | | | e-rí̱-[tùm-ír-à]	$\underline{H}$ L H_φ | | | e-rí̱-[tùm-ir-á]	$\underline{H}$ L | | e-rí̱-[tùm-ir-a]

In this chapter, the focus is on a very different pattern of tone assignment, which is found only in finite verb forms. This pattern is a Kinande-specific version of what Goldsmith (1987) calls the "Complex Stem Tone Pattern," and I will generally refer to it as "Complex tone" for short. Its exact realization varies according to the morphological and phonological structure of the verb to which it is assigned, but when it appears in its most distinctive form, it has the basic characteristics in (3).

(3) Basic Characteristics of Complex tone in Kinande

a. Assignment of Grammatical **H** tones
   - When the verb contains a *toneless* stem, grammatical **H** tones surface on the stem's *initial and pre-initial vowels* (4a).
   - When the verb contains a *H-toned* stem, grammatical **H** tones surface on the stem's *penultimate and antepenultimate* vowels (4b).

b. Suppression of Lexical $\underline{H}$ tones
   - The lexical $\underline{H}$ tone of the verb root does not surface on the pre-root vowel (4b)

c. Blocking of H_φ/Assignment of Final L
   - H_φ surfaces neither on the final vowel in φ-final position nor on the penultimate vowel in ι-final position. This indicates that Complex tone assigns a L tone to a stem's final vowel. (The ι-level boundary tones L_ι and H_ι surface normally on the ι-final vowel, just as in forms with Simple Tone.[1])

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[1] Clear evidence that the ι-level boundary tones L_ι and H_ι are not blocked like H_φ comes from yes/no questions, where H_ι overrides L in forms like *tw-á-[húm-ir-an-a-á]* 'we hit for each other?'

All of these characteristics are observed, for example, in the Recent Past verbs in (4).[2] As in (2), these are shown in ι-final, φ-final, and ι-medial position. In addition, in these forms and in examples to follow, grammatical **H** tones and the vowels that bear them are in bold.[3]

(4) Recent Past forms showing Complex tone (in 3 prosodic contexts)[4,5]

		ι-final: H_{φ}, L_{ι}	φ-final: H_{φ}	φ-medial
a.	*toneless stem* 'we hit for (recently)'	**H** L_{ι} tu-**á**-[h**ú**m-ir-a-à]	**H** L e-tu-**á**-[h**ú**m-ir-a-à][6]	**H** L tu-**á**-[h**ú**m-ir-a-à]
b.	*H-toned stem* 'we sent for (recently)'	**H**L_{ι} tu-a-[tum-ír-**á**-à]	**H**L e-tu-a-[tum-ír-**á**-à]	**H**L tu-a-[tum-ír-**á**-à]

1.2 Unity of Complex tone

Crucial to a proper understanding of Complex tone is the recognition that the three characteristics outlined in (3) form part of a *single package*: any verb with Complex tone will show *all* of them, provided that their morphological and phonological prerequisites (on which see below) are met. This emerges clearly when we compare segmentally identical verb forms that differ only in whether or not they receive Complex tone.[7] Consider, for example, the forms in (5) below, which are the counterfactual counterparts of the declarative forms in (4). Phonologically, the forms in (4) and (5) are almost entirely identical: the only difference is that

[2] These forms are "factual" Recent Past forms; see chapter 5 for an overview of Kinande verb tenses.
[3] Final L tones other than L_{ι} will remain unmarked for now; we will see that their origins are mixed, so that they sometimes result from grammatical tone assignment and sometimes arise in the course of tone shift.
[4] Throughout this chapter, the effects of glide formation and vowel contraction are suppressed for clarity and expositional ease.
[5] Here for simplicity, I do not show a L tone on V2 that results from leftward shift in forms with toneless stems.
[6] This form has an initial *e-* prefix because it is a nominalized verb meaning 'the fact that we hit for (recently).' This is, to my knowledge, the only way of placing a verb with Complex tone in φ-final position without also putting it in ι-final position.
[7] The topic of which verb forms are assigned Complex tone is addressed in detail in chapter 5.

those in (5) lack Complex tone. This one difference, however, causes all three of the characteristics in (3) to disappear: in (5), no grammatical **H** tones are assigned within the stem, lexical $\underline{\text{H}}$ tones are not suppressed, and the assignment of H_φ is not blocked. Thus, however the Simple tone vs. Complex tone distinction is represented (morphologically and phonologically), it must be able to trigger all three of these effects. Explaining how this happens is a major challenge for the analysis of Complex tone.

(5) Counterfactual Recent Past forms showing Simple Tone (in 2 prosodic contexts)

		ι-final: H_φ, L_ι assigned	φ-medial
a.	*toneless stem* 'If we had hit for (recently)'	$H_\varphi L_\iota$ tu-a-[hum-ir-á-à]	tu-a-[hum-ir-a-a]
b.	*H-toned stem* 'If we had sent for (recently)'	$\underline{\text{H}}$ L $H_\varphi L_\iota$ tu-á̲-[tùm-ir-á-à]	$\underline{\text{H}}$ L tu-á̲-[tùm-ir-a-a]

1.3 Variations in Complex tone

A second major challenge is that the realization of Complex tone is not constant, but instead varies according to the phonological and morphological properties of the verb to which it is assigned. We have already seen part of this variation, in the way that grammatical **H** tones surface in different parts of a stem depending on whether its root is toneless or H-toned (4a vs. 4b). However, the realization of Complex tone can also be affected by (a) the length of the verb stem, (b) the identity of pre-stem inflectional prefixes, and (c) the presence or absence of certain stem-internal suffixes. The first two of these affect only verbs with H-toned stems, while the third affects all verbs with Complex tone.

1.3.1 Stem length and grammatical tone

The length of a H-toned stem determines whether or not grammatical **H** tones surface within it. Grammatical **H** tones appear (on the penult and antepenult) in H-toned stems that are at least three vowels long (6a-c), but not in those with just two vowels (6d). These stems show just a final L tone which blocks the assignment of H_{φ} (6d).

(6) H-toned stems need at least three vowels to surface with grammatical H tones

a. **H** L tu-anga-[tum-an-írír-à] 'we should send each other on purpose'	b. **H** L tu-anga-[tum-ír-án-à] 'we should send for each other'
c. **H** L tu-anga-[túm-án-à] 'we should send each other'	d. L tu-anga-[tum-à] 'we should send'

1.3.2 Pre-stem inflectional prefixes and lexical tone

In verbs with Complex tone, whether or not a lexical H tone surfaces on the vowel immediately before the root depends on what morpheme this vowel belongs to. This is shown in (7) below. There, we see that no high tone surfaces on the vowel before a H-toned root when that vowel belongs to either a subject marker (7a) or a TAM morpheme (7b), but that a high tone *does* surface if the vowel belongs to either the affirmative morpheme *na-* 'indeed' (7c) or the object marker *mu-* 'him' (7d). In the latter cases, we know that the high tone which surfaces must be the lexical H tone originating from the root, since both *na-* and *mu-* are otherwise toneless. This is shown in (8), where we see these morphemes in infinitive forms with toneless roots (where they are affected neither by grammatical **H** tones nor by lexical H tones).

(7) Lexical H̲ tones do not surface on SM or TAM, but do surface on *na-* or OM

a.	root preceded by subject marker *tu-* ‘we’	**H** L tu-[tsém-ɟrè]	‘we are happy’
b.	root preceded by modal TAM marker *-anga-*	**H** L tu-anga-[tum-ɪ́rɪ́r-à]	‘we could send on purpose’
c.	root preceded by affirmative *na-* ‘indeed’	H̲ L **H** L tu-anga-ná̲-[tùm-ɪ́rɪ́r-à]	‘we can send on purpose’[8]
d.	root preceded by object marker *mu-* ‘him/her’	H̲ L **H** L tu-angá̲-mú̲-[tùm-ɪ́rɪ́r-à]	‘we should send him on purpose’

(8) Affirmative morpheme *na-* and object marker *mu-* are normally toneless

a. e-ri-[hum-a] ‘to hit’ (φ-medial)
b. e-ri-na-[hum-a] ‘to indeed hit’ (φ medial)
c. e-ri-mu-[hum-a] ‘to hit him’ (φ-medial)

Note that this phenomenon is completely independent of grammatical **H** tone assignment: even if a H-toned stem is too short for grammatical **H** tones to surface within it, its lexical H̲ tone will still surface only if preceded by *na-* or an object marker.

(9) Lexical tone suppression is independent of grammatical **H** assignment

a.	root preceded by modal TAM marker *-anga-*	L tu-anga-[tum-à]	‘we could send’
b.	root preceded by affirmative *na-* ‘indeed’	H̲ L L tu-anga-ná̲-[tùm-à]	‘we can send’
c.	root preceded by object marker *mu-* ‘him/her’	H̲ L L tu-angá̲-mú̲-[tùm-à]	‘we should send him’

[8] Combining *na-* with the modal TAM marker *-anga-* produces a meaning of *possibility* rather than *advisability*.

Finally, note that when a lexical H̲ tone surfaces on an object marker, it also surfaces on the vowel before it (7d)/(9c). This phenomenon, which I will refer to as Object Tone Doubling (OTD), is not specific to forms with Complex tone; it occurs in all forms, including infinitives, where a H-toned stem is immediately preceded by an object marker.

(10) Object Tone Doubling in infinitives (φ-medial)

a.	e-rí-[tùm-a]	'to send'	cf. e-ri-[hum-a] 'to hit'
b.	e-rí̲-mú̲-[tùm-a]	'to send him'	cf. e-ri-mu-[hum-a] ' to hit him'

Even though OTD is not a property of Complex tone *per se*, it will still be important to this chapter for two reasons. First, since verbs with Complex tone (like all verbs) are potentially subject to OTD, an analysis of OTD is necessary for a full account of their tone patterns. Second, as we will see in section 2, an understanding of OTD will occasionally help us to choose between competing analyses of Complex tone assignment.

1.3.3 Stem-internal suffixes and grammatical and intonational tone

Finally, whether or not the verb stem contains an extension suffix with the shape -*V*- (i.e. either passive -*u* or causative -*į*) influences the realization of both grammatical tone and intonational tone. If one of these suffixes is present, we see two separate effects. First, H_{φ} is no longer blocked, so that it appears on the penultimate vowel of the verb in ι-final position. Second, the V-shaped suffix acts as if it is underlyingly H-toned, in that a high tone surfaces on the vowel which immediately precedes it. Mutaka (1994), following Hyman and Katamba (1990), calls this H tone a "Spurious H," and I will adopt this term here as well. As shown in (11), the Spurious H (indicated with a double underline) surfaces *in addition* to grammatical **H** tones in verbs with toneless stems (11a), but in *in place* of them in verbs with H-toned stems

(11b). Crucially, however, it is completely absent in forms that are not assigned Complex tone; in infinitives, for example, both passive *-u* and causative *-į* are completely toneless (12).

(11) V-shaped suffixes cause disruption of Complex tone[9]

		Passive (*-u-*)	Causative (*-is-į-*)
a.	toneless root	H $\underline{\underline{H}}$ H_φ L_ι tu-angá-[húm-irí̱r-ú-à] 'we could be hit on purpose'	H $\underline{\underline{H}}$ H_φ L_ι tu-angá-[húm-í̱s-í̱-à] 'we could make (someone) hit'
b.	H-toned root	$\underline{\underline{H}}$ H_φ L_ι tu-anga-[tum-irí̱r-ú-à] 'we could be sent on purpose'	$\underline{\underline{H}}$ H_φ L_ι tu-anga-[tum-í̱s-í̱-à] 'we could make (someone) send'

(12) No Spurious H in the absence of Complex tone

a. H_φ L_ι e-ri-[hum-ú-à] 'to be hit'	b. H_φ L_ι e-ri-[hum-is-í̱-à] 'to be hit'

Since the Spurious H tone is clearly not an underlying property of the passive or causative suffixes, it must somehow arise from their interaction with Complex tone.

1.4 Taking stock: requirements for a successful analysis

Now that we have seen both the basic characteristics of Complex tone and how it varies in different circumstances, we can assess what is required of a satisfactory analysis. First, we must be able to account for each of Complex tone's individual effects. That is, we must account for (a) why grammatical **H** tones surface near the *left* edge of toneless stems but near the *right*

[9] The forms given here abstract away from vowel contraction. In actual surface forms, the passive and causative suffixes undergo glide formation, causing their H_φ tones and the L_ι tones on FV to produce falling tones, e.g. [twangáhúmirí̱rwâ] 'we could be hit on purpose' and [twangatumirí̱rwâ] 'we could be sent on purpose.'

edge of H-toned stems, (b) why grammatical **H** tones are always doubled, (c) why lexical $\underline{H}$ tones are suppressed, (d) why H_φ is blocked and (e) why the assignment of Complex tone appears to cause the passive and causative suffixes to become H-toned.

Second, we must be able to explain the circumstances under which the main effects of Complex tone are *not* observed. That is, we should be able to explain (a) why grammatical **H** tones do not surface in H-toned stems with only two vowels, (b) why lexical $\underline{H}$ tones are not suppressed when the root is preceded by an object marker or *na-*, and (c) why H_φ is not blocked when the verb stem contains a passive or causative suffix. All these effects are catalogued in (13) below, which organizes them according to what type of tone is involved.

(13) Effects of Complex tone that must be accounted for.

*Grammatical **H** tones*

c. Assigned in different parts of the stem depending on root tone
d. Absent from H-toned stems with just two vowels
e. When present, systematically doubled (i.e. spread one vowel to the left)
f. Augmented by Spurious H in toneless stems, replaced by Spurious H in H-toned stems

Lexical $\underline{H}$ tones

g. Deleted when the root is immediately preceded by a subject marker or TAM marker
h. *Not* deleted when the root is preceded by an object marker or *na-*

Intonational H_φ tones

i. Blocked by L tone that (in forms with Complex tone) is normally placed on final vowel
j. Not blocked in forms with passive or causative suffixes

In addition, a satisfactory analysis must explain two larger facts. First, it must explain the unity of Complex tone discussed in 1.2, i.e. why it is that if a verb shows any one of these effects, it will also show the others, provided that their morphological and phonological conditions are met. Second, it should be able to explain how the various effects of Complex tone interact with one another, often in opaque ways. For example, it must be able to explain why the assignment of grammatical **H** tones is sensitive to the presence or absence of lexical H̲ tones even in forms where the realization of lexical H̲ tones is suppressed.

The goal of this chapter, then, is to develop an analysis of Complex tone that meets these goals. This analysis is previewed in the remainder of the Introduction.

1.5 A new analysis of Complex tone

There are two key parts to the analysis of Complex tone that I propose here. First, its underlying representation consists of *three distinct tones* (two suffixal **H** tones and one prefixal **L** tone) which are exponents of clause type. Second, the OT grammar which evaluates these tones is a *stratal* grammar consisting of multiple lexical and postlexical constraint rankings. I will focus on this second part first, outlining the general architectural framework I adopt and some of the theoretical predictions that it generates. In 1.5.2, I then provide a preview of how I analyze Complex tone within this framework, before formalizing the analysis in detail in sections 2-5.

1.5.1 Architecture

The stratal phonology that I propose has three lexical strata, in addition to the postlexical strata posited in chapter 3. These strata are associated with the morphological domains of the *Stem*, *Macrostem*, and *Verbal Unit*. The Stem consists of all morphemes spanning from the root to the final desinence morpheme. The Macrostem contains the Stem as well as a preceding object marker, if present. The Verbal Unit (VU) consists of all verbal morphemes, including all Macrostem-internal morphemes as well as all inflectional prefixes. These three domains are illustrated in (14) below. There, and throughout this chapter, I will use [ ] brackets to indicate Stem boundaries, {} brackets to indicate Macrostem boundaries, and ⟨ ⟩ brackets to mark the edges of the VU.

(14) Stem, Macrostem, and Verbal Unit

⟨ mó-tu-a-na	{ kí	[sóm-er-an-à	]$_{\text{Stem}}$	}$_{\text{Macrostem}}$	⟩$_{\text{Verbal Unit}}$
⟨ FOC-SM.1P-PAST-AFF	{ OM.7	[√-APP-REC-DES	]	}	⟩

'we did read it (e.g. the book) for each other (a long time ago)'

I will assume that these three strata are evaluated cyclically, so that a new evaluation – i.e. a new pass through the stratum-specific EVAL function – is triggered with the phonological evaluation of each new morpheme. More specifically, I assume that phonological evaluation begins when the root is evaluated according to the Stem stratum's grammar, and that morphemes above the stem are then evaluated one by one, each triggering the evaluation of all material introduced thus far (i.e. the new morpheme and its base of affixation). The constraint ranking according to which this material is evaluated is determined by the stratum that the newly added morpheme belongs to. For example, in the derivation of the form in (14) above, the evaluation of the object marker *ki-* triggers the evaluation of /ki-somérana̖/ according to the Macrostem-level constraint ranking, yielding the output [ki-sómérana̖]. Later, the evaluation of the affirmative morpheme *na-* triggers the evaluation of /na-kisómérana̖/ according to the constraint ranking of the VU stratum, yielding the unchanged output [nakisómérana̖]. (The H tones of this output will undergo leftward shift postlexically.)

In addition, I will assume that evaluations are always triggered at the end of each stratum; this ensures that each stratum contributes to the phonological evaluation of a form, even if no new morphology is introduced within it.

Within this system, there are two ways that a derivational ordering can be established between two processes P1 and P2. First, P1 may apply before P2 because it applies in an earlier stratum. Second, P1 may apply before P2 because within the same stratum, the morphemes which provide the structural description for P1 are evaluated before those which provide the structural description for P2. Apart from these two cases, all processes apply in parallel.

By allowing ordering between processes in this limited range of circumstances, the system makes a potentially powerful prediction about when derivationally-based opacity can arise: *in order for one process to opacify another, it must apply in a later evaluation.*[10] However, for this prediction to have any actual force, we must place strong restrictions on the ability to assign processes to strata. Otherwise, the prediction is unfalsifiable, since any process which appears to opacify another could simply be placed in a later stratum by fiat. For example, an ordering between two word-bound processes could be established by artificially assigning one to a word level stratum and another to a phrase-level stratum with access to word boundaries.

I assume that there are two strong checks on this: Bracket Erasure and stratum-internal ranking consistency. I will adopt a very strong version of Bracket Erasure, whereby all information about morphological constituent structure is erased at the end of each *evaluation*, i.e. both at the end of each stratum and after each cycle *within* a stratum. This means that phonological processes do not actually make reference to any morphological boundaries at all: they simply apply within whatever phonological strings they are given in the input. With this assumption in place, any process that is bound within a given morphological domain must be triggered as soon as that domain is evaluated. This naturally predicts that processes which make reference to smaller morphological domains will take place before those which make reference to larger domains, and as we will see, this prediction is strikingly confirmed.

The second check against the arbitrary assignment of processes to strata is provided by the basic architecture of OT: it must be possible to characterize all processes within the same

[10] One process A "opacifies" another process B if the application of A causes the generalization enforced by B not to be surface-true, i.e. if A counterfeeds or counterbleeds B.

stratum with a single constraint ranking. If this is not possible – if for example, two processes which are clearly bound within the same domain require different constraint rankings – then this would be definite proof that the stratal architecture proposed here is insufficient to account for derivational opacity. Such a situation, however, does not appear to arise in Kinande, so that the stratal model can be maintained.

1.5.2 Schematic overview

Within the stratal analysis just described, there are five major processes that interact with one another in order to produce the Complex tone pattern: assignment of grammatical **H** tones, leftward spreading of grammatical **H** tones, overwriting of lexical $\underline{H}$ tones, leftward shift of all high tones assigned in the lexical phonology, and (non-)assignment of H_{φ}. In (15), I briefly describe how these processes work within the present analysis.

(15) Interacting Processes

a. Grammatical **H** tone assignment (inspired by Goldsmith 1987)
Two grammatical **H** tones (both exponents of clause type) are assigned within every stem: one to the stem's second vowel (V2), and the other to its final vowel (FV). However, a long-distance OCP constraint forces **H** to lower to **L** if it is immediately preceded by any H (i.e. $\underline{H}$ or **H**) on the tonal tier. In toneless stems, this results in a **H** on V2 and a **L** on FV. In H-toned stems, which have a lexical $\underline{H}$ tone on V1, this results in a **L** on V2 and a **H** on FV.

b. Leftward H tone spreading (inspired by Mutaka 1994, Black 1995)
Every Macrostem-internal H tone ($\underline{H}$ or **H**) spreads leftwards onto another Macrostem-internal vowel.

c. Lexical $\underline{H}$ tone overwriting (inspired by Black 1995)
In the Verbal Unit stratum, after the evaluation of *na-* but before the addition of any TAM morphemes or subject markers, a **L** tone prefix (a third exponent of clause type) is

evaluated. It is assigned to the leftmost vowel of whatever material has been evaluated up to this point, and overwrites any preexisting tone that is singly-linked. (Doubly-linked tones are protected by geminate faithfulness.) If neither *na-* nor an object marker has been introduced, the leftmost vowel is the verb root, so any lexical H̲ tone it bears will be overwritten.

d. Leftward shift (= Fall Conversion and Fall Expansion)
As discussed in chapter 2, all H tones which emerge from the lexical phonology – including all lexical and grammatical high tones – are converted to falling tones at the LP-PLP Watershed. These falling tones expand during the postlexical evaluation of φ, at which point (a) their H tone components shift one vowel to the left and (b) their L tone components occupy the vowel originally occupied by the shifted H.

e. (Non)-assignment of H_φ
H_φ is assigned during the evaluation of φ. However, it is blocked by L tones on the FV, which are introduced either (a) when a grammatical **H** tone assigned to FV lowers to **L** (in toneless stems) or (b) when H tones are converted to falls at the LP-PLP watershed (in H-toned stems)

These processes apply in the order just listed, which falls out from the fact that they make reference to successively larger domains. Grammatical **H** tone assignment (15a) crucially refers to positions within the stem, so it must take place within the Stem stratum. Tone doubling (15b) applies only applies from one Macrostem-internal vowel to another, so it must apply in the Macrostem stratum. Lexical H̲ tone deletion (15c) makes reference to inflectional prefixes, and so applies within the VU stratum. Finally, both leftward H tone shift (15d) and H_φ assignment (15e) take place during the postlexical evaluation of φ, since leftward shift cannot apply across φ boundaries and H_φ assignment makes crucial reference to φ's right edge.

In (16)-(17) below, I give a preliminary sketch of how these processes interact by providing derivations for six representative forms. These include the two verbs with Complex tone shown in (4) above – *tu-**á**-[h**ú**m-ir-a-à]* 'we hit for (recently)' and *tu-a-[tum-**í**r-**á**-à]* 'we sent for (recently) – as well as versions of these forms which contain the affirmative prefix *na-* and the 3rd singular object prefix *mu-*. While *na-* and *mu-* make no difference to the overall tone pattern in (16), their presence significantly influences the realization of the root's lexical H̲ tone in (17).

One thing to keep in mind while examining these derivations is that within the portion showing the lexical phonology, each line of the derivation represents not a single rule but a single pass through the stratum's constraint hierarchy. As mentioned in the previous section, I assume that this occurs both upon the addition of each morpheme and upon the completion of each stratum. Within the portion of the derivations showing the postlexical phonology, leftward shift and H_{φ} assignment are shown as ordered only for ease of exposition. As discussed in chapter 3, these processes actually apply simultaneously.

Conventions for marking tones are as follows. As in previous examples, vowels are underlined if they bear lexical H̲ tones, and are placed in bold if they bear grammatical **H** tones. Vowels are also bolded, however, if they bear **L** tones which (a) derive underlyingly from grammatical **H** tones or (b) derive from the prefixal **L** tone. Vowels which result from Fall Conversion at the LP-PLP Watershed are not bolded. Finally, for these derivations only, intonational L_{ι} tones are marked with a doubled grave accent.

(16) Derivations of Complex tone in verbs with toneless stems

Lexical Phonology (LP)	Stem Level	//	//	//
	Root cycle	hum	hum	hum
	Applicative Suffix cycle	hum-ir	hum-ir	hum-ir
	Desinence Suffix 1 cycle	humir-a	humir-a	humir-a
	Desinence Suffix 2 cycle	humira-a	humira-a	humira-a
	Grammatical H, 1st cycle	humíraa	humíraa	humíraa
	Grammatical H, 2nd cycle	humíraà	humíraà	humíraà
	Stratum-final evaluation	humíraà	humíraà	humíraà
	Macrostem Level (H Doubling)	/humíraà/	/humíraà/	/humíraà/
	Object marker cycle	(OM not added)	(OM not added)	mu-húmíraà
	Stratum-final evaluation	húmíraà	húmíraà	muhúmíraà
	Verbal Unit Level	/húmíraà/	/húmíraà/	/muhúmíraà/
	na- cycle	(*na* not added)	na-húmíraà	(*na* not added)
	L cycle	(gem. faith)	nà-húmíraà	mù-húmíraà
	TAM cycle	a-húmíraà	a-nà-húmíraà	a-mù-húmíraà
	SM cycle	tú-a-húmíraà	tú-a-nà-húmíraà	tú-a-mù-húmíraà
	Stratum-final evaluation	tú-a-húmíraà	tú-a-nà-húmíraà	tú-a-mù-húmíraà
LP-PLP Watershed		/tú-a-húmíraà/	/tú-a-nà-húmíraà/	/tú-a-mù-húmíraà/
Fall Conversion (V́ → V̂)		tû-a-húmîraà	tûanàhúmîraà	tû-a-mù-húmîraà
Postlexical Phonology (PLP)	φ Level	/tû-a-húmîraà/	/tû-a-nà-húmîraà/	/tû-a-mù-húmîraà/
	Fall Expansion/Leftward Shift	tù-á-húmìraà	tù-a-ná-húmìraà	tù-a-mú-húmìraà
	H_{φ} assignment	(blocked)	(blocked)	(blocked)
	ι-level	/tù-á-húmìraà/	/tù-a-ná-húmìraà/	/tù-a-mú-húmìraà/
	L_{ι} assignment	tù-á-húmìraȁ	tù-a-ná-húmìraȁ	tù-a-mú-húmìraȁ
Near-Surface (no contraction)		[tù-á-húmìraȁ]	[tù-a-ná-húmìraȁ]	[tù-a-mú-húmìraȁ]
Surface[11]		[tw-á-húmìrȁ:]	[tw-a-ná-húmìrȁ:]	[tw-a-mú-húmìrȁ:]

[11] For the final length observed in these surface forms, see chapter 3, note 18.

(17) Derivations of Complex tone in verbs with H-toned stems

Lexical Phonology (LP)	Stem Level	//	//	//
	Root cycle	tú̱m	tú̱m	tú̱m
	Applicative Suffix cycle	tú̱m-ir	tú̱m-ir	tú̱m-ir
	Desinence Suffix 1 Cycle	tú̱mir-a	tú̱mir-a	tú̱mir-a
	Desinence Suffix 2 Cycle	tú̱mira-a	tú̱mira-a	tú̱mira-a
	Grammatical **H**, 1st cycle	tú̱m**ì**raa	tú̱m**ì**raa	tú̱m**ì**raa
	Grammatical **H**, 2nd cycle	tú̱m**ì**ra**á**	tú̱m**ì**ra**á**	tú̱m**ì**ra**á**
	Stratum-final evaluation	tú̱m**ì**ra**á**	tú̱m**ì**ra**á**	tú̱m**ì**ra**á**
	Macrostem Level (H Doubling)	/tú̱m**ì**ra**á**/	/tú̱m**ì**ra**á**/	tú̱m**ì**ra**á**
	Object marker cycle	(OM not added)	(OM not added)	mú̱-tú̱m**ì**r**áá**
	Stratum-final evaluation	tú̱m**ì**r**áá**	tú̱m**ì**r**áá**	mú̱-tú̱m**ì**r**áá**
	Verbal Unit Level	/tú̱m**ì**r**áá**/	/tú̱m**ì**r**áá**/	/mú̱-tú̱m**ì**r**áá**/
	na- cycle	(*na* not added)	na-tú̱m**ì**r**áá**	(*na* not added)
	L cycle	**tù**m**ì**r**áá**	n**à**-tú̱m**ì**r**áá**	(gem. faith)
	TAM cycle	a-**tù**m**ì**r**áá**	a-n**à**-tú̱m**ì**r**áá**	a-mú̱-tú̱m**ì**r**áá**
	SM cycle	tú-a-**tù**m**ì**r**áá**	tú-a-n**à**-tú̱m**ì**r**áá**	tú-a-mú̱-tú̱m**ì**r**áá**
	Stratum-final evaluation	tú-a-**tù**m**ì**r**áá**	tú-a-n**à**-tú̱m**ì**r**áá**	tú-a-mú̱-tú̱m**ì**r**áá**
LP-PLP Watershed		/tú-a-**tù**m**ì**r**áá**/	/tú-a-n**à**-tú̱m**ì**r**áá**/	/tú-a-mú̱-tú̱m**ì**r**áá**/
Fall Conversion (V́ → V̂)		tû-a-**tù**m**ì**r**áâ**	tû-a-n**à**-tû̱m**ì**r**áâ**	tú-a-mú̱-tû̱m**ì**r**áâ**
Postlexical Phonology (PLP)	φ Level	/tû-a-**tù**m**ì**r**áâ**/	/tû-a-n**à**-tû̱m**ì**r**áâ**/	/tú-a-mú̱-tû̱m**ì**r**áâ**/
	Fall Expansion/Leftward Shift	tù-a-**tù**m**í**r**áà**	tù-a-ná̱-tùm**í**r**áà**	tù-á̱-mú̱-tùm**í**r**áà**
	H_{φ} assignment	(blocked)	(blocked)	(blocked)
	ι-level	/tù-a-**tù**m**í**r**áà**/	/tù-a-ná̱-tùm**í**r**áà**/	/tù-á̱-mú̱-tùm**í**r**áà**/
	L_{ι} assignment	tù-a-**tù**m**í**r**áȁ**	tù-a-ná̱-tùm**í**r**áȁ**	tù-á̱-mú̱-tùm**í**r**áȁ**
Near-Surface (no contraction)		[tù-a-**tù**m**í**r**áȁ**]	[tù-a-ná̱-tùm**í**r**áȁ**]	[tù-á̱-mú̱-tùm**í**r**áȁ**]
Surface		[tw-a-**tù**m**í**r**â:**]	[tw-a-ná̱-tùm**í**r**â:**]	[tw-á̱-mú̱-tùm**í**r**â:**]

These derivations, then, provide an initial sketch of how all of the pieces of the analysis of Complex tone work together. Of course, a good deal of detail remains to be filled in, most obviously regarding the constraint rankings which govern the lexical phonology in the Stem, Macrostem, and Verbal Unit strata. This is the task of the sections to follow, where the analysis is fully formalized within Stratal Optimality Theory.

1.6 Moving forward

The remainder of the chapter will develop as follows. In section 2, I clarify the goals of this chapter by distinguishing the *surface* properties of Complex tone, which derive in part from postlexical interactions examined in chapters 2 and 3, from the properties which the *lexical phonology* must derive. I then tackle the latter in sections 3-5, which respectively establish tonal grammars for the Stem, Macrostem, and Verbal Unit strata. In section 6, I briefly summarize the analysis and return the analytical desiderata presented in (13) above, explaining how each are met. In section 7, I review previous analyses of Complex tone, noting both elements of these that I adopt in this analysis (of which there are many) and areas of divergence. Section 8 concludes.

2 Complex tone in Kinande as a synchronically anticipated V2/FV pattern

Before we begin the formal analysis of Complex tone, one point is worth reiterating, since it will help us to know where to start: in the analysis proposed here, the pattern of Complex tone which is observed on the surface is not identical to the tone pattern which is created by the lexical phonology (LP), but reflects instead the additional application of leftward shift within the postlexical Phonology (PLP). This is required by my analysis of leftward shift in Chapter 2: there, I propose that every H tone which emerges from the LP (a) is incorporated into a falling tone at the LP-PLP Watershed and (b) shifts one vowel to left when this falling tone expands in the PLP. This is schematically illustrated with a H-toned infinitive in (18) below.

(18) Leftward Shift as postlexical expansion (schematic illustration)

	Lexical Phonology	**LP-PLP Watershed**	**Postlexical Phonology**
Input	e-ri-tú̲ma	e-ri-tú̲ma	e-ri-tû̲ma
Output	e-ri-tú̲ma	e-ri-tû̲ma	e-rí̲-tùma

To arrive at the output of the lexical phonology, then, we must undo the effects of tone shift, namely (a) the movement of H tones one vowel to the left and (b) the insertion of a L tone on the (rightmost) vowel that the shifted H occupied before shift. By undoing these two effects, we can convert the surface representations in (19a) – repetitions of forms originally seen in (4) – to their LP outputs in (19b).

(19) Verbs with Complex tone (Output of lexical phonology)

a.	*Surface*	H L L tu-**á**-[h**ú**m-ìr-a-à]	H L tu-a-[tum-**í**r-**á**-à]
b.	*End of LP*	H L tu-a-[h**ú**m-**í**r-a-à]	H tu-a-[tum-ir-**á**-**á**]

Generalizing from these forms, we can make the following observations about Complex tone at the end of the lexical phonology, which can be compared with the surface-oriented observations in (3).

(20) Basic Characteristics of Complex tone at the end of the LP

a. Assignment of Grammatical **H** tones

- In *toneless* stems, grammatical **H** tones occur on the *first and second vowels* (V1 and V2), and a grammatical L occurs on the *final vowel* (FV)
- In *H-toned* stems, grammatical **H** tones surface on the stem's *penultimate* and *final vowels* (Pen and FV).

b. Suppression of Lexical H̲ tones

- The lexical H̲ tone of the root is deleted unless the root is immediately preceded by *na-* or an object marker.

From these observations, we are forced to a particular analysis of how grammatical **H** tones are initially assigned: they must be assigned to V2 in toneless stems, and to the FV in H-toned stems. This follows from the chain of reasoning below:

1. In principle, the doubled **H** tones in (19b) could arise in two different ways: they might arise either from an initially-assigned V2/FV tone pattern that undergoes *leftward* **H** tone doubling (21), or through an initially-assigned V1/Penult pattern that undergoes *rightward* **H** tone doubling (22).

(21) V2/FV + Leftward Doubling

a.	*V2/FV*	H L tu-a-[hum-**í**r-an-a-**à**]	**H** tu-a-[tum-ir-an-a-**á**]
b.	*Leftward Doubling*	**H** L tu-a-[h**ú**m-**í**r-an-a-**à**]	**H** tu-a-[tum-ir-an-**á**-**á**]

(22) V1/Penult + Rightward Doubling

a.	*V1/Penult*	**H** L tu-a-[h**ú**m-ir-an-a-**à**]	**H** tu-a-[tum-ir-an-**á**-a]
b.	*Rightward Doubling*	**H** L tu-a-[h**ú**m-**í**r-an-a-**à**]	**H** tu-a-[tum-ir-an-**á**-**á**]

2. However, the "V1/Penult + Rightward Doubling" analysis carries a significant cost. So long as we understand grammatical **H** tone doubling (GTD) as resulting from *leftward* tone spread (21), we can develop a unified analysis both for it and for Object Tone Doubling (OTD), i.e. the doubling of lexical H̱ tones that occurs whenever they surface on object markers (e.g. *e-rí̱-{[tùmira]}* 'to send for' but *e-rí̱-{mú̱-[tùmira]}* 'to send for him'; cf. 1.3.2). This is because OTD clearly involves leftward spread of a lexical H̱ tone initially associated with the verb root (e.g. *e-ri-{mu-[tú̱mira]}* $\rightarrow_{\text{Spread}}$ *e-ri-{mú̱-[tú̱mira]}* $\rightarrow_{\text{Shift}}$ *e-rí̱-{mú̱-[tùmira]}*). On the other hand, if GTD is analyzed as *rightward* tone spread, as in (22), no such unification is possible, since rightward spread produces incorrect results for OTD (e.g. *e-ri-{mu-[túmira]}* $\rightarrow_{\text{Spread}}$ *e-ri-{mu-[tú̱mí̱ra]}* $\rightarrow_{\text{Shift}}$ **e-ri-{mú̱-[tú̱mìra]}*).

3. Thus, in order to maintain a V1/Penult pattern of grammatical **H** tone assignment, we would need to posit a rule of *rightward* spread for grammatical **H** tones, and a rule of *leftward* spread for lexical H̱ tones. This is not only inelegant, but within the stratal analysis adopted here, it would require that we allow lexical and grammatical H tones to be distinguished through diacritic marking well after they are introduced, in contradiction of our goal of reducing tonal typing (and covert reference to previous derivational stages) as much as possible.

I conclude, therefore, that grammatical **H** tones are initially assigned according to a V2/FV pattern. At this point, it is worth revisiting something I mentioned briefly in 1.1. The reason that I refer to the tone pattern under discussion as "Complex tone" is to emphasize the close relationship between it and what Goldsmith (1987) calls the "Complex Stem Tone pattern." In this pattern, found in many languages throughout the Great Lakes region of East Africa[12], grammatical **H** tones appear on the *surface* in variations of the same V2/FV pattern that I have assumed for the early stages of Kinande.

[12] The Great Lakes region is bounded in the east by Lake Victoria and in the west (proceeding from north to south) by Lake Albert, Lake Edward, Lake Kivu, and Lake Tanganyika. These are the approximate borders of the Interlacustrine language group classified as zone J by Meeussen (Bastin 2003).

This pattern is very straightforwardly manifested, for example, in Kihunde (Goldsmith 1985, 1987). Here, verbs that show Complex tone do not show lexical H tone suppression, so the conditioning of grammatical tone placement by lexical tone is surface-transparent.

(23) V2/FV Pattern in Kihunde (phrase-medial position)[13]

```
a.  toneless root            H
                             |
                  tu-na-[som-ér-an-a]        'we read for each other'
b.  H-toned root           H     H
                           |     |
                  tu-na-[tem-er-an-á]        'we cut for each other'
```

We also see this pattern in Haya (Hyman and Byarushengo 1984), but here it surfaces somewhat differently. Here verbs with Complex tone always show lexical H tone suppression, resulting in the systematically opaque conditioning of grammatical H assignment seen in (24).

(24) V2/FV Pattern in Haya, w/ Lexical H Tone Suppression (phrase-medial)[14]

```
a.  toneless root          H
                           |
                  ba-Ø-[jun-íle]             'they helped'
b.  H-toned root             H
                             |
                  ba-Ø-[kom-ilé]             'they tied up'
```

To illustrate one final variation on this theme, we also see Complex tone in Luganda. (Hyman 1982; Hyman and Katamba 1993). Here, Complex tone occurs in conjunction with

[13] H tones in Kihunde shift one vowel to the left in phrase-final position, so the citation form of (23b) would be *tu-na-[tém-er-án-a]*. Interestingly, Kihunde also shows a process of Bounded Plateauing, whereby a HLH sequence becomes HHH, but this process is counterfed by leftward shift (Goldsmith 1985).

[14] As in Kihunde, phrase-final H tones in Haya shift one vowel to the left. In addition, penultimate H tones within the phrase become falls. The citation forms of (24a) and (24b), then, are *ba-jun-île* and *ba-kom-île*, respectively.

unbounded High Tone Plateauing, so that when a grammatical **H** tone is assigned to the FV of a stem with a H-toned root, we see a H tone span from the root's first vowel to the FV (25b).

(25) V2/FV Pattern in Luganda, w/ Long-distance High Tone Plateauing

a.	toneless root	**H** L **L** a-Ø-[tul**ú**mùl-à]	'he who enrages'
b.	H-toned root	<u>H</u> **H** L a-Ø-[k<u>ó</u>lókót-**â**][15]	'he who scrapes'

Within this context, it is easy to see that Complex tone in Kinande descends from a historical V2/FV pattern that has given rise to a number of different variants in different languages. In the analysis proposed here, its history is recapitulated by its synchronic derivation, with its conservative elements (e.g. the initial V2/FV pattern) preserved in its lexical phonology while its most innovative elements (e.g. tone shift) occur postlexically.

We now have a number of landmarks to guide the analysis of Complex tone. We know (a) that it begins with the assignment of grammatical **H** tones in a V2/FV pattern, (b) that by the end of the lexical phonology these grammatical **H** tones have doubled while lexical <u>H</u> tones may (depending on the pre-root morphology) have been suppressed, and (c) that postlexically, all lexical and grammatical high tones shift to the left. This is shown

[15] According to the analysis of Hyman and Katamba (1993), the final fall of this form reflects the fact that grammatical tone assignment involves a HL tone complex rather a simple H tone. While a detailed analysis of Luganda is beyond the scope of the present work, I suggest that the falling tone in Luganda actually arises from the same Fall Conversion process active in Kinande. In Luganda, H tones originating from the lexical phonology are systematically followed by L tones just as they are in Kinande. The main difference between Kinande and Luganda appears to be that in Kinande, intermediate falling tones are resolved via *leftward* expansion while in Luganda, they are resolved via *rightward* expansion or, if in final position, simply tolerated.

schematically in (26). (Here, I ignore the details of the stratal morphological analysis, and show all morphemes at all stages of derivation.)

(26) Main landmarks in the derivation of Complex tone

a.	*Input*	tu-a-[hum-ir-a-a]	H tu-a-[túm-ir-a-a]
b.	*Complex Tone Assignment*	H L tu-a-[hum-ír-a-à]	H L H tu-a-[túm-ìr-a-**á**]
c.	*Output of LP*	H L tu-a-[húm-ír-a-à]	H tu-a-[tum-ir-**á**-**á**]
d.	*Output of PLP (Near-Surface)*	H L L tu-**á**-[húm-ìr-a-à]	H L tu-a-[tum-ír-**á**-à]

Since the postlexical phonology has already been developed in chapter 3, we will here focus on the lexical phonology, whose organization is summarized in (27). Here, I show each of the three strata of the lexical phonology, the processes that take place within them, and the justification for locating particular processes within particular strata.

(27) Organization of lexical phonology

Stratum	Processes	Justification
Stem	Lexical Tone Association Grammatical Tone Association	Make reference to stem's left and right edges
Macrostem	Tone Doubling	Bound within Macrostem
Verbal Unit	Lexical Tone Suppression	Involves inflectional prefix

We now turn to the formal analysis of each of these strata in sections 3-5 below.

3 Stem stratum

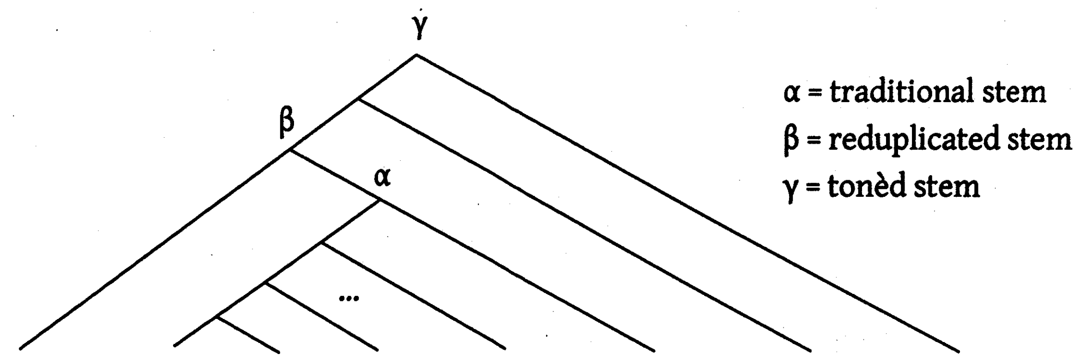
3.1 Morphological overview

Within the Stem stratum, up to five different types of morphemes are evaluated: *roots*, *extension suffixes* (or just *extensions*), stem-final *desinence suffixes*, *reduplicants*, and *tonal morphs*. These are briefly described below.

ROOT:	The root expresses the core meaning of the verb. At minimum, it must always combine with a DESINENCE.
EXTENSION:	Extension suffixes usually modify valence (e.g. causative *(-is)-i̧*, applicative *-ir*, reciprocal *-an*, passive *-u*, stative *-ik*), but may also affect meaning in some other way (e.g. reversive *-uk/-ukal/-ul*, purposive *-irir*, iterative *-ang*).
DESINENCE:	In conjunction with inflectional prefixes, the desinence helps to express verb's tense, aspect, and mood. The most common desinence consists of a single morpheme (*-a*), but all the others consist of a bimorphemic sequence (*-a-a*, *-a-e*, or *-i̧r-e*).
REDUPLICANT:	The reduplicant is a disyllabic prefix which copies as much contiguous morphological material as it can from the stem. Its presence expresses that an action is either repeated, hurried, or performed haphazardly.
TONAL MORPH: = TONE	Tonal morphs are exponents of clause type. I assume that they originate quite high within the syntactic structure of a clause, but appear as suffixes to the stem as a consequence of morphological lowering. When realized, these morphs are attracted to specific vowels within the stem, namely its second vowel (V2) and its final vowel (FV).

I assume that these morphemes – of which only the root and the desinence are required in all stems – are organized within the Stem as in (28). Here, we see both an abstract representation of the Stem and an illustrative form containing all possible morpheme types: a toneless reduplicated verb stem that is assigned Complex tone. Below each morpheme of this example form, I indicate the order in which it is evaluated.

(28) Morphological organization of the Stem (*huma-humiraa* 'hit for hurriedly')



[[REDUPLICANT	[ROOT	EXT 1	EXT *n*	DES 1	DES 2 $]_\alpha$ $]_\beta$	TONE 1	TONE 2 $]_\gamma$
huma	*hum*	*ir*	...	*a*	*a*	H	H
5	1	2		3	4	6	7

Different parts of this structure are motivated in different ways. Below α – the constituent that is typically identified as the "Stem" in Bantu literature – I simply assume that the linear order of the morphemes accurately reflects their final morphological constituency.[16] Below β (the reduplicated stem), evidence that the reduplicant combines with α comes from the fact that α is its phonological base: RED may copy material within α, but not material outside of it. Finally, below γ (the tonèd stem), the evidence that tonal morphs combine with β is that this is the domain in which these tones are realized: when grammatical H tones are assigned according to the V2/FV pattern, V2 is counted from the left edge of β while FV marks its right edge. This is shown (29) below, where we see surface representations of a form containing the reduplicated stem in (28), as well a form that is morphologically identical except that it contains a H-toned root.

[16] Here, I am ignoring cases in which the ordering of extension suffixes runs counter to their semantic scope (cf. Hyman 2003a).

(29) Grammatical **H** Assignment applies within reduplicated stem (=β)

a.	*toneless stem*	**H** L tu-**á**-[h**ú**ma-hum-ir-a-à]	'we hit for again and again (recently)'
b.	*H-tone stem*	**H** L tu-a-[tuma-tum-**í**r-**á**-à]	'we sent for again and again (recently)'

Within the cyclic evaluation of the morphological structure just motivated, two major facts concerning tone must be derived. One, of course, is the V2/FV pattern of grammatical **H** tone assignment that we have focused on up until now. Before addressing this, however, we must account for an important generalization concerning *lexical* tone: while verb roots may be either toneless or H-toned, roots that are H-toned contrast neither in how many underlying H̲ tones they have nor in where their underlying H̲ tones appear on the surface. No matter how long a verb root is, it can bear at most one underlying H̲ tone, which always surfaces on the first vowel before the root. This is seen, for example, in the infinitive forms in (30).

(30) Root size has no influence on the number of lexical Hs or where they are realized

a. e-rí̱-[tùm-a] 'to send'
b. e-rí̱-[gʉ̀lɨng-a] 'to round'
c. e-rí-[kʉ̀rʉgʉt-a] 'to scrub'

In 3.1, I propose that this distributional restriction arises from a Stem-level grammar in which noninitial H tones are heavily penalized, so that inputs with noninitial H tones are systematically repaired either through tone movement or tone deletion. As the Stem-level grammar applies cyclically to each new stem-internal constituent, it enforces the restriction anew with each cycle.

In 3.2, I then show how the V2/FV pattern of grammatical **H** tone assignment fits within this grammar. I argue first that grammatical **H** tones are diacritically marked as attracted to these positions (an admitted but necessary departure from the goal of removing tonal diacritics from the phonology), and they are able to survive in them (despite the general prohibition against noninitial H tones) thanks to highly-ranked faithfulness constraints which come into play because grammatical **H** are not just features but entire morphs. I then show how the V2/FV pattern arises from the assignment of **H** tones to both V2 *and* FV, followed by systematic lowering of the second **H** (the one on FV) in toneless stems and lowering of the first **H** (i.e. the one on V2) in H-toned stems. In 3.3, evidence for this analysis, as opposed to one in which a single **H** is assigned to V2 *or* FV, is presented first from forms that show a "V2" pattern of grammatical tone assignment, and second from forms showing Spurious H tones.

3.2 Lexical tone association

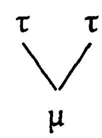
We saw in (30) above that in *surface* forms, lexical H̲ tones always appear on the first vowel *before* the verb root, assuming they are not suppressed due to Complex tone. Therefore, we can infer that at the end of the lexical phonology, they appear on the first vowel *of* the verb root. Under the standard assumption of Richness of the Base (Prince and Smolensky 1993/2004), this distributional fact cannot derive solely from the underlying representations of verb roots, but must arise as a consequence of the grammar. I assume that it arises as a consequence of the *Stem*-level grammar, which prohibits noninitial H tones (other than grammatical tones, on which see 3.3) throughout the cyclic evaluation of the stem. If noninitial H tones occur in the input, they are moved to V1 if possible, and otherwise deleted.

We can readily capture this analysis with positional markedness: H tones are banned in noninitial position, due to a ranking of ANCHOR-H (31a) above MAX-H (31b) and LINEARITY(V,H)

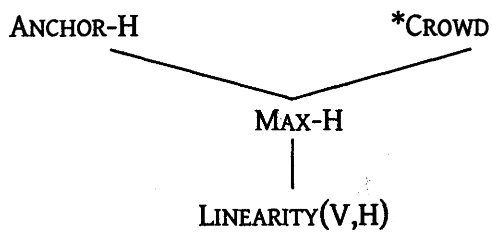
(31c). I assume, non-crucially, that LINEARITY(V,H) is ranked below MAX-H, so that deletion will occur only if shift to V1 is impossible. This is the case whenever leftward shift would result in two tones on V1, in violation of undominated *CROWD (31d). This produces the ranking in (32).

(31) Constraints involved in limiting H to V1

a.	ANCHOR(H,L,Stem,L) = ANCHOR-H	H tones should be associated with the first vowel of the stem. One violation is assigned for each H tone that is not.
b.	MAX-H	Each input H tone should have an output correspondent.
c.	LINEARITY(V,H)	If an input high tone H and an input vowel V have the output correspondents H′ and V′, then if V < H then V′ < H′.
d.	*CROWD	Violated once for each instance of the structure



(32) Stem-level ranking for restricting H̲ to V1 (initial)



In (33)-(36), we see how this ranking ensures that H-toned roots will always surface with a single H tone on the root-initial vowel, regardless of where it occurs in the input. First, in (33), we see that if a H̲ tone starts on a noninitial root vowel, it will shift to V1 rather than stay in its input position (33b) or delete (33c).

(33) Shift of noninitial H tone onto V1

	H | /badupíl/	*CROWD	ANCHOR-H	MAX-H	LINEARITY(V,H)
a.	☞ H | bádupil				**
b.	H | badupíl		*! W		L
c.	badupil			*! W	L

In (34), we see that ANCHOR-H will also cause a H tone that is floating in the input to associate to V1.

(34) Linking of input floating H

	H /badupil/	*CROWD	ANCHOR-H	MAX-H	LINEARITY(V,H)
a.	☞ H | bádupil				
b.	H badupil		*! W		

In (35), we see how a noninitial H tone is deleted if V1 is already occupied by another tone. It cannot surface in its input position due to ANCHOR-H (35b), and cannot shift to V1 due to *CROWD (35c).

(35) Deletion of H̲ to ensure only one H tone per root

	Input / candidates	*Crowd	Anchor-H	Max-H	Linearity(V,H)
	H̲ H̲ | | /bá̲dupí̲l/				
a.	☞ H̲ | bá̲dupil			*	
b.	H_1 H_2 | | bá̲dupí̲l		*! W	L	
c.	H_1 H_2 \/ bá̲̋dupil	*! W		L	** W

Finally, in (36), we see the evaluation of an input which contains multiple H tones when none of these are associated to V1. In forms such as these, one H tone will shift to V1, while the others delete. I assume that it is the leftmost tone which shifts, since shift of any other H will incur more Linearity(V,H) violations (36c).

(36) Deletion and shift in service of Anchor-H

	Input / candidates	*Crowd	Anchor-H	Max-H	Linearity(V,H)
	H_1 H_2 | | /badú̲pí̲l/				
a.	☞ H_1 | bá̲dupil			*	*
b.	H_1 H_2 | | badú̲pí̲l		*!* W	L	L
c.	H_2 | bá̲dupil			*	**! W

We see, then, that the ranking in (32) guarantees that at the end of the root cycle, all inputs roots with any number of input H̲ tones (positioned anywhere) will have a single H̲ tone on the first vowel of the root. It should also be obvious that input roots that are toneless will still be toneless at the end of the root cycle: since none of the constraints posited demand the presence of a H tone, insertion of a H tone would gratuitously violate Dep-H. We have therefore successfully derived the fact that roots contrast only in whether or not they bear a H̲ tone on their initial vowel.

We can now consider how our analysis handles the evaluation of extension suffixes and desinences. In its present state, our analysis predicts that if any of these morphemes were to bear an underlying H̲ tone, it would survive and shift leftwards onto V1. This would produce a system where the contrast between toneless roots and H-toned roots would be neutralized, in favor of H-toned roots, upon the addition of certain suffixes but not others. For example, the imaginary H-toned extension suffix *-*ím* would cause the tonal neutralization of roots that are, in other stems, tonally distinct:

(37) Partial stem paradigms with -*hum*- 'hit' and -*túm*- 'send'

a.	no extension suffix	*hum-a*	*tú̲m-a*
b.	reciprocal -*an*	*hum-an-a*	*tú̲m-an-a*
c.	applicative -*ir*	*hum-ir-a*	*tú̲m-ir-a*
d.	mystery extension *-*ím*	*hú̲m-im-a*	*tú̲m-im-a*

In fact, we never see this: desinences and extension suffixes are always underlyingly toneless, never contributing a H tone anywhere within the verb stem. I assume that this is due to a requirement at the Stem level that if a H tone is introduced as part of a morpheme, it must associate to segmental material belonging to that morpheme. This "dance with the one that brung you" principle is enforced by *STRAY (38). Ranked above MAX-H, it ensures that any H tone introduced by a suffix will delete rather than shift to V1. This is illustrated in (39).

(38) *STRAY A H introduced within morpheme M must associate with segmental material within M.

(39) A H tone from a suffix cannot shift onto toneless V1

	H | /badupil-ím/	ANCHOR-H	*STRAY	MAX-H	LINEARITY(V,H)
a.	☞ badupil-im			*	
b.	H | badupil-ím	*! W			
c.	H | bádupil-im		*! W	L	* W

Since the same interaction will apply with a H-toned desinence, we have now derived the fact that up until the evaluation of α in (28), any H tone within the stem is confined to the stem-initial vowel, and that this H tone must originate from the root. With that established, we can now examine how the current analysis treats tone in reduplication, introduced in β.

A full study discussion of reduplication lies well outside of this chapter's current scope; at a very simplified level, we can say that in verbal reduplication, the verb root and the final vowel -*a* are copied into a disyllabic reduplicant which occurs to the left of the main stem.[17]

[17] This statement accurately describes the vast majority of cases, but leaves out many significant variations. For more on the details of Kinande reduplication, see Mutaka and Hyman (1990), Mutaka (1994) and Downing (2000).

This, of course, leads to two copies of the root. Crucially, however, it does *not* lead to two copies of a root's lexical H̲ tone. Consider, for example, the surface forms of infinitives with reduplicated H-toned stems. Here, lexical H̲ tones surface only on the first vowel before the reduplicant, and not on the first vowel before the main verb root.

(40) Surface tone patterns of reduplicated stems (φ-medial – no boundary tones)

	Non-reduplicated	Reduplicated	Gloss
a.	e-ri-[hum-a]	e-ri-[*huma*-huma]	'to hit (again and again)'
b.	e-ri-[hum-ir-a]	e-ri-[*huma*-humira]	'to hit for (again and again)'
c.	e-rí̲-[tùm-a]	e-rí̲-[*tùma*-tuma]	'to send (again and again)'
d.	e-rí̲-[tùm-ir-a]	e-rí̲-[*tùma*-tumira]	'to send for (again and again)'

By undoing the postlexical effects of leftward H tone shift and L tone insertion (via Fall Conversion), we can infer that the outputs of reduplication within the lexical phonology are as in (41). Here, reduplicated verb stems with H-toned roots show a single lexical H̲ tone on the first vowel of the reduplicant, rather than one H̲ tone on the reduplicant and another on the main verb root (from which it copies its segmental material).

(41) Reduplicated stems at the end of the lexical phonology

	Non-reduplicated	Reduplicated	
a.	[hum-a]	[*huma*-huma]	
b.	[hum-ir-a]	[*huma*-humira]	
c.	[tú̲m-a]	[*tú̲ma*-tuma]	*[tú̲ma-túma]
d.	[tú̲m-ir-a]	[*tú̲ma*-tumira]	*[tú̲ma-tú̲mira]

Within the standard theory of Base-Reduplicant correspondence developed by McCarthy and Prince (1995, 1999), this result is rather unexpected. It appears that a copy of the root H tone survives in the reduplicant even when its base correspondent – which should license it via Base-to-Reduplicant MAX – is deleted. However, we can make sense of this if we assume that the lexical H tone on V1 is not a *copy* of the root tone, but instead the *original* tone which has shifted to V1 of the reduplicated stem. Given the rankings established above, this requires only that we rank ANCHOR-H and MAX-H above DEPBR-H (42), which is violated when H tones appear in the reduplicant but not the Base.

(42) DEPBR-H A H tone in RED should have a correspondent in the Base

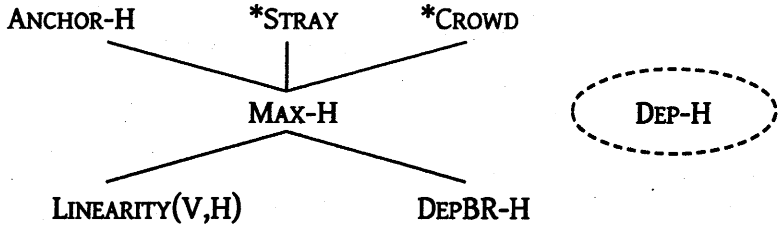
(43) Movement of H from Base to RED

	H | RED-túma	*STRAY	ANCHOR-H	MAX-H	DEPBR-H
a.	☞ H | túma-tuma				*
b.	H H | | túma-tuma		*! W		L
c.	tuma-tuma			*! W	L

Note that I assume that the winning candidate of this competition (43a) does not violate *STRAY, and that this is crucial to its success. The reason for this is cyclic amnesia: after a tone is linked to a vowel in the evaluation in which it is introduced, its morphological affiliation is lost. Thus, *STRAY will never block the movement of tones which are linked to morphologically old segmental material in the input.

This leads us to the ranking in (44), which accounts for the distribution of H tones within stems up to the evaluation of β. Here, constraints that are not crucially ranked relative to any others are enclosed in dotted lines.

(44) Stem-level ranking for restricting H to V1 (revised)



Note that in any normal stem-level derivation (i.e. one that evaluates native roots and suffixes), these rankings will not cause any changes to the underlying representation unless the stem is reduplicated. This is because, due to the effects of Lexicon Optimization (Prince and Smolensky 1993/2004) acting over Stem-level representations, the distributions enforced at the stem level will be respected by underlying representations as well. All H-toned roots will underlyingly contain a single H tone on V1, since a tone anywhere else would achieve the same surface result with more violations of faithfulness. Similarly, suffixes will always be underlyingly toneless, since if they had a tone it would always be deleted without a trace. Thus, except in the case where a H-toned stem is reduplicated (which requires a movement of H from V1 of α to V1 of β), the tonal derivation of β will always be remarkably boring, consisting simply of the concatenation of pre-existing and newly evaluated material. This changes with the introduction of grammatical **H** tones.

3.3 Grammatical **H** association

As discussed in 3.1, I propose that grammatical **H** tones are introduced into the stem via two **H** tone morphs which combine with either α or β, depending on whether or not the stem is reduplicated (cf. (28)). Following the diachronic explanation of the origins of the Complex tone pattern posited by Goldsmith (1987), I assume that each of these suffixes is a separate morpheme. Each is therefore evaluated within its own cycle, with the first assigned to V2 and the second to FV. Crucially, as a **H** tone is assigned, it lowers to **L** if it is preceded by another high tone (H̲ or **H**) on the tonal tier. As shown in (45), this lowering always affects one of the two **H** tones.[18] As a result, it looks as if grammatical **H** tones are assigned *either* to V2 *or* to FV, even though they are actually assigned to both.

(45) Derivation of assumed outputs in style of Goldsmith (1987)

a.	toneless stems	humiraa + **H**	→ humíraa	(1st cycle: **H** on V2)
		humíraa + **H**	→ humíraà	(2nd cycle: **H** → **L** on FV)
b.	H-toned stems	tú̲miraa + **H**	→ tú̲mìraa	(1st cycle: **H** → **L** on V2)
		tú̲mìraa + **H**	→ tú̲mìraá	(2nd cycle: **H** on FV)

This analysis synchronically re-enacts the historical origins of Complex tone posited by Goldsmith (1987): he suggests that the Complex "V2/FV" tone pattern originated when an earlier "V2" tone pattern – in which a single **H** tone suffix was consistently assigned to V2 – was augmented with another **H** tone suffix attracted to FV. In section 3.4, I discuss the motivations for pursuing this approach, rather than one in which a single **H** tone is assigned either to V2 or the FV. First, however, I show how the proposed analysis works within OT.

3.3.1 Implementation: basic cases

We have just seen in 3.1 that within the stem stratum, most high tones are restricted to V1, due to ANCHOR-H. Additional constraints, therefore, are needed to account for the behavior of grammatical **H** tones, which are systematically attracted to V2 and FV.

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[18] The one exception concerns toneless H-toned stems with only two vowels. These are too short to assign two grammatical **H** tones, so lowering is never triggered. (H-toned stems with only two vowels also assign only one **H** tone, but this **H** tone is lowered due to the preceding lexical H̲ tone on V1.)

First, we need specialized markedness constraints that attract these tones, but not other tones, to V2 and FV. I propose the constraints in (46), which are crucially sensitive to a diacritic mark specific to grammatical **H** tones.

(46) Tones responsible for assigning V2/FV pattern

a. $\mathbf{T_G} \rightarrow$ V2 — A grammatical tone should be associated with V2

b. $\mathbf{T_G} \rightarrow$ FV — A grammatical tone should be associated with FV

By ranking these diacritic-sensitive constraints above ANCHOR-H, we ensure that grammatical **H** tones are attracted to V2 and FV without causing lexical H̲ tones to be drawn to them as well. Below, we see this effect with T_G→V2. In (47), the *grammatical* **H** surfaces on V2 even though it violates ANCHOR-H in this position because if it were to surface on V1, it would violate higher-ranking T_G→V2. In (48), however, the *lexical* H̲ tone continues to be assigned to V1. Since it is not a grammatical H tone, surfacing on V1 does not violate T_G→V2, so occurring on V2 would violate ANCHOR-H gratuitously.

(47) If T_G→V2 » ANCHOR-H, Grammatical **H** is attracted to V2

	humiraa **H**	$T_G \rightarrow$ V2	ANCHOR-H
a.	☞ humíraa		*
b.	húmiraa	*! W	 L

(48) No problems with lexical tone if diacritically-sensitive assignment of grammatical tone

	/badú̲pil/	$T_G \rightarrow$ V2	ANCHOR-H
a.	☞ bá̲dupil		
b.	badú̲pil		*!

In addition to the markedness constraints posited above, we also need new faithfulness constraints if grammatical **H** tones are to surface on V2 and FV. Since ANCHOR-H dominates

Max-H, our current constraint ranking predicts that grammatical **H** tones will avoid violating $T_G \rightarrow V2$ or $T_G \rightarrow FV$ not by surfacing on V2 or FV but instead by simply deleting.

(49) Grammatical **H** tones satisfy $T_G \rightarrow V2$ through deletion

	humiraa **H**	$T_G \rightarrow V2$	Anchor-H	Max-H
a.	☞ humíraa		*	
b.	húmiraa	*!		
c.	💣 humiraa			*

To avoid this outcome, we must introduce some high-ranking faithfulness constraint that specifically protects grammatical **H** tones from deletion, and rank it above Anchor-H.

One option open to us, of course, is to simply stipulate that grammatical **H** tones are subject to a specific faithfulness constraint like Max-H_G. However, a more principled option is available to us: to tie the unique durability of grammatical **H** tones to their unique morphological status. Unlike lexical $\underline{H}$ tones, grammatical **H** tones are morphs in their own right, so that deleting them will incur a violation of Realize-Morph (50: Samek-Lodovici 1996; Kurisu 2001). Thus, by ranking Realize-Morph above Anchor-H, we ensure that noninitial grammatical **H** tones will not be deleted. This is shown in the tableau in (51).

(50) Realize-Morph — A morpheme must have some overt exponent.

(51) Realize-Morph allows grammatical **H** tones to surface on noninitial vowels

	hum-ir-a-a **H**	Realize-Morph	$T_G \rightarrow V2$	Anchor-H	Max-H
a.	☞ humíraa			*	
b.	humiraa	*!			*
c.	húmiraa		*!		

Here, a potential question arises concerning the potency of Realize-Morph. Previously, in discussing why *Stray does not cause lexical $\underline{H}$ tones in reduplicated stems to delete rather than shift to V1 of RED, I posited that information about the morphological affiliation of tones is lost at the end of the cycle in which they are introduced. If this is true, then REALIZE-MORPH can only protect a grammatical **H** tone for one cycle. Nevertheless, every grammatical **H** tone survives at least one cycle after it is initially assigned: the first grammatical **H** tone survives the cycle triggered by second, and both grammatical **H** tones survive the stratum-final evaluation. If REALIZE-MORPH is unable to protect them in these cycles, how do they survive?

An important generalization about the operations of the Stem cycle thus far has been that whenever H tones are deleted, they are always deleted in the cycle where they are first introduced. We have not seen any cases where a H tone assigned in one cycle is deleted in a later one. This allows for the possibility that faithfulness constraints might specifically protect material already present in the morphological Base, formalized in (52) as a family of $\mathscr{F}_{BASE}$ constraints. With MAX$_{BASE}$-H is ranked above ANCHOR-H, any grammatical **H** tones licensed by REALIZE-MORPH in one cycle will be permitted to remain in all future cycles. This is shown in (53), which shows a hypothetical input with a **H** tone on V2.[19]

(52) $\mathscr{F}_{BASE}$ For every general faithfulness constraint $\mathscr{F}$, $\mathscr{F}_{BASE}$ is a specific faithfulness constraint which only seeks to preserve correspondence relations involving phonological material within the morphological base.

(53) MAX$_{BASE}$-H protects grammatical **H** tones from deletion after their first evaluation

		humá̱	REALIZE-MORPH	MAX$_{BASE}$-H	$T_G \rightarrow$ V2	ANCHOR-H	MAX-H
a.	☞	humá̱				*	
b.		huma		*! W		 L	* W
c.		hú̱ma			*! W	 L	

[19] As we will see in 3.3.2, this tableau could represent the stratum-final evaluation of a toneless 2-vowel stem.

In addition, note that in order for a grammatical **H** tone to remain on V2 or FV in cycles after it is first assigned, it must retain the diacritic mark that attracts it to these positions. Otherwise, T_G→V2 would not be able to assign a violation to (53c) above, in which the grammatical **H** has shifted to V1 to satisfy ANCHOR-H, and this candidate would incorrectly emerge as the winner. Thus, though information about morphological structure is erased at the end of each cycle, diacritics on individual morphemes (here, H tones) are not.

Finally, note that ANCHOR-H could be satisfied without violating REALIZE-MORPH or T_G→V2 if **H** were assigned to V2 as a **L** tone. This would violate only IDENT-[hi], which is penalized whenever tones change from **H** to **L** or from **L** to **H**. (I am here assuming very minimal tonal representations, in which H tones are [+hi] while L tones are [-hi].)

(54) IDENT-[hi] — If an input tone T corresponds to an output tone T′, then if T is [αhi] then T′ must also be [αhi].

Since this option is not taken, we must infer that ANCHOR-H is dominated by IDENT-[hi] as well; this is shown in (55).

(55) IDENT-[hi] » ANCHOR-H

	hum-ir-a-a **H**	REALIZE-MORPH	IDENT-[hi]	T_G → V2	ANCHOR-H	MAX-H
a.	☞ humíraa				*	
b.	humìraa		*! W		L	

Now that we have in place the rankings that allow grammatical **H** tones to survive (as H tones) on V2 and FV, let us proceed through the assignment of grammatical **H** tones to an actual verb stem, the toneless 4-vowel stem [*hum-ir-a-a*]. As discussed above, each of these **H** tones is evaluated and thereby placed within the verb stem within its own cycle. In the first cycle, which occurs immediately after the construction of either the traditional stem (α in (28)) or the reduplicated stem (β in (28)), the first **H** tone must be attracted to V2 rather than FV in order for subsequent tone lowering to work correctly. To ensure this result, we can rank $T_G \rightarrow V2$ above $T_G \rightarrow FV$.[20] Moreover, to ensure that we do not satisfy $T_G \rightarrow V2$ and $T_G \rightarrow FV$ simultaneously by either (a) failing to realize the **H** tone at all (and so satisfying the constraints vacuously) or (b) realizing the **H** tone on both V2 and FV (as well as all vowels in between)[21], we must rank $T_G \rightarrow FV$ below both REALIZE-MORPH and *LONGT (56: Yip 2002). These rankings are demonstrated in (57), where we see first **H** tone cycle for the stem [*hum-ir-a-a*].

(56) *LONGT   A tone may not be associated with more than one vowel.

(57) Assignment of initial **H** morph

	H humiraa	*LONGT	REALIZE-MORPH	$T_G \rightarrow V2$	$T_G \rightarrow FV$	ANCHOR-H	MAX-H
a.	☞ H | humíraa				*	*	
b.	H | humiraá			*! W	L	* ~	
d.	humiraa		*! W		L	L	* W
e.	H /| humíráá	*! W			L	*** W	

[20]Alternatively, we could mark each suffix with its own diacritic so that each is attracted to its own separate position, but I prefer to keep the use of diacritic features to an absolute minimum.

[21] Following Ni Choisain and Padgett (1997) and Archangeli and Pulleyblank (2002), I assume that "gapped" representations in which **H** is linked only to V2 and FV, and not intervening vowels, are not produced by GEN.

We now proceed to next cycle, where the second suffixal **H** tone is evaluated. As discussed above, this tone is changed to L as soon as it is assigned, due to the preceding **H** tone on V2. We will address this change momentarily. First, however, let us establish why the resulting **L** tone ends up on the FV. First, the fact that it does not occur together with the first **H** on V2 reveals that $T_G \rightarrow V2$ is dominated by *CROWD (58b). Second, the fact that it does not replace the initial **H** tone on V2 reveals that $T_G \rightarrow V2$ is also dominated by MAX_{BASE}-H (58c). Third, the fact that the new tone is assigned at all, despite the fact that it incurs a violation of $T_G \rightarrow V2$, shows that $T_G \rightarrow V2$ is dominated by REALIZE-MORPH (58d). Fourth, the fact that the second **H** surfaces on FV instead of some other, non-V2 vowel (e.g. the penult) is derived simply from the presence of $T_G \rightarrow FV$ (58e) within the constraint set.

(58) Second grammatical **H** tone is assigned to FV

	Input: H_1 H_2 (│ H_1) humíraa	*CROWD	MAX_{BASE}-H	REALIZE-MORPH	*LONGT	$T_G \rightarrow V2$	$T_G \rightarrow FV$
a.	☞ H_1 L_2 (│ │) humíraà					*	*
b.	H_1 L_2 (both linked to í) humîraa	*! W				L	** W
c.	H_2 (│) humíraa		*! W				* ~
d.	H_1 (│) humíraa			*! W		L	* ~
e.	H_1L_2 (│ │) humíràa					* ~	**! W

With the fact that **L** surfaces on the final vowel thus derived, we can now address its lowering from underlying **H**. I assume that this is motivated by the OCP constraint in (59), which forbids adjacent H tones on the tonal tier.

(59) OCP-H[TONALTIER] (=OCP) Adjacent high tones on the tonal tier are forbidden

Since OCP is satisfied through lowering from **H** to **L** rather than through deletion, we can infer that IDENT-[hi] is outranked not just by the OCP (60b), but also by REALIZE-MORPH, which is violated by deletion of the second grammatical **H** (60c), and MAX_{BASE}-H, which is violated by deletion of the first grammatical **H** (60d).

(60) Assignment of second **H** morph

	H_1 H_2 humíraa	OCP	REALIZE-MORPH	MAX_{BASE}-H	$T_G \rightarrow$ V2	$T_G \rightarrow$FV	IDENT-[hi]
a.	☞ H_1 L_2 humíraà				*	*	*
b.	H_1H_2 humíraá	*! W			* ~	* ~	L
c.	H_1 humíraa		*! W		L	* ~	L
d.	H_2 humíraa			*! W	L	* ~	L

In addition, since the OCP is not satisfied by epenthesizing a **L** tone between the two **H** tones, we can infer that IDENT-[hi] is outranked by DEP-L.

(61) **H** lowering preferred to **L** tone epenthesis

	H H | humíraa	DEP-L	IDENT-[hi]
a.	☞ **H L** | | humíraá		*
b.	**HLH** | | | humìràá	*! W	L

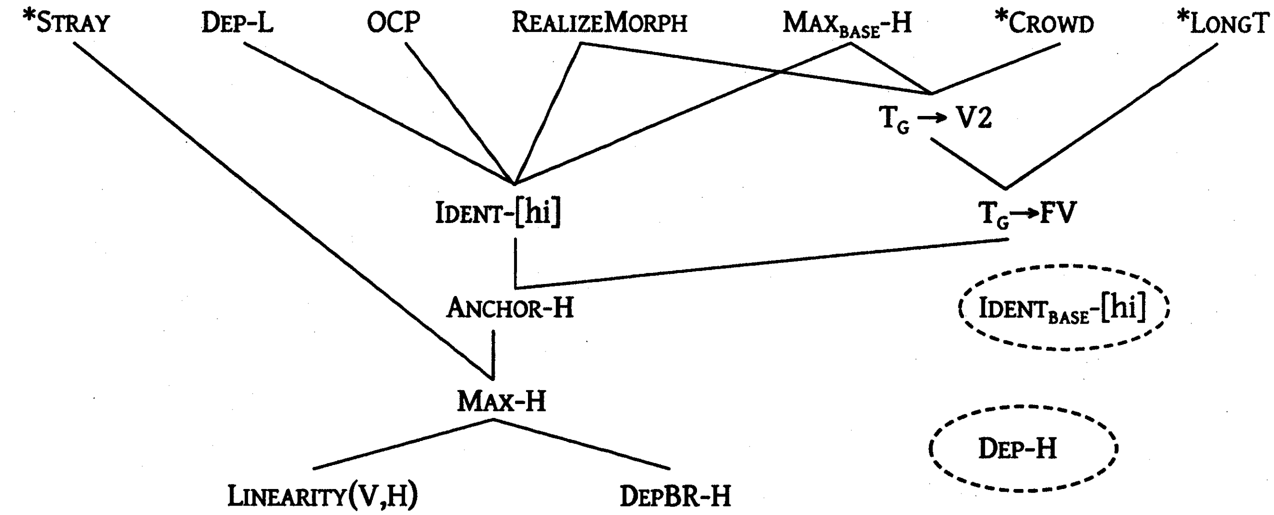
Having now established that lowering from **H** to **L** is the preferred repair for the OCP, we must account for the fact that it is the *second* **H** that lowers rather than the first. For this, I again appeal to $\mathcal{F}_{BASE}$, specifically IDENT$_{BASE}$-[hi]. Including it in the constraint set, regardless of ranking, ensures that newly-assigned H tones will lower in preference to H tones assigned in previous cycles. For convenience, I assume it is undominated.

(62) Cyclic lowering from **H** to **L**

	H H | humíraa	OCP	IDENT$_{BASE}$-[hi]	$T_G \rightarrow$ V2	$T_G \rightarrow$ FV	IDENT-[hi]
a.	☞ **H L** | | humíraà			*	*	*
b.	**L H** | | humìraá		*! W	* ~	* ~	* ~

This leads us to the Stem-level constraint ranking in (63). Here, crucial rankings are established by domination lines, while constraints whose rankings are entirely undetermined are encircled with dotted lines.

(63) Stem-level Constraint Hierarchy



Without only one slight modification, this hierarchy correctly derives the assignment of grammatical **H** tones to H-toned stems. No changes are needed in the first cycle: due to the presence of the lexical H tone on V1, the **H** assigned to V2 lowers to **L** This is preferable to incurring an OCP violation (64b), deleting H (64c), or deleting the newly assigned **H** (64d).

(64) Assignment of first H morph to H-toned stem

	H **H** | túmiraa	OCP	MAX$_{BASE}$-H	REALIZE-MORPH	$T_G \rightarrow$ V2	$T_G \rightarrow$ FV	IDENT-[hi]
a.	☞ H **L** | | túmìraa					*	*
b.	H **H** | | túmíraa	*! W				* ~	L
c.	**H** | tumíraa		*! W			* ~	L
d.	H | túmiraa			*! W			L

In the subsequent cycle, the second **H** tone is assigned to the final vowel without lowering. It cannot be assigned to V2 while the **L** tone is there because this would violate *CROWD (65b), and it cannot vacuously satisfy $T_G \rightarrow$V2 through deletion because this would fatally violate REALIZE-MORPH (65c). It also cannot overwrite the **L** on V2. We currently have no constraint that penalizes this, since all of our MAX-TONE constraints refer to H tones. The easiest way to correct this is simply to generalize MAX_{BASE}-H to MAX_{BASE}-T, which protects both H and L. With that change in place, the new **H** tone cannot overwrite the **L** tone in the base, (65d), and is forced to associate to FV (65a). Finally, note that lowering this **H** to **L** gratuitously violates IDENT-[hi] because it is immediately preceded (on the tonal tier) by a **L** tone (65e).

(65) Assignment of second H morph to H-toned stem

	$\underline{H}$ L_1 H_2 | | túmìraa	*CROWD	MAX_{BASE}-T	OCP	REALIZE-MORPH	$T_G \rightarrow$ V2	$T_G \rightarrow$FV	IDENT-[hi]
a.	☞ $\underline{H}$ L_1 H_2 | | | túmìraá					*	*	
b.	$\underline{H}$ L_1 H_2 | / túmǐraa	*! W				L	** W	
c.	$\underline{H}$ L_1 | | túmìraa				*! W	L	* ~	
d.	$\underline{H}$ L_2 | | túmìraa		*! W			L	* ~	
e.	$\underline{H}$ L_1 L_2 | | | túmìraà					* ~	* ~	*! W

We have now derived the V2/FV pattern of tone assignment for both toneless and H-toned stems with three or more vowels. In the next section, we complete the analysis by considering "short" stems with only two vowels

3.3.2 Complex tone in short stems

Verbs with short (two vowel) toneless stems surface with the same basic tone pattern as verbs with long (three or more vowel) toneless stems: a H tone surfaces on the first vowel of the root and on the first vowel before the root, while a L tone surfaces on the stem-final vowel. However, verbs with H-toned short stems surface very differently: they completely lack grammatical **H** tones within the stem, although they do have a **L** tone on the stem-final vowel which blocks the assignment of H_{φ}. This is seen in (66) below; note that in these forms, lexical <u>H</u> tones are suppressed because the root is immediately preceded by a TAM morpheme (cf. 1.3.2).

(66) Surface representations of short stems

		ι-final: H_{φ}, L_{ι} assigned	φ-final: H_{φ} assigned	φ-medial
a.	*toneless stem*	**H** L_{ι} tu-ang**á**-[h**ú**m-à]	**H** L e-tu-ang**á**-[h**ú**m-à]	**H** L e-tu-ang**á**-[h**ú**m-à]
b.	*H-toned stem*	L_{ι} tu-anga-[tum-à]	L e-tu-anga-[tum-à]	L tu-anga-[tum-à]

By undoing the effects of boundary tone assignment, tone shift, tone doubling and lexical <u>H</u> suppression, we can infer that that the forms in (66) emerge from the Stem stratum as in (67).

(67) 2-vowel stems at end of Stem stratum

a.	*toneless stem*	H | [humá]
b.	*H-toned stem*	H L | | [túmà]

Our current grammar will already predict these forms, so long as we make one small addition: we must assume that if no free vowel is available to host a grammatical **H** tone, it will simply delete. Consider first the evaluation of (67a). In the first cycle, the grammatical **H** will be assigned to V2 of toneless [*huma*], yielding [**humá**]. In the second cycle, the second **H** tone has no place to go. It cannot dock onto the final vowel due to *CROWD, and it cannot overwrite the **H** tone already on V2 since this would violate Max_{BASE}-H. Both of these constraints then, must be ranked above REALIZE-MORPH.[22]

(68) Newly added **H** deletes if there is no free vowel for it

	H_1 H_2 | humá	OCP	*CROWD	MAX_{BASE}-T	REALIZE-MORPH	IDENT-[hi]
a.	☞ H_1 | humá				*	
b.	H_1 L_2 |/ humâ		*! W		L	* W
c.	H_2 | humá			*! W	L	

[22] We actually cannot tell which tone deletes, since both are **H**. I assume the second **H** deletes in keeping with the general observation that faithfulness to newly assigned tones is less than faithfulness to old tones,

In the case of toneless stems, failing to realize the second grammatical **H** tone produces no visible consequences. A **H** tone is still assigned to V2/FV, and in the LP-PLP Watershed, a **L** tone will be placed on V2/FV when this **H** is converted to a falling tone. Assigning just a single **H** to V2, then, will still generate the "**H** on penult and antepenult, L on final vowel" pattern that generally characterizes forms with toneless stems.

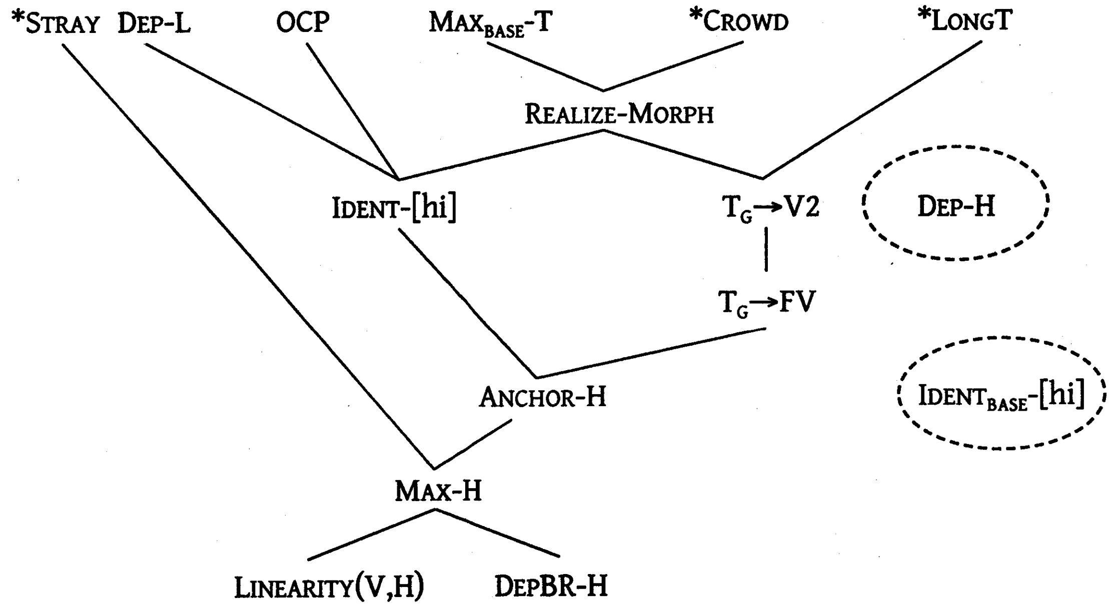
In H-toned stems, however, the consequences of not realizing the second grammatical **H** tone are much more obvious. Since the first **H** is lowered to **L** when it is assigned to V2, failure to assign the second **H** means that no grammatical **H** tone surfaces as **H** within the stem. The only trace of grammatical tone assignment is the lowered **L** tone, which will later block the assignment of H_φ. This is shown in (69) below, where we see how no grammatical **H** is assigned in the second tonal cycle of *tw-anga-*[*tum-à*].

(69) No **H** tone assigned within 2-vowel H-toned stems

	$\underline{\mathbf{H}}$ $\mathbf{L_1}$ $\mathbf{H_2}$ túmà	OCP	*CROWD	MAX$_{BASE}$-T	REALIZE-MORPH	IDENT-[hi]
a.	☞ $\underline{\mathbf{H}}$ $\mathbf{L_1}$ túmà				*	
b.	$\underline{\mathbf{H}}$ $\mathbf{L_1}$ $\mathbf{H_2}$ túmǎ		*! W		L	* W
c.	$\underline{\mathbf{H}}$ $\mathbf{L_2}$ túmà			*! W	L	* W

We now arrive at the final constraint ranking in (70), which derives the correct initial placement of grammatical **H** tones in almost all verb stems. The one category of stems we have yet to account for – those with passive or causative suffixes – are addressed in the next section, where I present evidence in favor of the assumption – central to this analysis – that Complex tone involves the assignment of two separate **H** tones.

(70) Stem-level Constraint Hierarchy



3.4 Evidence for two **H** tones

The formal analysis of grammatical **H** tone assignment developed in 3.3 relied crucially upon the idea that grammatical **H** tone assignment consists in the assignment of *two* grammatical **H** tones, which are assigned to both V2 and FV. However, only one of these **H** tones actually ever surfaces as such. This means that an alternate interpretation of the V2/FV tone pattern – one in fact taken by all previous formal work on Kinande – is that grammatical **H** tone assignment consists in the assignment of a *single* **H** tone, which is assigned to V2 *or* FV. This interpretation has usually coexisted with the view that grammatical **H** tones are initially assigned according to a V1/Penult pattern, rather than the V2/FV pattern crucially assumed here. However, the single **H** hypothesis and V2/FV hypothesis are not inherently incompatible. Consider, for example, the following potential analysis of Complex tone, which is a V2/FV version of the analysis of grammatical **H** tone assignment proposed by Mutaka (1994) and adopted by Black (1995).

(71) Potential V2/FV Analysis with Single **H** tone

a. Stems that are assigned Complex tone have two tonal suffixes: a **H** tone and a **L** tone
b. Both **H** and **L** must associate with either V2 or FV.
c. In toneless stems, **H** associates to V2 and **L** associates with FV
d. In H-toned stems, **H** associates to FV so that it does not immediately follow H; in that case, **L** has nowhere to go and must delete.

This approach is illustrated in (72) for both toneless and H-toned stems. As shown, it generates largely the same stratum-final pattern of tone assignment as the analysis proposed here: toneless stems have a **H** on V2 and a **L** on FV, while H-toned stems have a **H** on FV. One difference is that in (72), no **L** tone is assigned to V2 in H-toned stems. However, since this **L** tone has no obvious surface effect, for all practical purposes the results are identical.

(72) Possible analysis of Complex tone as resulting from the assignment of a **HL** melody

		toneless stem	*H-toned stem*
a.	*α* *(traditional stem)*	[hum-ir-a-a]	H | [túm-ir-a-a]
b.	*H cycle*	H | [hum-ír-a-a]	H H | | [túm-ir-a-á]
c.	*L cycle*	H L | | [hum-ír-a-à]	H H L→Ø | | [túm-ir-a-á]

Since the "one **H**" (1**H**) analysis above generates essentially the same results as the "two **H**" (2**H**) analysis while being somewhat less abstract (in the sense that it does not posit more **H** tones than are seen in any given form) it would seem to have the advantage. However, there are two strong reasons to favor the 2**H** hypothesis. First, it is better able to account for the full range of tone patterns assigned to Kinande verb forms, and not just Complex tone. In particular, it allows us to better understand a rare but productive tone pattern which, for reasons which will become clear below, I will refer to as "V2 tone." Second, it offers the basis of an analysis for verbs that show "Spurious H tones." These two sources of evidence for the 2**H** analysis of Complex tone are discussed in 3.4.1 and 3.4.2, respectively.

3.4.1 V2 Tone

In addition to Complex tone, a second pattern which assigns grammatical **H** tones to verb stems in Kinande is the "V2" pattern, which has the surface properties in (73) below:

(73) Surface characteristics of V2 Tone

a. Assignment of grammatical **H** tones
   - In *toneless* stems, grammatical **H** tones surface on the first vowel of the stem and on the first vowel before the stem (i.e. just as in Complex tone)
   - In *H-toned* stems, no grammatical **H** tones surface at all

b. No suppression of lexical H̲ tones
   - Lexical H̲ tones surface on the first vowel before the stem and, if this vowel belongs to an OM, on the vowel before that as well (i.e. just as in Simple Tone, cf. (1))

c. Blocking of H_φ/Assignment of final **L** tones
   - In both toneless and H-toned stems, a stem-final **L** tone blocks the assignment of H_φ

This pattern is found, to my knowledge, only in deverbal manner nouns and object-marked imperatives. These are shown in (74) and (75) below.[23] Next to them, for comparison, I show morphologically related forms that show Complex tone.

(74) Deverbal manner nouns (V2) vs. Recent Past Forms (Complex)

	V2 Pattern	Complex Pattern
a. toneless root *-hangam-* 'stand up straight'	H L e-m**í**-[h**á**ngam-ir-**è**] AUG-NC.4-[√-APP-DES] 'way of standing straight'	H̲ H L mó-tu-**á**-[h**á**ngam-ɟrè][24] FOC-SM.1P-PAST-[√-DES] 'we stood up straight (recently)'
b. H-toned root *-hákab-* 'smear'	H̲ L e-mí̲-[hakab-ir-**è**] AUG-NC.4-[√-APP-DES] 'way of smearing'	H̲ HL mó-tu-a-[hak**á**b-**ɟrè**] FOC-SM.1P-PAST-[√-DES] 'we smeared (recently)'

(75) Ind. Imper. with object markers (V2) vs. Ind. Imper. without object markers (Complex)

	V2 Pattern	Complex Pattern
a. toneless root *-hum-* 'hit'	H L u-m**ú**-[h**ú**m-a**è**] SM.2S-OM.3S-[√-DES] 'Please hit him.'	H L **ú**-[h**ú**m-a**è**] SM.2S-[√-DES] 'Please hit.'
b. H-toned root *-túm-* 'send'	H̲ L ú̲-mú̲-[tum-a**è**] SM.2S-OM.3S-[√-DES] 'Please send him'	HL u-[t**ú**m-**áè**] SM.2S-[√-DES] 'Please send'

---

[23] In (75), we see indirect imperative/subjunctive forms; they are used for polite requests.

[24] Deverbal manner nouns and Recent Past verbs end in entirely different sets of morphemes, even though their endings are segmentally similar. Deverbal manner nouns end in the applicative suffix *-ir* followed by the desinence *-e*, while Recent Past forms end in the (potentially bimorphemic) desinence *-ɟre*. The difference is seen clearly in forms whose roots end in mid vowels: the applicative suffix harmonizes in height with the root-final mid vowel, while the desinence *-ɟre* does not (*e.g. e-mí-*[*sóm-er-e*] 'way of reading' vs. *mó-tw-á-*[*sóm-ɟrè*] 'we read.')

Since verbs with toneless stems show **H** tones on V1 and V0, while verbs with H-toned stems show only lexical H tones, we can describe the surface tone pattern which results from V2 tone as a "V1+V0/Lex" pattern.

This surface pattern, just like Complex tone's "V1+V0/Penult+Antepenult" surface pattern, is readily identifiable as a doubled and anticipated version of a more widespread tone pattern found in other Lacustrine Bantu languages. Once more, I illustrate with Kihunde (76), Haya (77) and Luganda (78). In these languages, V2 tone assigns a grammatical **H** tone to V2 in toneless stems, but appears to assign no grammatical **H** tones in H-toned stems, and instead allows the stem's lexical tone to surface on V1. (This is true even in Haya, which, as we saw in (24), invariably suppresses H tones in the presence of Complex tone.) In these languages, then, V2 tone creates a "V2/Lex pattern," which is simply Kinande's V2 tone pattern without the effects of leftward doubling and shift.

(76) V2 Tone in Kihunde (Goldsmith 1987)

a.	toneless root	H | a-tu-mu-[som-**e**r-a]	'we are reading for him'
b.	H-toned root	H | a-tu-mu-[tém-er-a]	'we are cutting for him'

(77) V2 Tone in Haya (Hyman and Byarushengo 1984)

a.	toneless root	H | ba-a-[jun-**á**ngan-ag-a]	'we used to help each other'
b.	H-toned root	H | ba-a-[kóm-angan-ag-a]	'we used to help each other'

(78) V2 tone in Luganda (Hyman and Katamba 1993)[25]

a.	toneless root	H L te-bá-kí-[túlúmulà]	'they do not enrage it (cl. 7)'
b.	H-toned root	H L te-bá-kí-[kó̲lokotà]	'they do not scrape it (cl. 7)'

Without the distorting effects of shift and doubling, the analysis of V2 tone is somewhat more clear. Goldsmith (1987) proposes that it arises from the assignment of a single **H** tone to V2, *regardless of root tone.* In forms with toneless roots, this straightforwardly results in a **H** tone on V2. In forms with H-toned roots, however, this causes no grammatical **H** tones to surface within the stem, since any grammatical **H** tone assigned to V2 is either (depending on the language) lowered to L or deleted due to the preceding lexical H̲ on V1 (Meeussen's Rule). This is illustrated for Haya in (79), where Meeussen's Rule appears to be a deletion rule.[26]

(79) Assignment of V2 Tone in Haya

a.	Underlying	ba-a-[jun-angan-ag-a]	ba-a-[kó̲m-angan-ag-a]
b.	H → V2	ba-a-[jun-ángan-ag-a]	ba-a-[kó̲m-ángan-ag-a]
c.	Meeussen's Rule	---	ba-a-[kó̲m-angan-ag-a]
d.	Surface	ba-a-[jun-ángan-ag-a]	ba-a-[kó̲m-angan-ag-a]

Since, in the analysis we have been developing for Complex tone, leftward spreading and leftward shift occur in the Macrostem stratum (cf. section 2) and the postlexical phonology, we can derive the "V1/Lex" pattern of Kinande simply by assuming that that the V2 tone pattern observed on the *surface* in Haya is assigned in Kinande in the Stem stratum.

[25]In Luganda, we see H tone plateauing between the H tone of the subject marker and either the grammatical H tone on V2 (78a) or the lexical tone on V1 (78b).

[26] Unlike in Kinande or Luganda, there is no clear evidence for active L tone in Haya.

The one thing that we must add is that in Kinande, forms that receive V2 tone are assigned not just a H tone on V2, but also a L tone on FV. This explains why they are able to block the assignment of H_φ without ever placing grammatical **H** tones near the right edge of the stem. In (80), we see a schematic overview of how this analysis would work. (This overview ignores the stratal morphology and presents all morphemes at all stages of derivation.)

(80) Assignment of V2 Tone in Kinande

a.	Underlying		e-mi-[hangam-ir-e]	e-mi-[há̱kab-ir-e]
b.	Stem	H → V2 (w/ MR)	e-mi-[hangá**m**-ir-e]	e-mi-[há̱k**à**b-ir-e]
c.		L→FV	e-mi-[hangá**m**-ir-**è**]	e-mi-[há̱k**à**b-ir-**è**]
d.	Macrostem	Doubling	e-mi-[há**n**gá**m**-ir-è]	---
e.	Postlexical	Leftward Shift	e-mí-[há**n**gàm-ir-è]	e-mí̱-[hàkàb-ir-è]
f.	Surface		e-mí-[há**n**gàm-ir-è]	e-mí̱-[hàkàb-ir-è]

Note that this analysis uses the exact same grammatical machinery used for Complex tone, deriving the different effects of V2 tone purely from a minor difference in underlying representation. Below, I demonstrate this by showing the two tone-assigning cycles of the Stem-level level evaluation of the toneless stem [*hangam-ir-e*] when it is assigned V2 tone.

(81) 1st cycle of V2 tone: Assignment of **H** to V2 of [*hangamire*]

	hangamire, **H**	*CROWD	REALIZE-MORPH	$T_G \rightarrow$ V2	$T_G \rightarrow$FV	ANCHOR-H
a.	☞ hangá**m**ire				*	*
b.	hangamir**é**			*!		*
c.	hangamire		*!			

(82) 2nd cycle of V2 tone: Assignment of **L** to [*hangámire*]

	hangá**m**ire, **L**	*CROWD	REALIZE-MORPH	$T_G \rightarrow$ V2	$T_G \rightarrow$FV	ANCHOR-H
a.	☞ hangá**m**ir**è**			*	*	*
b.	hangâ**m**ire	*!			**	*
c.	hangá**m**ire		*!		*	*

After these two cycles are complete, **H** has been assigned to V2 and **L** has been assigned to the FV, so that V2 tone assignment produces the same effects in toneless stems that Complex tone assignment does. Note, however, that it achieves this result quite differently. In verbs with Complex tone, the final **L** tone results from a **H** that is lowered to **L** because of the OCP, while in verbs with V2 tone, the final tone is **L** underlyingly.

Our grammar for Complex tone also derives correct results for V2 tone in H-toned stems. In the first cycle, just as when Complex tone is assigned, the grammatical **H** tone assigned to V2 will lower to **L** due to the OCP. In the second cycle, simple assignment of the **L** tone to FV falls out from our ranking of MAX_{BASE}-T and REALIZE-MORPH above T→V2. This is illustrated in (83) and (84) for the H-toned stem [*hákab-ir-e*].

(83) 1st tone cycle of V2 tone: assignment of **H** to [*hákabire*]

	hákabire, **H**	OCP	MAX_{BASE}-T	REALIZE-MORPH	T_G→V2	T_G→FV	IDENT-[hi]
a.	☞ hák**à**bire					*	*
b.	hák**á**bire	*!				*	
c.	hak**á**bire		*!			*	
d.	hákabire			*!			
e.	hákabir**è**				*!		*

(84) 2nd tone cycle of V2 tone: assignment of **L** to [*hák**à**bire*]

	H L_1 L_2 | | hák**à**bire	OCP	MAX_{BASE}-T	REALIZE-MORPH	T_G | V2	T_G | FV	IDENT-[hi]
a.	☞ **H** L_1 L_2 | | | hák**à**bir**è**				*	*	
b.	**H** L | | hák**à**bire		*! (if **L** = L_2)	*! (if L = L_1)		*	

We see, then, that an explanatory analysis of V2 tone and how it compares to Complex tone falls out naturally under the **2H** analysis of Complex tone developed in this chapter. No such analysis of V2 tone, however, is available under a **1H** analysis of Complex tone. As we saw in (72), an analysis of Complex tone in which a single **H** tone is attracted *either* to V2 *or* to FV must posit a **HL** melody in order to account for the final **L** tone observed in toneless stems. Positing a **HL** melody for Complex tone, however, presents problems for the analysis of V2 tone. Since V2 tone clearly necessitates a **HL** melody, Complex **HL** and V2 **HL** would need to differ purely in the mobility of their **H** tones – the Complex **H** would need to be able to associate with FV instead of V2 when V1 bears a lexical H̲ tone, while V2 **H** would need to have a fatal attraction to V2, associating there even though it will necessarily be lowered to **L** due to the OCP. This would not be impossible to implement, but the means of doing so are not particularly attractive. We would need to differentiate Complex **H** and V2 **H** with a diacritic, and rank the constraints which associate them to V2 differently. For example, we might rank $\mathbf{H}_{V2}\rightarrow$V2 above IDENT-[hi] and $\mathbf{H}_{Complex}\rightarrow$V2 below IDENT-[hi]. That would ensure that Complex tone's **H** would flee to the final vowel to avoid lowering while the V2 H tone will not. However, it would do so at the expense of arbitrary diacritics and a proliferation of constraints.

By contrast, in the analysis proposed here, a single set of constraints assigns all grammatical tones, and tonal diacritics are kept to an absolute minimum. This way, the differences in tone assignment between Complex tone and V2 tone fall out entirely as a consequence of their differing underlying representations, as we would normally expect.

3.4.2 Spurious H tone

The second major advantage of the **2H** analysis of Complex tone is that it provides a promising starting point for the analysis of "Spurious H tones." Certain aspects of this analysis admittedly remain unclear, but appear to be solvable in a **2H** approach while they are entirely baffling in a **1H** approach.

As mentioned in section 1, Spurious H tone assignment refers an unusual distortion of the normal Complex tone pattern found in forms with passive or causative suffixes. In these forms, we find that passive and causative suffixes appear as if they are underlying H toned, since a H tone appears on the first vowel before them. This H tone – "spurious" because these suffixes do not otherwise show signs of being underlyingly H-toned (cf. (12)) – occurs *in addition* to grammatical **H** tones in forms with toneless stems, and *instead* of grammatical **H** tones in forms with H-toned stems. In addition, in both toneless and H-toned stems, the final vowel appears not be associated with a final L tone, since $H_φ$ appears on the penultimate vowel.

(85) Effects of Spurious H Tone

		Toneless stem	*H-toned stem*
a.	w/o passive or causative	**H** L tu-angá-[húm-irir-à] SM.1P-POT-[√-PURP-DES] 'we could hit on purpose'	**H** L tu-anga-[tum-írír-à] SM.1P-POT-[√-PURP-DES] 'we could send on purpose'
b.	w/ passive -*u*	**H** H̳ $H_φ$ $L_ι$ tu-angá-[húm-irí̳r-ú-à] SM.1P-POT-[√-PURP-PASS-DES] 'we could be hit on purpose'	H̳ $H_φ$ $L_ι$ tu-anga-[tum-irí̳r-ú-à] SM.1P-POT-[√-PURP-PASS-DES] 'we could be sent on purpose'
c.	w/ causative (-*is*)-*į*	**H** H̳ $H_φ$ $L_ι$ tu-angá-[húm-í̳s-į́-à] SM.1P-POT-[√-CAU1-CAU2-DES] 'we could make s.o. hit'	H̳ $H_φ$ $L_ι$ tu-anga-[tum-í̳s-į́-à] SM.1P-POT-[√-CAU1-CAU2-DES] 'we could make s.o. send'

Under the present analysis, where Complex tone consists in the assignment of two **H** tones, we can account for all of these effects quite simply: all we must do is assume (a) that the second **H** tone is assigned to the vowel of the causative or passive suffix rather than the final vowel and (b) that this **H** tone is then exempted from the lexical phonology's processes of long-distance Meeussen's Rule (i.e. OCP-based lowering) and Macrostem tone doubling.

Under this account, the "Spurious H" tone which occurs before the causative or passive suffix is simply the second grammatical **H** tone. In toneless stems, the fact that this **H** tone is exceptionally exempted from OCP-based lowering means that both grammatical **H** tones assigned by Complex tone are able to surface: the one assigned to V2, which doubles and shifts, and the one assigned to the passive or causative suffix, which does not double but does shift. On the other hand, the fact that the second **H** is exempted from lowering in H-toned stems results in no additional **H** tone, since this **H** would never have lowered anyway.

Moreover, under this analysis, we can explain why the presence of a passive or causative suffix causes the return of H_{φ}: since the second **H** tone of Complex tone is never assigned to the final vowel, it never gives rise to a final L tone that can block H_{φ}.

In (86) and (87), below, I illustrate how this analysis works in forms with toneless and H-toned stems by showing side-by side derivations for forms with and without a passive suffix. Throughout these derivations, I keep track of the originally assigned **H** tones with subscripts. L tones with subscripts are lowered grammatical tones. L tones without subscripts are L tones introduced via Fall Conversion at the LP-PLP Watershed.

(86) Toneless stems: both grammatical **H** tones surface w/ passive suffix

		without passive -*u*	with passive *u*-	
a.	Underlying	$\mathbf{H_1}$ $\mathbf{H_2}$ tu-anga-[hum-irir-a]	$\mathbf{H_1}$ $\mathbf{H_2}$ tu-anga-[hum-irir-u-a]	
b.	Gram. Tone Association (Stem)	$\mathbf{H_1}$ $\mathbf{L_2}$ tu-anga-[hum-írir-á]	$\mathbf{H_1}$ $\mathbf{H_2}$ tu-anga-[hum-írir-ú-a]	$\mathbf{H_2}$ exempted from lowering
c.	Doubling (Macrostem)	$\mathbf{H_1}$ $\mathbf{L_2}$ tu-anga-[húm-írir-à]	$\mathbf{H_1}$ $\mathbf{H_2}$ tu-anga-[húm-írir-ú-a]	$\mathbf{H_2}$ exempted from doubling
d.	Leftward Shift (Postlexical)	$\mathbf{H_1}$ L $\mathbf{L_2}$ tu-angá-[húm-ìrir-à]	$\mathbf{H_1}$ L$\mathbf{H_2}$ L tu-angá-[húm-ìrír-ù-a]	
e.	H_φ Assignment (Postlexical)	--- (blocked by final $\mathbf{L_2}$)	$\mathbf{H_1}$ L$\mathbf{H_2}$L H_φ tu-angá-[húm-ìrír-ù-á]	H_φ associates to free FV
f.	L_ι Assignment (Postlexical)	$\mathbf{H_1}$ L L_ι tu-angá-[húm-ìrir-à]	$\mathbf{H_1}$ L$\mathbf{H_2}$ $H_\varphi L_\iota$ tu-angá-[húm-ìrír-ú-à]	

(87) H-toned stems: only 2nd grammatical **H** surfaces both with and without passive suffix

		without passive -*u*	with passive -*u*	
a.	Underlying	H̲ H_1 H_2 tu-anga-[tú̲m-irir-a]	H̲ H_1 H_2 tu-anga-[tú̲m-irir-u-a]	
b.	Gram. Tone Association (Stem)	H̲ L_1 H_2 tu-anga-[tú̲m-ìrir-**á**]	H̲ L_2 H_2 tu-anga-[tú̲m-ìrir-**ú**-a]	
c.	Doubling (Macrostem)	H̲ L_1 H_2 tu-anga-[tú̲m-**ì**rír-**á**]	H̲ L_2 H_2 tu-anga-[tú̲m-ìrir-**ú**-a]	H_2 exempted from doubling; H̲ cannot double[27]
d.	Lexical Tone Suppression (Verbal Unit)	L_1 H_2 tu-anga-[tum-**ì**rír-**á**]	L_1 H_2 tu-anga-[tum-ìrir-**ú**-a]	
e.	Leftward Shift (Postlexical)	H_2L tu-anga-[tum-**í**rír-à]	L_1H_2L tu-anga-[tum-ìrír-ù-a]	
f.	H_φ Assignment (Postlexical)	--- (blocked by final L)	L **H** L H_φ tu-anga-[tum-ìrír-ù-á]	H_φ associates to free FV
g.	L_ι Assignment (Postlexical)	**H** L_ι tu-anga-[tum-**í**rír-à]	L **H**$H_\varphi L_\iota$ tu-anga-[tum-ìrír-ú-à]	

Obviously, a number of questions remain, including (a) why **H** tones are attracted to the passive and causative suffixes and (b) why their presence on these suffixes makes them exempt from **H** tone doubling and OCP-based lowering. Hyman and Katamba (1990), in their discussion of Spurious H tones in Luganda, propose that the high tones of the passive and causative suffixes are relics of a stage where these morphemes were not yet fully incorporated into the stem. I agree with this historical explanation; it remains unclear, however, how the

[27] H̲ cannot double because it is Macrostem-initial, and therefore has no Macrostem-internal mora that it can double onto when Doubling takes place. See section 4 for details.

special status of the passive and causative suffixes should be represented synchronically. For now, I will leave these questions for future work.

Before turning away from Spurious tone, it is important to point out one limitation of the analysis proposed above. Since the Spurious tone is claimed to be nothing more than the second **H** tone assigned in Complex tone, we expect Spurious tones never to appear in verbs that receive the V2 tone pattern just discussed in 3.4.1, since the second grammatical tone assigned in this tone pattern is **L**. As shown in (88), this prediction is correct for H-toned stems with V2 tone, but incorrect for toneless stems: they show a Spurious H tone in addition to their initial grammatical **H** tone.

(88) Spurious H tones in Object-marked imperatives with V2 tone (Surface forms)

		toneless stems	*H-toned stem*
a.	w/o passive or causative	**H L L** tu-mú-[húm-a-è] SM.1P-OM.3S-[√-DES1-DES2] 'let us hit him'	**H̲ L L L** tú̲-mú̲-[tùm-a-è] SM.1P-OM.3S-[√-DES1-DES2] 'let us send him'
c.	w/ causative *(-is)-į*	**H L H̲ H_φ L_ι** tu-mú-[húm-ìs-á̲-į́-è] SM.1P-OM.3S-[√-C1-DES1-C2-DES2][28] 'let us make him hit'	**H̲ L L L** tú̲-mú̲-[tùm-ìs-a-į-è] SM.1P-OM.3S-[√-C1-DES1-C2-DES2] 'let us make him send'

In addition, remote past forms[29] which appear to be assigned only a suffixal **L** tone also show a Spurious **H** tone in the presence of a passive or causative suffix.[30]

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[28] In these glosses, to save space, C1 and C2 stand for "causative morpheme 1" and "causative morpheme 2."

[29] This pattern is characteristic only of "factual" remote forms. Informative remote forms show Complex tone; see chapter 5 for a summary of different tenses.

[30] In addition to the final **L** suffix, which prevents the assignment of H_φ, remote past form also show a pattern of lexical H̲ realization which is the exact opposite of that seen in Complex tone: H̲ *is* realized on a SM or TAM, but is

(89) Spurious H tones in factual Remote Past forms

		toneless stems	*H-toned stem*
a.	*without passive or causative sufifix*	L | tu-a-[hum-a-a] SM.1P-PAST-[√-DES1-DES2] 'we hit (long ago)'	H̲ L L | | | tu-á̲-[tùm-a-à] SM.1P-PAST-[√-DES1-DES2] 'we sent (long ago)'
c.	w/ passive *-u*	H̲ H_{φ} L_{ι} | | | tu-a-[hum-á̲-ú-à] SM.1P-PAST-[√-DES1-PASS-DES2] 'we were hit (long ago)'	H̲ L H̲ H_{φ} L_{ι} | | | | | tu-á̲-[tùm-á-ú-à] SM.1P-PAST-[√-DES1-PASS-DES2] 'we were sent (long ago)'

It is not immediately clear how these cases should be handled. It is possible that they represent analogical extensions from verbs with Complex tone, where Spurious H tones presumably originally arose. More work on these tone patterns (and possibly related patterns in other languages) may shed more light on this.

3.5 Local summary

In (90) below, we see the results of the Stem-level grammar developed in the previous sections when applied to toneless and H-toned stems of various sizes. Once the tones of these forms undergo leftward tone spread in the Macrostem stratum, lexical H̲ tone suppression in the Verbal Unit stratum, and leftward shift postlexically, they will give rise to the exactly the tone patterns that we observe on the surface. In the next section, we see the first step of this in the Macrostem.

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not realized on an OM or the affirmative morpheme *na*. I have no good explanation for these facts, and leave their OT analysis to future work; for previous analyses, see Mutaka (1994, chapter 6) and Black (1995).

(90) Outputs of the Stem Stratum: Complex tone

		2V	3V	4V	5V
a.	*toneless stem* H on V2 L on FV	H [humá]	HL [humáà]	H L [humíraà]	H L [humíranaà]
b.	*H-toned stem* L on V2 H on FV	H̱ L [tú̱mà]	H̱ LH [tú̱màá]	H̱ L H [tú̱mìraá]	H̱ L H [tú̱mìranaá]

4 Macrostem stratum

The Macrostem contains the Stem as well as any object marker (OM) that may optionally precede it, and therefore has one of the two structures in (91) below.

(91) Structure of Macrostem

a. with object marker	b. without object marker
Macrostem OM Stem {mu humirana }	Macrostem Stem {humirana}

I assume that like the Stem, the Macrostem is evaluated cyclically, but due to its simple structure there are no crucial consequences that follow from this. If an OM is present, as in (91a), an input formed from the combination of it and the Stem is submitted to the Macrostem grammar for evaluation. The output of that evaluation will then be immediately resubmitted to the Macrostem-grammar for a stratum-final evaluation, which causes no further changes. If no OM is present, as in (91b), the Stem is submitted to the Macrostem grammar only once, in the stratum-final evaluation. (As mentioned in section 1, the stratum-final evaluation ensures that Macrostem-level phonology will take place even if no OM is present.)

The (tonal) grammar of the Macrostem stratum is much simpler than that of the Stem stratum, since it only needs to do one thing: account for tone doubling. Recall that there are two kinds of tones that are doubled: grammatical **H** tones, and lexical <u>H</u> tones that surface on object markers. We see both of these in (92) below, which shows the surface forms of verbs with Complex tone that are preceded either by the affirmative *na-* or the object marker *mu-*. In (92a,b), which show toneless stems, we see doubling of grammatical **H** tones at the left edge of the stem. In (92c), which shows a H-toned stem, we see doubling of grammatical **H** tones at the right edge of the stem, but no doubling of lexical <u>H</u> tones. Finally, in (92d) we see doubling of both lexical and grammatical high tones.

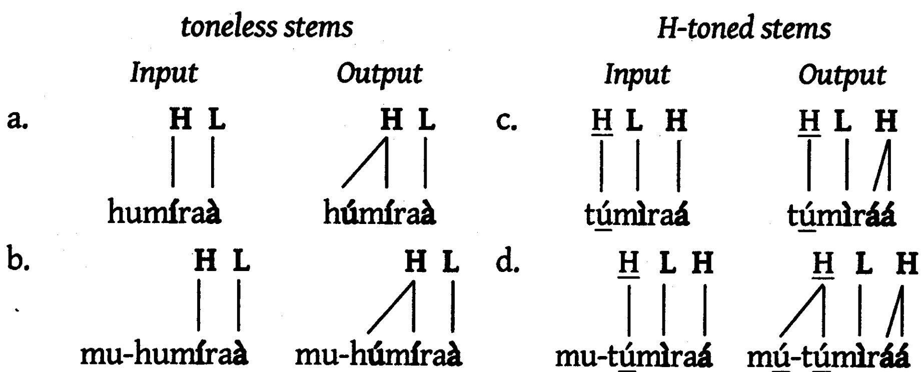
(92) Surface result of Macrostem doubling in verbs with toneless (a,b) and H-toned (c,d) stems

a.	**H** L L tu-a-n**á**-{[h**ú**m-ìr-a-à]}	'we indeed hit for (recently)'
b.	**H** L L tu-a-{m**ú**-[h**ú**m-ìr-a-à]}	'we hit for him (recently)'
c.	<u>H</u> L **H** L tu-a-n<u>á</u>-{[tùm-**í**r-**á**-à]}	'we indeed sent (recently)'
d.	<u>H</u> L **H** L tu-<u>á</u>-{m<u>ú</u>-[tùm-**í**r-**á**-à]}	'we sent for him (recently)'

The *surface* generalization that we can form about doubling is that any high tone – **H** or <u>H</u> – located within the Macrostem is doubled one vowel to the left. In (92a), a grammatical **H** tone on the first vowel of the Macrostem is doubled onto the first vowel before it; in (92b), a grammatical **H** tone on the Macrostem's second vowel is doubled onto its first; in (92c) and (92d), a grammatical **H** tone on the Macrostem's penultimate vowel is doubled onto its antepenultimate vowel; and finally, in (92d) a lexical H tone on the Macrostem's first vowel is doubled onto the first vowel before it. In (92c), the lexical H tone is *not* doubled because it surfaces outside of the Macrostem. From this surface-based perspective, grammatical **H** tones are always doubled because they always surface at least partially within the Macrostem, while lexical H tones are only doubled sometimes, since they only surface within the Macrostem if the morpheme immediately preceding the root is an object marker.

Under the theoretical assumptions laid out in section 1, however, since the generalization concerning spreading makes reference to the Macrostem, it must be derived within the Macrostem stratum. This forces a shift in perspective, since within the Macrostem stratum all H tones occur one vowel to the right of their surface locations, having not yet undergone postlexical leftward shift. Thus, the inputs and outputs of the Macrostem stratum must be as in (93) below. The input is simply the output of the Stem stratum combined with any object marker that is added, while the output shows the effect of doubling.

(93) Inputs and outputs of Macrostem stratum



From this Macrostem-level perspective, the generalization about Macrostem spreading is very simple: every H tone spreads to the left, so long as there is some vowel that it can spread onto. This, then, is the generalization that the Macrostem grammar must derive.

4.1 Formal analysis of Macrostem Spreading

To derive spreading, I adopt the constraint *MonoH (94a), which forbids H tones from associating to just a single vowel,[31] and rank it above both Ident-Long(H) (94b) and *LongT (56). To ensure that spreading is to the *left*, I employ Linearity(τ/V) constraints. In particular, I posit that *MonoH dominates Linearity(V,H) (31c), which is violated by leftward tone movement, but not Linearity(H,V) (94c), which is violated by rightward tone movement. Finally, *MonoH must be ranked above both Max-H (31b) and Ident-[hi] (54). Otherwise, Macrostem-initial H tones that cannot not spread to the left would either delete or lower to L in order to satisfy *MonoH.

(94) Constraints involved in leftward tone shift

a.	*MonoH	A H tone cannot be associated with just one vowel.
b.	Ident-Long(H)	The length of a H tone, as measured by the number of vowels it is associated to, is identical in the input and the output.
c.	Linearity(H,V)	If an input vowel V has an output correspondent V′, and if an input high tone H has an output correspondent H′, then **if H < V then H′ < V′.**

(95) Macrostem stratum grammar

Max-H   Linearity(H,V)   Ident-[hi]

*MonoH

*LongT   Linearity(V,H)   Ident-Long(H)

These effects of the ranking in (95) are most easily illustrated by showing how it governs spreading of lexical H̲ tones in (the Macrostem strata of) infinitive forms, where

[31] This constraint is inspired by Cassimjee and Kisseberth's (1998) *MonoHD, which demands that a high tone domain be at least two moras or two syllables long. However, the constraints have different effects, since Cassimjee and Kisseberth's H tone domains are not domains in which H tones *are* realized, but only domains in which they *may* be realized. Thus, *MonoHD (in combination with other constraints) can produce both tone shift and tone spread, while *MonoH can produce only spread.

grammatical **H** tones are not assigned. In (96), we see that when a lexical H tone is noninitial within the Macrostem because an object marker precedes the root, *MonoH is satisfied by spreading it one vowel to the left. This is because the Linearity(V,H) violation incurred by leftward spreading (96a) is less costly than the *MonoH violation incurred by not spreading (96b). Moreover, we see spreading to the left instead of spreading to the right (96c), deletion (96d), or lowering to L (96e) because these repairs for *MonoH would all violate constraints that outrank Linearity(V,H).

(96) Leftward spreading preferred repair for *MonoH

	H mu-túmiraa	Lin(H,V)	Max-H	Id-[hi]	*MonoH	Lin(V,H)	*LongT	Id-Long(H)
a.	☞ H mú-túmiraa					*	*	*
b.	H mu-túmiraa				*! W	L	L	L
c.	H mu-túmíraa	*! W				L	* ~	* ~
d.	mu-túmiraa		*! W			L	L	L
e.	L mu-tùmiraa			*! W		L	L	L

In (97), we see that when a lexical H tone is initial within the Macrostem because no object marker precedes the root, it is left unchanged. In particular, it does not spread to the right (97b), delete (97c), or lower to L (97d) because all these repairs violate constraints that outrank *MonoH.

(97) If leftward spreading is impossible, singly-linked H tones remain unchanged

	H túmiraa	LIN(H,V)	MAX-H	ID-[hi]	*MONOH	LIN(V,H)	*LONGT	ID-LONG(H)
a.	☞ H túmiraa				*			
b.	H túmíraa	*! W			L		* L	* L
c.	túmiraa		*! W		L			
d.	L tùmiraa			*! W	L			

With the rankings in (95) now verified, we can see how they perform the input-output mappings specified in (93). This is shown in (98)-(101) below. In all forms, we see grammatical **H** tones spreading one vowel to the left. Moreover, in (100) and (101) we also see again that lexical H tones that are initial within the Macrostem do not spread (having nowhere to spread onto) while H tones that are not initial do. Note that in all of these forms, the inputs include the Stem-level outputs for 4V stems shown in (90).

(98) Spreading of Grammatical **H** in a toneless stem without an OM

	H L **humíraà**	LIN(H,V)	MAX-H	ID-[hi]	*MONOH	LIN(V,H)	*LONGT	ID-LONG(H)
a.	☞ **H L** **húmíraà**					*	*	*
b.	**H L** **humíraà**				*! W	L	L	L

(99) Spreading of Grammatical **H** in a toneless stem with an OM

	H L mu-humíraà	LIN(H,V)	MAX-H	ID-[hi]	*MONOH	LIN(V,H)	*LONGT	ID-LONG(H)
a.	☞ H L mu-húmíraà					*	*	*
b.	H L mu-humíraà				*! W	L	L	L

(100) Spreading of Grammatical **H** only in a H-toned stem without an OM

	H L H túmìraá	LIN(H,V)	MAX-H	ID-[hi]	*MONOH	LIN(V,H)	*LONGT	ID-LONG(H)
a.	☞ H L H túmìráá				*	*	*	*
b.	H L H túmìraá				**! W	L	L	L

(101) Spreading of Grammatical **H** and Lexical H in a H-toned stem with an OM

	H L H mu-túmìraá	LIN(H,V)	MAX-H	ID-[hi]	*MONOH	LIN(V,H)	*LONGT	ID-LONG(H)
a.	☞ H L H mú-túmìráá					**	**	**
b.	H L H mu-túmìraá				*! * W	L	L	L

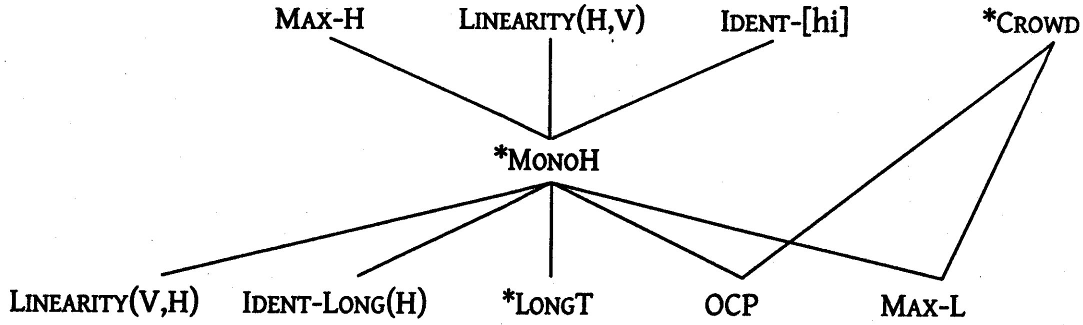
One last set of rankings is required to account for H-toned stems with three vowels. In these stems, when a grammatical **H** tone spreads to the left, it overwrites the **L** tone which was assigned to V2 in the Stem stratum. To ensure this result, we must first rank *MONOH, MAX-H, IDENT-[hi], and *CROWD above MAX-L. This ensures that H tones cannot remain unspread on the surface, and that this is avoided by overwriting a preceding L tone rather than by deleting a H tone (102b), lowering it to L (102c), or allowing spreading to form a contour tone (102d). In addition, *MONOH, MAX-H, IDENT-[hi] and *CROWD must also be ranked above the OCP constraint formulated in (59), since overwriting the **L** tone on V2 causes **H** tones to become adjacent on the tonal tier.

(102) Spreading of **H** from FV to V2 overwrites **L** tone

	<u>H</u> L H t<u>ú</u>mìrá	IDENT-[hi]	MAX-H	*CROWD	*MONOH	MAX-L	OCP
a.	☞ <u>H</u> H t<u>ú</u>mírá				* (<u>H</u>)	*	*
b.	<u>H</u> L L t<u>ú</u>mìrà	*! W			* (<u>H</u>) ~	L	L
c.	<u>H</u> L t<u>ú</u>mìra		*! W		* (<u>H</u>) ~	L	L
d.	<u>H</u> L H t<u>ú</u>mǐrá			*! W	* (<u>H</u>) ~	L	L
e.	<u>H</u> L H t<u>ú</u>mìrá				* (<u>H</u>) *! (H) W	L	L

This addition yields the final Macrostem stratum grammar in (103).

(103) Macrostem stratum grammar (final)



4.2 Stem vs. Macrostem strata

In the grammar presented in (103), two rankings are of particular interest, since they differ from rankings established in the Stem-level grammar, and therefore provide evidence that the lexical phonology of Kinande is not just *cyclically evaluated* but also *stratal*. The first is the ranking of *MonoH above Ident-Long(H) and *LongT. This, of course, is the ranking responsible for tone spreading in the Macrostem stratum. In order to ensure that spreading does *not* happen in the Stem stratum, we must assume that there, at least one ranking is reversed, with *MonoH ranked *below* either Ident-Long(H) or *LongT (or both).

The second ranking of interest is the ranking of Ident-[hi] above OCP. As we just saw in (102), this ranking is crucial to the analysis of H-toned stems with three vowels, in which a grammatical **H** tone assigned to FV spreads leftwards onto V2, overwriting a **L** tone previously associated there and thereby coming into contact with a stem-initial H̲ tone. To derive this outcome, *MonoH must dominate OCP in the Macrostem stratum, or spreading would simply be blocked in cases where it would cause two H tones to become adjacent (104c). In addition, however, a ranking of Ident-[hi] above OCP is needed to ensure that *MonoH is satisfied through (OCP-violating) spreading (104a), rather than through (OCP-satisfying) tone lowering (104b).

(104) Macrostem Stratum: IDENT-[hi] » OCP

	H L H túmìrá	IDENT-[hi]	*MONOH	OCP
a.	☞ H H túmírá		*	*
b.	H L L túmìrà	*! W	* ~	L
c.	H L H túmìrá		**! W	L

In the Stem stratrum, however, the opposite ranking of IDENT-[hi] below OCP is responsible for the fact that grammatical **H** tones lower to **L** when they are preceded by a H tone on the tonal tier. This is particularly important to the analysis of 2-vowel H-toned stems. Without a ranking of OCP above IDENT-[hi], we predict that a grammatical **H** tone assigned to FV (=V2) in 2-vowel stems will remain **H** rather than lowering to **L.**

(105) Stem stratum: OCP » IDENT-[hi]

	H H túma	OCP	IDENT-[hi]
a.	☞ H L túmà		*
b.	H H túmá	*! W	L

The conflicting demands of 2-vowel and 3-vowel H-toned stems, then, seem to provide crucial evidence for reranking. However, we should be cautious in immediately accepting this conclusion, for we have already seen instances in which other apparently conflicting demands on rankings ultimately turned out to require not reranking, but simply cyclic evaluation. Specifically, this was the case for the interaction between H_φ and lexical L tones, examined in detail in chapter 3. There, we saw that while the assignment of H_φ is blocked by a final L tone, it is able to overwrite a penultimate L tone. At first sight, blocking and overwriting seem to demand conflicting rankings of MAX-L and MAX-H: blocking requires a ranking of MAX-L above MAX-H, while overwriting requires a ranking of MAX-H above MAX-L. Nonetheless, we saw in chapter 3 that cyclic evaluation allows us to posit a single ranking for both: Max-H cannot overwrite L during its *initial placement* due to a ranking of MAX-L above MAX-H, but if it is placed elsewhere first, it can overwrite L in the course of *tone shift* due to a ranking of MAX-H[LINKED] above MAX-L. This situation was described as a *toehold effect*, since H_φ is ultimately able to occur in a position that it cannot be *initially* assigned to (namely, a vowel that bears a L tone in the input) so long as there is some intermediate stage in which it can be assigned to a different position, and thereby gain a toehold into the representation.

Given this result, it is worth asking if we can also analyze the apparently conflicting demands on the ranking between IDENT-[hi] and OCP as arising from a toehold effect. The key fact this analysis would need to account for is that a grammatical **H** tone assigned to the FV of a 2-vowel H-toned stem will *lower* in order to *satisfy* OCP, while a grammatical **H** assigned to a 3-vowel H-toned stem will *spread* and *violate* OCP. This is shown once more in (106).

(106) Differing response to OCP in H-toned stems

a.	túma + **H**	→	[tú̱mà]	(at end of LP)
b.	tú̱mìra + **H**	→	[tú̱míră]	(at end of LP)

One way of summarizing these facts is as follows: the *initial placement* of a **H** tone cannot violate OCP, but if a **H** tone is initially placed in a position which does not cause an OCP violation, its subsequent spreading *can* violate OCP. This, of course, sounds like just the sort of fact that a toehold-based analysis should be able to explain, which suggests a possible unification of the Stem-level and Macrostem-level grammars; in particular, it suggests that we might be able to incorporate spreading into the Stem-level grammar, and treat the evaluation of the object marker simply as the Stem's final cycle.

In this account, spreading would always take place as soon as possible, but would occur at different times in different forms: a final **H** tone assigned to 4-vowel *túmirana* would spread to the penult at the same time as tone assignment, since that would not cause an OCP violation in the course of tone assignment (107a), but a final **H** tone assigned to 3-vowel *túmira* would need to wait until the following cycle (i.e. either the cycle in which the OM is evaluated, or the stratum-final evaluation of the Stem), since spreading in the same cycle in which **H** is assigned would violate OCP (107b). Meanwhile, a final **H** assigned to 2-vowel *túma* will lower to L when it is assigned because there is no way to avoid violating OCP (107c).

(107) Potential unification of tone assignment and spreading

		Input (H cycle)[32]		Output (H cycle)		Output (Stem-final evaluation)
a.	4V stem	túmìrana + **H**	→	tú̲mì**ráná**	→	(no change)
b.	3V stem	tú̲mìra + **H**	→	tú̲mì**rá**	→	tú̲mí**rá**
c.	2V stem	tú̲ma	→	tú̲**mà**	→	(no change)

Formally, this account would run as follows. First, OCP dominates IDENT-[hi], forcing a grammatical **H** tone to lower to **L** if it would otherwise violate OCP when first assigned. However, OCP is dominated in turn by IDENT-[hi][LINKED]. Thus, so long as a **H** tone is first assigned into a position that does *not* violate OCP, it can later move into a position where it

[32] "H cycle" refers to the cycle in which a **H** tone is first assigned to **FV**. This occurs during the second **H** cycle of stems with 3 or more vowels, and in the first **H** cycle of stems with just two vowels.

does violate OCP through spreading. In (108), we see how this analysis would work for 2-vowel *túma*. In this form, **H** lowers to **L** when it is first assigned to satisfy the OCP (108b), and it remains **L** in future evaluations due to IDENT-[hi][LINKED].

(108) Toehold-based analysis of Macrostem spreading: 2-vowel H-toned stem

a. Initial assignment of **H**: **H** lowers to **L** to avoid violating OCP

	<u>H</u> **H** | t<u>ú</u>ma	IDENT-[hi] [LINKED]	OCP	IDENT-[hi]
a.	☞ <u>H</u> **L** | | t<u>ú</u>m**à**		*	
b.	<u>H</u> **H** | | t<u>ú</u>m**á**		W	*! L

b. Subsequently: Final **L** remains, in satisifaction of IDENT-[hi]

	<u>H</u> **H** | t<u>ú</u>ma	IDENT-[hi] [LINKED]	OCP	IDENT-[hi]
a.	☞ <u>H</u> **L** | | t<u>ú</u>m**à**			

In (109), we see how the analysis would derive OCP-violating tone spreading in the course of the cyclic evaluation of *t<u>ú</u>mira*. In (109a), **H** associates to the final vowel, but does not spread because this would violate OCP. Spreading is delayed until the following cycle, where **H** is protected not just by IDENT-[hi] but also IDENT-[hi][LINKED] (109b).

(109) Toehold-based analysis of Macrostem spreading: 3-vowel H-toned stem

a. Initial assignment of H to non-OCP violating position

		IDENT-[hi] [LINKED]	OCP	IDENT-[hi]
	H L H túmìra			
a.	☞ H L H túmìrá			
b.	H L L túmìrà			*!

b. Subsequently: spreading of H violates OCP

		IDENT-[hi] [LINKED]	OCP	IDENT-[hi]
	H L H túmìra			
a.	☞ H H túmírá		*	
b.	H L L túmìrà	*! W	L	* W

So far, this analysis seems promising. A fatal flaw, however, is revealed when we consider the role of *MONOH, the markedness constraint responsible for spreading. In order for spreading to occur in 3-vowel H-toned stems, *MONOH must dominate OCP. However, since OCP must dominate IDENT-[hi] (108a), this means that, by transitivity of constraint domination, *MONOH must also dominate IDENT-[hi]. With this ranking, it is not possible for **H** to first associate to the FV and only later spread. Instead, any **H** tone that cannot immediately spread at the time that it is first assigned will lower to L. This is shown in (110).

(110) Failure of toehold-based analysis of Macrostem spreading

		Ident-[hi] [linked]	*MonoH	OCP	Ident-[hi]
	H L H túmìra				
a.	☞ H L H túmìrá		*! W		
b.	💣 H L L túmìrà				*!

The problem here is that it is not enough simply to provide an intermediate stage in which a **H** tone can associate to FV before spreading to the penult. In addition, the constraint ranking which governs this intermediate stage must permit a singly-linked **H** tone to occur in the output. In a purely cyclic approach, this is not possible: since the same grammar must contain (a) a ranking of *MonoH above OCP, which is motivated by tone *spread* in 3-vowel stems (104c) and (b) a ranking of OCP above Ident-[hi], which is motivated by tone *lowering* in 2-vowel stems (105b), we inevitably obtain a third, unwanted ranking of MonoH above Ident-[hi]. This makes a two step process of tone assignment followed by tone spreading impossible, since it bans the intermediate step in which a H tone is assigned but not yet spread (110).

Crucially, within the stratal analysis adopted here, this problem does not arise. According to this analysis, the ranking of *MonoH above OCP belongs only to the Macrostem grammar, while the ranking of OCP above Ident-[hi] belongs only to the Stem grammar. Therefore, the constraint ranking at the stage of the derivation in which **H** is first assigned to FV need not contain the ranking of *MonoH above Ident-[hi] which arises in the cyclic analysis through transitivity. This means that H can first associate just to the final vowel, in satisfaction of highly-ranked OCP, and spread back only later, once the OCP has been demoted.

Reranking, then, is crucial to the interaction between tone assignment and tone spread. Tone *assignment* must be governed by the Stem-level ranking OCP » IDENT-[hi] » *MONOH. This explains both why **H** lowers to **L** in 2-vowel H-toned stems, and why singly-linked **H** is permitted in 3-vowel stems. Tone *spreading*, on the other hand, must be governed by the Macrostem-level ranking IDENT-[hi] » *MONOH » OCP. This explains both how tone spreading can cause OCP violations and how singly-linked H tones that cannot spread (e.g. those that are Macrostem-initial) are tolerated rather than lowered to L. These points are illustrated in (111) and (112), where we see how the stratal account is able to account for tone assignment and spreading in both 2-vowel and 3-vowel H-toned stems.

(111) Stratal analysis of Tone Assignment and Macrostem Spreading: 2-vowel stems

c. Stem stratum: **H** lowers to **L** if it would otherwise violate OCP

	H H (first H linked) túma	OCP	IDENT-[hi]	*MONOH
a.	☞ H L túmà		*	*
b.	H H túmá	*! W	L	** W

d. Macrostem stratum: Macrostem-initial H tones which cannot double do not lower

	H L túmà	IDENT-[hi]	*MONOH	OCP
a.	☞ H L túmà		*	
b.	L L tùmà	*! W	L	

(112) Stratal analysis of Tone Assignment and Macrostem Spreading: 3-vowel stems

a. Stem stratum: **H** assigned faithfully to FV if assignment does not violate OCP

		OCP	IDENT-[hi]	*MONOH
	H L H túmìra			
a.	☞ **H L H** túmìrá			**
b.	**H L L** túmìrà		*! W	* L

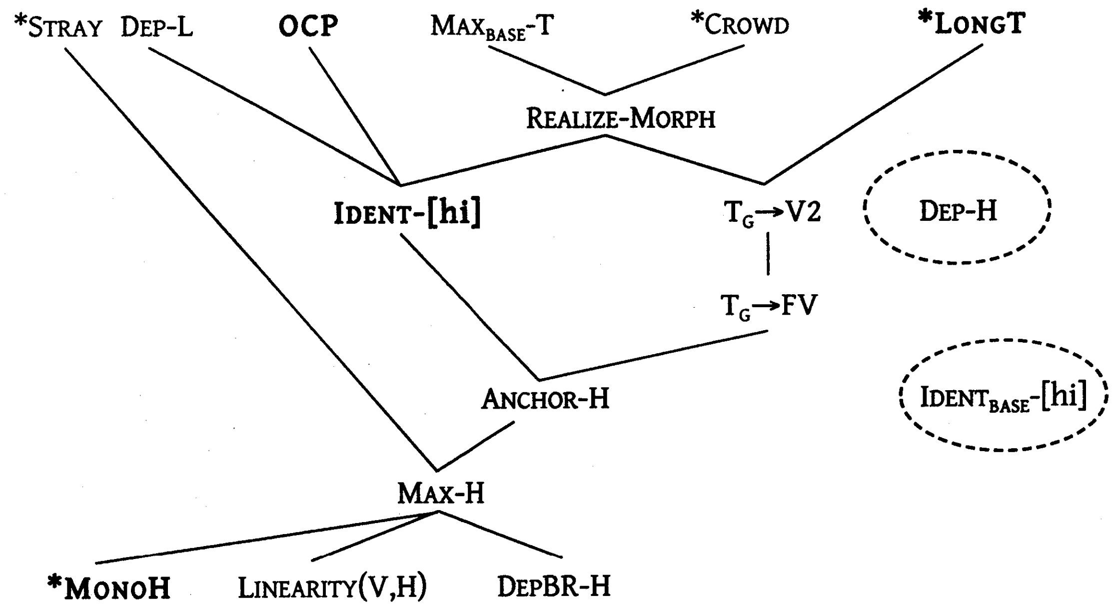
b. Macrostem stratum: Spreading from FV violates OCP

		IDENT-[hi]	*MONOH	OCP
	H L H túmìrá			
a.	☞ **H H** túmírá			*
b.	**H L L** túmìrà	*! W		L

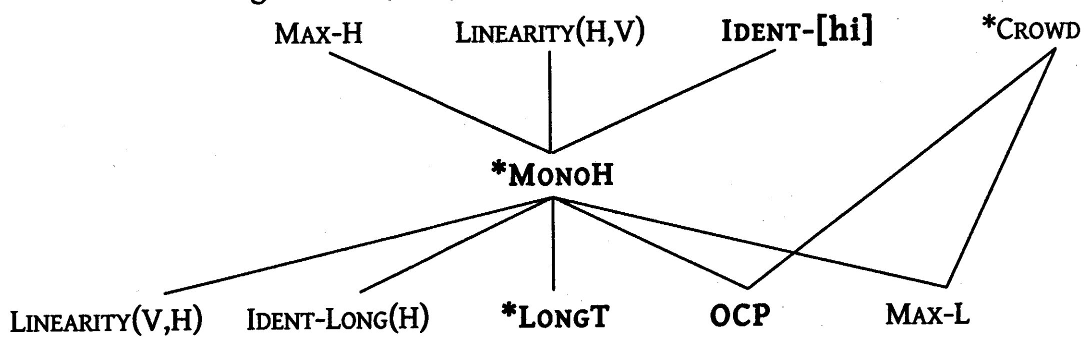
4.3 Local summary

The main results of this section are summarized in (113) and (114), where we see both the Stem-level grammar from (70) above, augmented with the required Stem-level rankings just discussed in 4.2, and the Macrostem grammar developed in 4.1. Constraints involved in crucial rerankings are in bold.

(113) Stem-level Constraint Hierarchy (final)



(114) Macrostem stratum grammar (final)



We now proceed to the final stage of the LP, the Vebal Unit stratum.

5 Verbal Unit stratum

Within the Verbal Unit stratum, all inflectional prefixes which precede the Macrostem are evaluated. These prefixes fall into the following categories:

Polarity Polarity morphemes include negative *tá̱* and affirmative *na*. We will focus only on the latter here. Its presence is generally optional, and it places focus on the truth of the statement being expressed. It has a more specialized sense when it combines with certain tense markers (cf. note 8, for example).

TONE — A prefixal L tone helps (in combination with the two suffixal **H** tones evaluated in the Stem stratum) to express clause type.

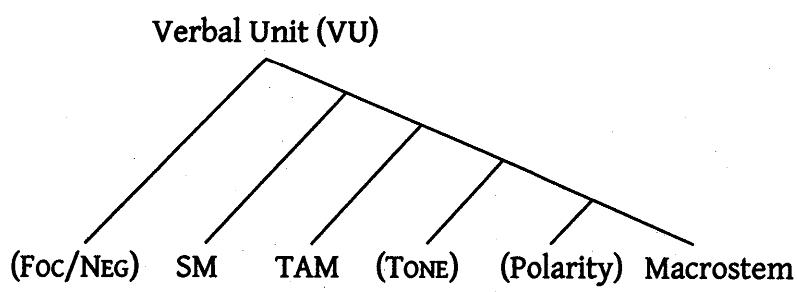
TAM — TAM morphemes help define (in concert with other affixes) the tense, aspect, and mood of a verb. I assume they are always obligatory, but sometimes Ø (e.g. in Stative Present forms like *tʉ́-Ø-[lʉ́hịrè]* 'we are tired').

SM — Subject Markers (SM) agree with the subject in noun class and (for animate subjects) person features. They are usually H-toned, as shown by the fact that they place H tones on FOC and NEG markers which precede them (see below).

FOC/NEG — The two main morphemes that precede the SM are the focus marker *mo* and the negation marker *si*. *Mo* occurs in what Valinande (1984) calls "Informative" verb forms, where focus is on the verb or verb phrase. Informative forms contrast with "factual" forms, where focus is generally on the post-verbal predicate.

I assume that morphemes are prefixed to the stem in the order listed above, so that the Verbal Unit has the structure in (115).

(115)

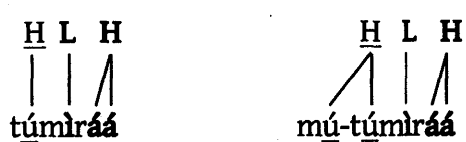


As in the Stem and Macrostem strata, this structure is evaluated cyclically, with a new evaluation triggered as each new morpheme above the Macrostem is evaluated. For the most part, this results simply in the concatenation of new material and old. For example, when the affirmative morpheme *na-* is evaluated, a phonological input consisting of *na-* and a following Macrostem *muhʉ́mɨ́raà* simply yields the output *namuhʉ́mɨ́raà*. However, one morpheme that cannot be simply concatenated with pre-existing material is Tone. I propose that when this prefix is realized, its **L** exponent must associate to the leftmost possible previously evaluated vowel, overwriting any tone already associated there. This is responsible for the phenomenon of lexical H̲ tone suppression, whereby a lexical H̲ tone fails to surface just in case the root is preceded by neither by the affirmative morpheme *na-* nor by an object marker.

To see how this occurs, let us consider once more the possible outputs of the Macrostem stratum for a H-toned stem. If the stem is preceded by an object marker, the lexical H̲ tone belonging to the root will have spread leftwards onto the object marker by Macrostem spreading. Otherwise, the lexical H̲ tone will not spread, since there is nowhere for it to spread onto. Thus, the two possible outputs of the Macrostem stratum are as in (116).

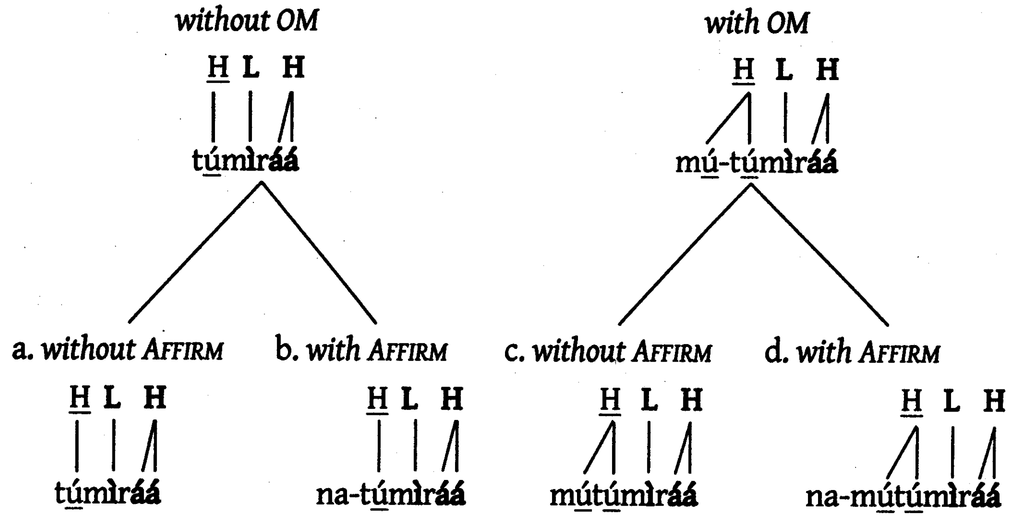
(116) Possible outputs of Macrostem stratum for H-toned stem [*túm-ir-a-a*]

a. *without OM* b. *with OM*



When these outputs enter the VU stratum, they may or may not be combined with the affirmative marker *na*. This leads to the following four possible outputs:

(117) Possible outputs of *na-* cycle for stem [*tú̲m-ir-a-a*]



These outputs are then combined with the **L** tone prefix. This must result in the suppression of H̲ in (117a), but not in (117b-d), since we do not see H̲ suppression in forms where the root is preceded by an OM or *na.* It seems, then, that the addition of **L** to a form only results in the suppression of H̲ if, at the time **L** is evaluated, H̲ is (a) initial and (b) singly-linked. The first condition rules out suppression in (117b) and (117d), while the second rules out suppression in (117c). We can make sense of this by saying (a) that **L** targets the initial vowel of its morphological base (b) that **L** overwrites any singly-linked **H** which it finds there, and (c) that it is not able to overwrite any part of a doubly-linked **H** tone.

In formalizing the analysis, I assume that the main constraint responsible for the placement of **L** is REALIZE-MORPH. In order for TONE to be realized, **L** must associate to some vowel. The fact that it associates to the *initial* vowel may be derived through faithfulness: I assume that **L** precedes all other material in the input, so that association to V1 incurs the fewest number of LINEARITY(L,V) violations. By ranking REALIZE-MORPH above LINEARITY(L,V) and MAX-H we can ensure that the **L** tone is moved into the segmental input just enough to be realized on V1, overwriting a H̲ tone if necessary. This is illustrated in the tableau in (118).

(118) **L** prefix overwrites singly-linked lexical H tone

	L H L H túmì**ráá**	REALIZE-MORPH	LINEARITY(L,V)	MAX-H
a.	☞ **L L H** túmì**ráá**		*	*
b.	**H L H** túmì**ráá**	*! W	L	L

Since doubly-linked initial H tones are not affected by the **L** prefix, I assume that they are protected by special faithfulness constraints ranked above REALIZE-MORPH. In particular, I assume that they are protected by MAX-H(LONG) (119), which prevents doubly-linked H tones from deleting, and IDENT-LONG(H) (94b), which prevents a tone that is doubly-linked in the input from surfacing on just one output vowel. The latter prevents a **H** tone that is doubly-linked in the input from de-linking from one vowel so that **L** can associate to it. The ability of these two constraints to block the realization of **L** is illustrated in (120).

(119) MAX-H(LONG) Any H tone linked to two vowels in the input must have a correspondent in the output

(120) Geminate **H** tones are not affected by the affixation of **L**

	L H L H mútúmìráá	MAX-H(LONG)	IDENT-LONG(H)	REALIZE-MORPH	LIN(L,V)	MAX-H
a.	☞ H L H mútúmìráá			*		
b.	L L H mùtumìráá	*! W		L	* W	* W
c.	L H L H mùtúmìráá		*! W	L	* W	* W

In cases where the *na-* is present, no tonal overwriting needs to occur in order for **L** to surface: it simply surfaces on the vowel provided by *na*. This is shown in (121) and (122).

(121) **L** associates with toneless vowel of *na-*, if available (form with no OM)

	L H L H natúmìráá	MAX-H (LONG)	IDENT-LONG(H)	REALIZE-MORPH	LINEARITY(L,V)	MAX-H
a.	☞ L H L H natúmìráá				*	
b.	H L H natúmìráá			*! W	L	

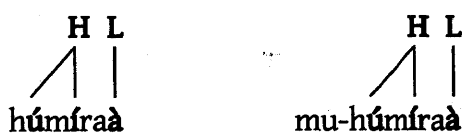
(122) L associates with toneless vowel of *na-*, if available (form with OM)

	L H̲ L H namu̲tu̲mìráá	MAX-H (LONG)	IDENT-LONG(H)	REALIZE-MORPH	LINEARITY(L,V)	MAX-H
a.	☞ L H̲ L H nàmu̲tu̲mìráá				*	
b.	H̲ L H namu̲tu̲mìráá			*! W	L	

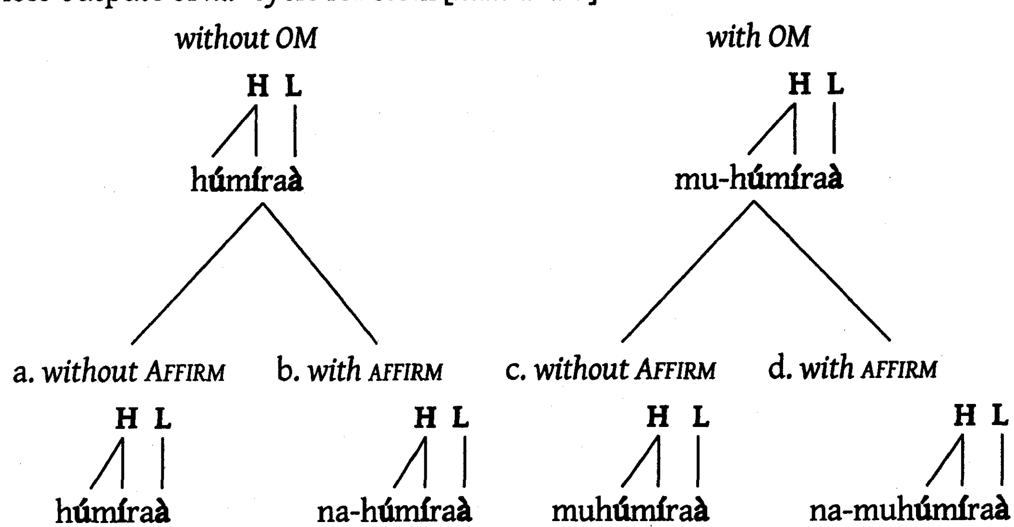
This analysis predicts correct results in forms with toneless stems as well. Recall that the possible outputs of the Macrostem stratum for toneless stems that have been assigned Complex tone are as in (123), so that the possible outputs of the *na-* cycle are as in (124).

(123) Possible outputs of Macrostem stratum for stem [*hum-ir-a-a*]

a. *without OM* b. *with OM*



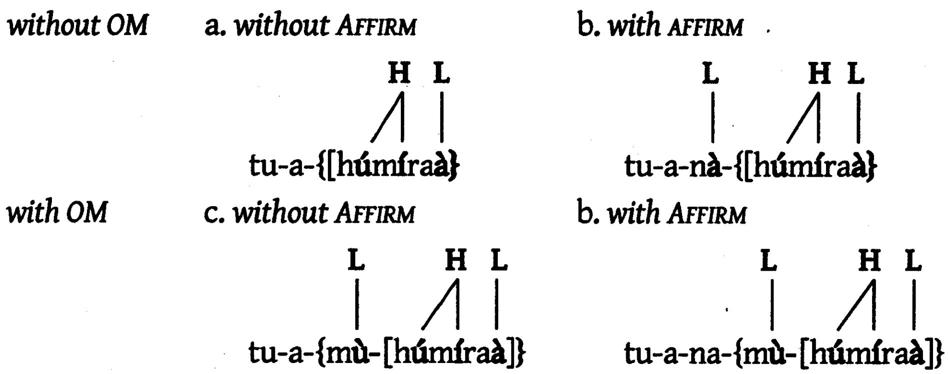
(124) Possible outputs of *na-* cycle for stem [*hum-ir-a-a*]



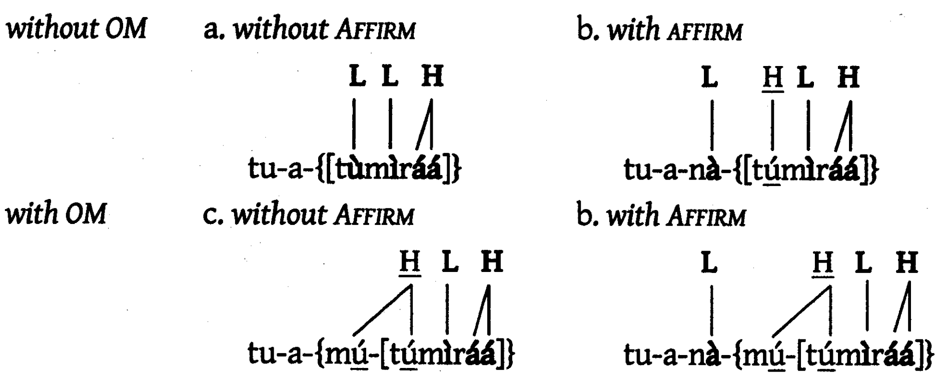
As shown above, forms with toneless stems never show an initial singly-linked H tone at the time of **L** tone assignment. If neither an OM or *na-* are prefixed to the stem, then a doubly-linked **H** tone will occur at the stem's left edge, and this will block the assignment of **L**. If either an OM or *na-* (or both) are prefixed to the stem, there is guaranteed to be at least one toneless vowel to which **L** can associate. Therefore, we correctly predict that there is never any tone suppression in toneless forms (though see ch. 2, section 5.2).

After the prefixation of **L**, addition inflectional prefixes (TAM, SM, FOC/NEG) are evaluated, but these evaluations involve just the concatenation of input and output material. At the end of the VU stratum, then, we have the potential outputs in (125) and (126) below, assuming prefixation of the past tense prefix *-a-* and the 1st plural SM *tu-*.

(125) Potential outputs of VU stratum (toneless stems)



(126) Potential outputs of VU stratum (toneless stems)



Above, (125a) and (126c) lack **L** tones, since **L** is blocked by a doubly-linked **H** tone which is initial when **L** is assigned (i.e. before *-a-* or *tu-* are evaluated). In (126a), **L** has overwritten a singly-linked H̲ tone that was initial when **L** was assigned. In all other forms, **L** surfaces on a vowel that was toneless when **L** was assigned.

The constraint ranking for the VU stratum is presented in (127).

(127) Constraint hierarchy for the verbal unit stratum

MAX-H(LONG) IDENT-LONG(H)

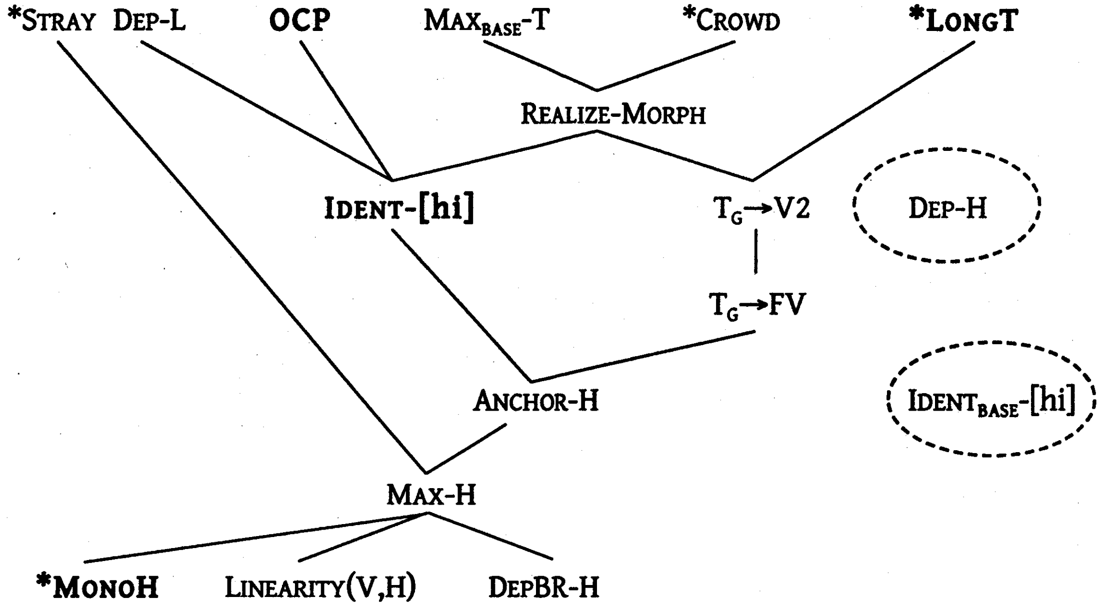
REALIZE-MORPH

MAX-H LINEARITY(L,V)

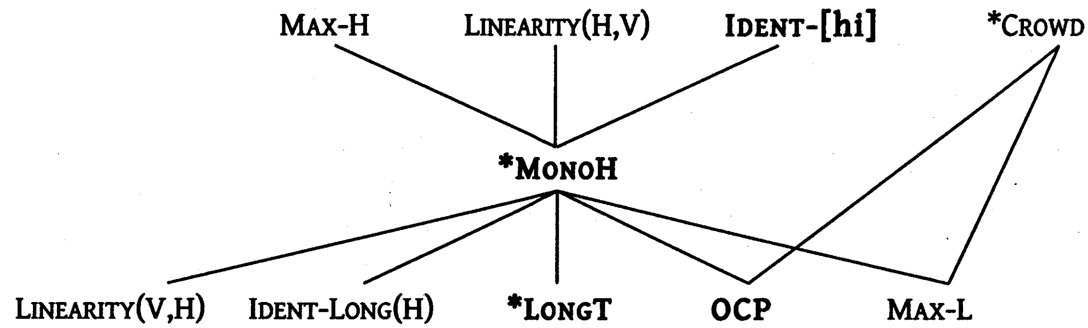
6 Analysis summary

In the preceding sections, I have proposed that as the morphemes of the verb are evaluated one by one, successively larger verbal constituents are evaluated. When morphemes within the Stem stratum are evaluated, the verb is submitted to the constraint hierarchy in (128). When morphemes within the Macrostem stratum are evaluated, the verb is submitted to the constraint hierarchy in (129). And when morphemes within the VU stratum are evaluated, the verb is submitted to the constraint hierarchy in (130).

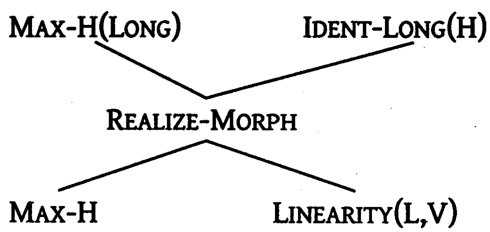
(128) Stem-level Constraint Hierarchy (final)



(129) Macrostem stratum grammar (final)



(130) VU Stratum Constraint Hierarchy



We can review the effects of this stratal grammar by following the derivation of two stems, one toneless and one H-toned, from the beginning of the phonology to the end.

6.1 Derivation of forms with [*hum-ir-a-a*]

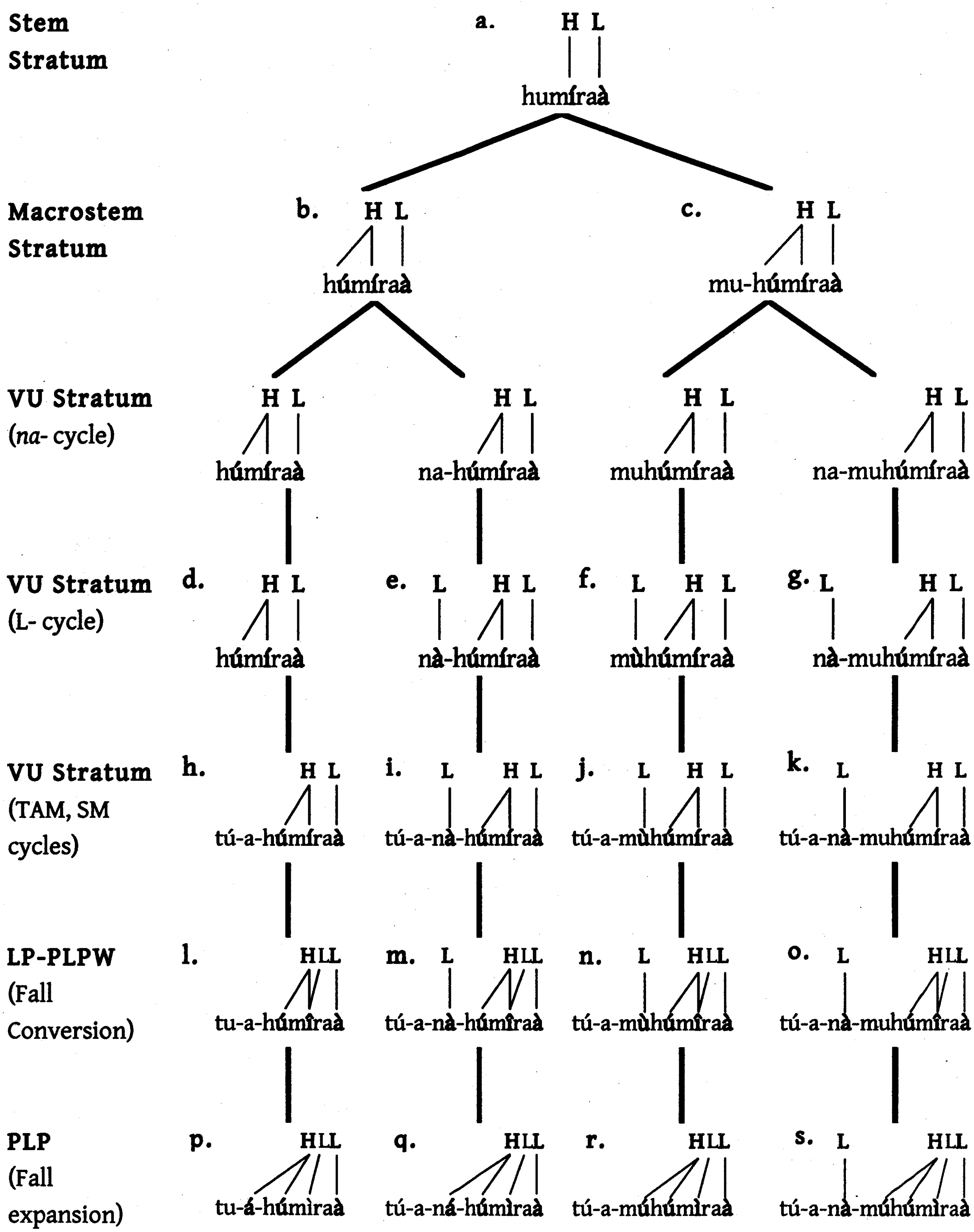
In the stem stratum, when the toneless stem [*hum-ir-a-a*] is assigned the first of two grammatical **H** tones, a ranking of T_G→V2 above NONINITIALH attracts the **H** to the stem's second vowel, even though high tones are normally confined to the stem-initial vowel. When the second **H** is assigned, T_G→FV attracts it to the final vowel, while OCP ensures that it lowers to **L** since it is immediately preceded (on the tonal tier) by the **H** on V2. Thus, at the end of the Stem Stratum, the stem [*hum-**í**r-a-**à***] is as in (131a).

In the Macrostem Stratum, the stem may or not be augmented with an OM. Either way, a ranking of *MONOH above LINEARITY(H,V) ensures that the grammatical **H** on the stem's second vowel spreads one vowel to the left on to V1 (131b, 131c).

In the VU stratum, the Macrostem may or may not be augmented with *na*. If a Macrostem that has no OM is not augmented with *na-*, the doubly-linked grammatical **H** tone will be initial when **L** is assigned (131d), and will therefore prevent **L** from surfacing due to the ranking of MAX-H(LONG) above REALIZE-MORPH. If the Macrostem has an OM, or if the Macrostem is augmented by *na-* (131e-g), then **L** will associate freely to the leftmost vowel of its morphological base, which will be toneless. The addition of the TAM and SM morphemes then produces the LP-final forms in (131h-k).

At this point, the lexical phonology (LP) is complete. As described in chapter 2, all **H** tones that emerge from the LP are then converted to falls at the LP-PLP Watershed (131l-o). These falls expand in the Postlexical Phonology (PLP) proper, thus shifting every H̲ and **H** tone one vowel to the left to yield the final forms in (131p-s).

(131) Derivation of verb forms with stem [*hum-ir-a-a*]



6.2 Derivation of forms with [*tú̲m-ir-a-a*]

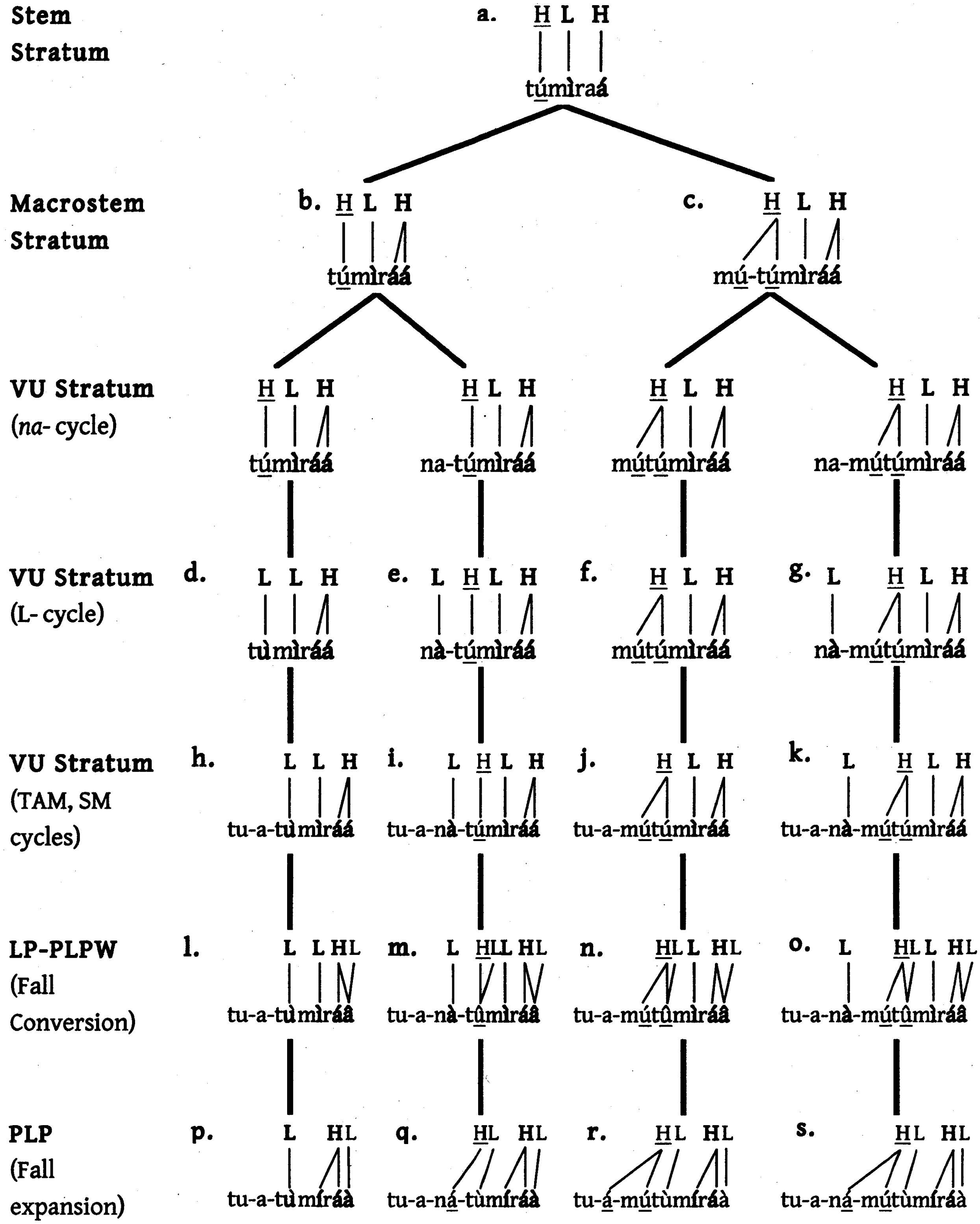
When the H-toned stem [*tú̲m-ir-a-a*] is assigned grammatical **H** tones in the Stem stratum, the first **H** tone is attracted to V2 and lowered to **L** because of the preceding H̲ tone on V1, while the second **H** is attracted to the FV and remains **H**, yielding the output in (132a).

In the Macrostem stratum, there may or may not be an OM to evaluate. If there is not, then only the grammatical **H** tone assigned to FV is able to spread to the left, since the lexical H̲ tone on V1 will have no vowel to its left (132b). If there is an OM, then the lexical H̲ tone on V1 will be able to spread to the left, in addition to the grammatical **H** tone on FV (132c).

In the VU stratum, there may or may not be an affirmative morpheme to evaluate in the *na-* cycle. If there is, then in the subsequent **L** cycle, **L** will be able to associate to the vowel made available by *na-* without difficulty (132e,g). If there is no affirmative morpheme, then whether or not **L** surfaces depends on the presence or absence of the OM. If there is no OM, then a singly-linked lexical H̲ tone will stand at the left edge of the **L**'s morphological base, and will be overwritten by **L** because REALIZE-MORPH ranks above MAX-H (132d). If there is an OM, then the lexical H̲ will still stand at the left edge, but it will be doubly-linked, having spread from the root's first vowel to the object marker in the Macrostem stratum. Since MAX-H(LONG) is ranked above REALIZE-MORPH, this blocks **L** from surfacing (132f). In subsequent cycles, evaluation of TAM and SM morphemes produces the LP-final outputs in (132h-k).

At this point, all L tones which emerge from the LP are converted to falls at the LP-PLP (132l-o). In the postlexical phonology proper, the expansion of these falls yields the final surface forms in (132p-s).

(132) Derivation of verb forms with stem [*túm-ir-a-a*]



6.3 A return to desiderata

In the introduction to this chapter, in (13), I listed a number of properties of Complex tone that required an explanation. With the formal analysis of Complex tone now behind us, let us revisit this list, repeated in (133), and see how each of its items is accounted for.

(133) Effects of Complex tone that must be accounted for.

*Grammatical **H** tones*

a. Assigned in different parts of the stem depending on root tone
b. Absent from H-toned stems with just two vowels
c. When present, systematically doubled (i.e. spread one vowel to the left)
d. Augmented by Spurious H in toneless stems, replaced by Spurious H in H-toned stems

Lexical H̲ tones

e. Deleted when the root is immediately preceded by a subject marker or TAM marker
f. *Not* deleted when the root is preceded by an object marker or *na*

Intonational H_{φ} tones

g. Blocked by L tone that (in forms with Complex tone) is normally placed on final vowel
h. Not blocked in forms with passive or causative suffixes

According to the analysis laid out in this chapter, the first two of these properties are actually misidentified. Grammatical **H** tones are *not* assigned in different parts of the stem depending on root tone (133a), and they are not completely absent from H-toned stems with just two vowels (133b). They are always assigned in the same two positions – V2 and FV – and vary only in where they actually surface as **H** tones. In toneless stems, when **H** tones are assigned to both V2 and FV, the first remains **H** while the second lowers due to the OCP; this creates the appearance that a **H** tone is assigned only to the left edge of the stem (134a). In H-toned stems, the **H** tone assigned to V2 lowers due to the preceding lexical H̲ tone on V1, while the **H** tone assigned to FV surfaces faithfully; this creates the appearance that a H tone is assigned only to the right edge of the stem (134b). Similarly, in H-toned stems with just two vowels, a **H** tone *is* assigned, and only appears not to be because it must lower to **L** due to the OCP (134c).

(134) OCP-based lowering creates appearance of tonal movement (a,b) or tonal deletion (c)

a. toneless stems (H on V2, **H→L** on FV)

Stem (before **H**s assigned)	[hum-ir-a-a]
1st **H** cycle	[hum-ír-a-a]
2nd **H** cycle	[hum-ír-a-**à**]
Tone Doubling, Leftward Shift ...	...
Near-Surface (without coalescence, boundary tones)	tu-**á**-[h**ú**mìra**à**]
Surface (with coalescence, $H_φ$ and $L_ι$)	tw-**á**-[h**úm** ir**à**:]

b. H-toned Stems (H̲ on V1, **H→L** on V2, **H** on FV)

Stem (before **Hs** assigned)	[tú̲m-ir-a-a]
1st **H** cycle	[tú̲m-**ì**r-a-a]
2nd **H** cycle	[tú̲m-**ì**r-a-**á**]
Tone Doubling, Lexical H̲ Suppression, Leftward Shift ...	
Near-Surface (without coalescence, boundary tones)	tu-a-[tum**í**r**áà**]
Surface (with coalescence, $H_φ$ and $L_ι$)	tw-a-[tumírâ:]

c. H-toned stems with only 2 vowels (H̲ on V1, **H→L** on V2)

Stem (before **Hs** assigned)	[tú̲m-a]
1st **H** cycle	[tú̲m-**à**]
2nd **H** cycle	--- (2nd **H** deletes)
Tone Doubling, Lexical H̲ Suppression, Leftward Shift ...	
Near-Surface (without coalescence, boundary tones)	tu-a-[tum**à**]
Surface (with coalescence, $H_φ$ and $L_ι$)	tw-a-[tum**à**]

The fact that two grammatical **H** tones are assigned to the Stem in forms with Complex tone also explains why these forms systematically block intonational $H_φ$ tones (133g): one way or another, they always end up with a final **L** tone on the FV when $H_φ$ is assigned. In toneless stems, the mechanism by which a **L** tone occurs on the FV is fairly direct: as stated above, the grammatical **H** tone assigned to FV lowers to **L** in the Stem stratum, and stays there for the rest of the derivation (see, for example, all derivations in (131)). In H-toned stems, the mechanism is somewhat more indirect: a **L** tone is inserted onto the FV when the final **H** tone assigned there undergoes Fall Conversion at the LP-PLP Watershed (see, for example, all derivations in (132)).

The assignment of two grammatical **H** tones also explains the occurrence of Spurious H tones in forms with passive and causative suffixes, why these spurious H tones appear to supplement normally assigned grammatical **H** tones in toneless stems but replace them in H-toned stems (133d), and why forms that are assigned Spurious H tones do not block H_{φ}. I argued above that in forms with Complex tone, Spurious H tones arise when the *second* grammatical **H** tone is exceptionally attracted to the vowel of the passive or causative suffix instead of the final vowel, and that in this position, it is exceptionally immune both from OCP-based lowering and Macrostem doubling. In toneless stems, the second **H** tone's immunity from lowering results in a stem where both the first and second **H** tones actually surface as **H**, giving the appearance that the Spurious H tone *supplements* the normally assigned grammatical tone. In H-toned stems, however, the second **H** tone's immunity from lowering does not cause two grammatical **H** tones to surface within the stem, since the first grammatical **H** on V2 will still be lowered by the preceding lexical $\underline{H}$ tone on V1. This creates the appearance in H-toned stems that the Spurious H tone simply replaces the normally assigned grammatical **H** tones. Moreover, in both types of stems, the fact that the second **H** is attracted to the passive or causative suffix instead of the final vowel means that no grammatical tone is assigned to the latter, which explains the re-emergence of H_{φ} in these forms (133h).

(135) Spurious H = 2nd **H** tone attracted to passive or causative suffix rather than FV

a. toneless stems with causative *-is-į*: 1st **H** on V2, 2nd **H** on *-į* immune from lowering

Stem (before **H**s)	[hum-is-a-į-a]	
1st H cycle	[hum-ís-a-į-a]	
2nd **H** cycle	[hum-ís-a-**į́**-a]	
Tone Doubling, Leftward Shift		
Near-Surface (w/o contraction, H_{φ} or L_{ι})	tu-**á**-[h**ú**m-ìs-**á**-į̀-a]	
Surface (with contraction, H_{φ} and L_{ι})	tw-**á**-[h**úm**-is-**á**-y-â]	'we made X hit'

b. H-toned stems with causative *-is-į*: 1st **H→L** on V2, 2nd **H** on *-į*

Stem (before **H**s)	[tú̲m-is-a-į-a]	
1st **H** cycle	[tú̲m-ìs-a-į-a]	
2nd **H** cycle	[tú̲m-ìs-a-**į́**-a]	
Tone Doubling, H̲ Suppression, Leftward Shift ...		
Near-Surface (w/o contraction, H_{φ}, L_{ι})	tu-a-[tum-ìs-**á**-į̀-a]	
Surface (with contraction, H_{φ} and L_{ι})	tw-a-[tum-ìs-**á**-y-â]	'we made X send'

All of the properties of Complex tone accounted for so far have stemmed from the assignment of two grammatical **H** tones in the Stem stratum. Two more – the fact that lexical H̲ tones are suppressed when the root is immediately preceded by a TAM marker or a SM (133e), but not when the root is immediately preceded by the affirmative marker *na-* or an OM (133f), derive from the assignment of a **L** tone prefix in the VU stratum. This prefixal **L** tone is able to overwrite a lexical H̲ tone just in case the verb root is preceded neither by *na-* nor an OM. This is because this is the one case where H̲ is singly-linked at the left edge of the L tone's morphological base, so that it both (a) *can* be overwritten by **L** and (b) must be overwritten by **L** for the tonal prefix to be realized.

Finally, we found the last property of Complex tone to be accounted for – the fact that all grammatical H tones spread one vowel to the left (133c) – turned out not to be a property of Complex tone at all; it results from the fact that all H tones (lexical and grammatical) spread one vowel to the left if they can at the Macrostem stratum.

Two final goals of the analysis were (a) to account for the "unity" of the Complex tone effects in (133) – i.e. the fact that if a verb shows one effect, it also shows the others – and (b) to account for opaque interactions between processes. In the analysis proposed in this chapter, the unity is assumed to be ultimately syntactic in nature: Complex tone expresses clause type. I propose that this syntactic feature is expressed in the morphology through three separate tonal morphemes, i.e. the two **H** tone suffixes and the **L** tone prefix. How exactly this single syntactic feature is expressed in this distributed manner requires more work to resolve; it should be noted, however, that this problem would hardly be unique in Bantu verbal exponence. As we will see in the next chapter, inflectional features such as past tense are frequently expressed using combinations of morphemes distributed throughout the verb form (e.g. TAM prefixes and desinence suffixes).

Finally, opaque interactions between processes – such as the fact that the placement of grammatical **H** tones is conditioned by a lexical tone contrast that may not survive on the surface – are handled purely through ordering. When one phonological process renders another opaque, it occurs later because it applies within a larger morphological domain.

7 Previous analyses of Complex tone

The analysis of Complex tone developed on this chapter draws substantially from previous work on Kinande, including that of Hyman and Valinande (1985), Mutaka (1994), and Black (1995). In 7.1-7.3, I very briefly summarize each of these analyses in turn, and note elements that I have incorporated into my own analysis. In 7.4, I then discuss one major area of difference: the status of Bracket Erasure. A major advantage of the analysis proposed in this chapter is that it respects Bracket Erasure, and is thereby able to predict the generalization that if one process applies after another it also applies within a larger domain. Previous analyses – even those developed within the theory of Lexical Phonology – have not been able to respect Bracket Erasure. In 7.4, then, I identify the main analytical choices that have prevented them from doing so.

7.1 Hyman and Valinande (1985)

Hyman and Valinande (henceforth H&V) propose that verbs with Complex tone bear an underlying **H** tone on the FV which is assigned by the morphology. From this underlying H tone, the full pattern of Complex tone arises through the four rules paraphrased in (136).

(136) Tone Rules of Hyman and Valinande (paraphrased)

d.	High Tone Shift (HTS)	If V1 is toneless, shift a H tone from the FV to V2, and leave a L tone in its place.
e.	Root H Deletion (RHD)	Delete any <u>H</u> tone preceded by a TAM marker or a subject marker[33,34]
f.	H Tone Anticipation (HTA)	Shift every H tone one vowel to the left, and leave a L tone in its place.
g.	High Tone Doubling (HTD)	Spread a grammatical **H** tone one vowel to the left[35]

[33] Hyman and Valinande state this rule very differently, stating that a root H tone deletes if it is initial within a posited morphological "foot" that is preceded by "any pre-initial morphemes preceding the SM, the SM, and *some* tense markers" (emphasis mine). In effect, this is the same as saying that a root H tone deletes if it is preceded by a SM or by a "pre-foot" tense marker, as opposed to a foot internal one. I argue in chapter 5 that all elements that Hyman and Valinande consider to be foot-internal tense markers are actually auxiliary stems, so that "pre-foot tense markers" may be simplified to just "tense markers," resulting in the formulation in (136b).

[34] Note that this rule is *not* explicitly conditioned by tone in any way, even though we have seen that only forms with Complex tone undergo lexical H tone deletion. This non-tonal formulation is possible because according to Hyman and Valinande's analysis, the forms that receive Complex tone are exactly those in which the root is directly preceded by a subject marker or a "foot-external" tense marker. All forms that lack Complex tone (coincidentally) possess a foot-*internal* tense marker, so that the structural description of (their original formulation of) Root H Deletion is never met (see note 33).

[35] Hyman and Valinande state this rule very differently (cf. H&V, p. 253), but it has the effects paraphrased here.

In (137) and (138) below, I show how the application of these rules derives the correct surface forms for verbs with toneless and H-toned long (i.e. > 2V) stems, with and without object markers. In (138), I use a doubled underline to mark a putative underlying H tone which is claimed by H&V to belong to an OM before a H-toned root; this is their explanation for Object Tone Doubling.

(137) Derivation of Complex tone in verbs with toneless stems (H&V 1985)

		without OM	with OM
a.	Underlying	H tu-a-[hum-ir-a-**á**]	H tu-a-mu-[hum-ir-a-**á**]
b.	High Tone Shift	H L tu-a-[hum-ír-a-à]	H L tu-a-mu-[hum-ír-a-à]
c.	Root H Deletion	--- (no root H)	--- (no root H)
d.	High Tone Anticipation	H L L tu-a-[húm-ìr-a-à]	H L L tu-a-mu-[húm-ìr-a-à]
e.	High Tone Doubling	H L L tu-**á**-[húm-ìr-a-à]	H L L tu-a-**mú**-[húm-ìr-a-à]

(138) Derivation of Complex tone in verbs with H-toned stems (H&V 1985)

		without OM	with OM
a.	Underlying	H̲ H tu-a-[tú̲m-ir-a-**á**]	H̲ H̲ H tu-a-mú̲-[tú̲m-ir-a-**á**]
b.	High Tone Shift	--- (no shift: H on V1)	--- (no shift: H on V1)
c.	Root H Deletion	H tu-a-[tum-ir-a-**á**]	--- (no deletion: H̲ not preceded by SM or TAM)

d.	High Tone Anticipation	H L tu-a-[tum-ir-**á**-à]	H H L H L tu-á-mú-[tùm-ir-**á**-à]
e.	High Tone Doubling	H L tu-a-[tum-ír-**á**-à]	H H L H L tu-á-mú-[tùm-ír-**á**-à]

In (139), I show the derivation of short H-toned stems. This illustrates the application of one additional rule: Final H Deletion (FHD), which lowers a final H to L if it is immediately preceded by a H tone.

(139) Derivation of short H-toned stem

a.	Underlying	H H tu-anga-[túm-**á**]
b.	Final H Deletion	H L tu-anga-[túm-à]
c.	High Tone Shift	---
d.	Root H Deletion	L tu-anga-[tum-à]
e.	High Tone Anticipation	---
f.	High Tone Doubling	---

There are two aspects of H&V's analysis that I have adopted in the OT analysis developed here. First, in positing an initial rule of High Tone Shift, which moves a **H** tone from FV to V2 in toneless stems, H&V posit that grammatical **H** tones are initially assigned according to a V2/FV pattern, and shift left by the same mechanisms which shifts lexical H tones to the left. I also adopt this basic assumption, but we will see below that all work in between H&V's analysis and my own does not.

Second, I follow H&V in assuming that Meeussen's Rule (MR) plays a key role in the early phonology of Kinande, lowering a **H** tone to **L** after another **H** tone. In H&V's analysis, MR appears as the Final H Deletion rule, which has only a local effect; in my analysis, I generalize MR to apply non-locally as well.

7.2 Mutaka (1994)

The analysis of Mutaka (1994) differs from that of H&V in two fundamental ways. First, Mutaka rejects the idea, central to both H&V's analysis and my own, that grammatical **H** tones are initially assigned according to a V2/FV pattern and subsequently shifted leftwards by the same process that shifts lexical H̲ tones. In his analysis, grammatical **H** tones do not undergo synchronic anticipation at all, but are instead assigned directly to either V1 or the Penult. Second, Mutaka proposes a stratal analysis, in which the effects of Complex tone are derived over three strata: a cyclic Macrostem stratum (stratum 1), a noncyclic Word stratum (stratum 2), and a postlexical stratum (stratum 3). I summarize the effects of these strata below.

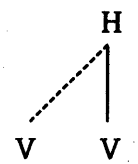
At least so far as tone is concerned, the only responsibility of the Macrostem stratum is to ensure that lexical H̲ tones, which Mutaka assumes to be underlyingly floating, are associated to the root-initial vowel. This occurs in the first cycle, when H̲ tones are associated to the root-initial vowel by automatic left-to-right association conventions (Pulleyblank 1986: p. 11); future cycles simply add additional Macrostem-internal affixes.

(140) Stratum 1: Cyclic evaluation of Macrostem

	{[hum-ir-a-a]}	*{mu-[hum-ir-a-a]}*	*{[túm-ir-a-a]}*	*{mu-[túm-ir-a-a]}*
INPUT	hum	hum	tu̲m, H	tu̲m, H
ROOT	hum	hum	tú̲m	tú̲m
APP	hum-ir	hum-ir	tú̲m-ir	tú̲m-ir
DES 1	humir-a	humir-a	tú̲mir-a	tú̲mir-a
DES 2	humira-a	humira-a	tú̲mira-a	tú̲mira-a
OM	---	mu-humiraa	---	mu-tú̲miraa

The first rules which pertain specifically to Complex tone apply in Strata 2, in which all inflectional prefixes are added to the Macrostem. The first of these is Tone Spread, which spreads any lexical H tone on V1 onto the vowel of the preceding prefix.

(141) Tone Spread[36]



Next, grammatical tones are assigned. Mutaka, like H&V, proposes a 1**H** analysis of Complex tone. Specifically, he proposes that verbs with Complex tone are assigned a grammatical **HL** melody, which is associated to the Stem as in (142) below.

(142) Grammatical Tone Association

a. **L** associates to the *rightmost* vowel (FV)
b. **H** associates to the *leftmost* vowel (V1) if this is not occupied by another tone
c. Otherwise, **H** associates as rightmost as possible (Penult)

---

[36] Tone *spread* is the first step of leftward *shift*, of which the second part is Delinking (144). However, Delinking does not occur immediately after Tone Spread, but is instead delayed until after the assignment of grammatical **H** tones (143). This allows Mutaka to reconcile two apparently contradictory ordering requirements. On the one hand, lexical H tones must shift *before* grammatical **H** tones are assigned, if tone shift is to be formulated in any general (i.e. non-diacritically sensitive) way. This is because, as mentioned above, Mutaka assumes that grammatical **H** tones do *not* undergo synchronic shift, but are instead assigned directly to positions (V1 and Penult) that are shifted in comparison to other related languages. On the other hand, lexical H tones must shift *after* grammatical tone assignment, since the presence or absence of a lexical H tone on V1 is crucial to determining what edge of the stem grammatical **H** tones are assigned to. The analysis of tone shift as a staggered Spreading + Delinking sequence resolves this paradox. The *Spread* part of shift affects lexical H tones but not grammatical **H** tones because it applies before grammatical **H** tones are assigned, while still allowing the lexical H tone to remain on V1 to condition grammatical tone assignment. The *Delinking* part of shift affects lexical H tones but not grammatical **H** tones because when it applies, only lexical H tones are multiply linked. We therefore end up, in effect, with a shift rule that affects only lexical H tones.

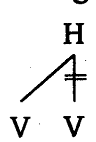
The effects of Grammatical Tone Association (GTA) in toneless and H-toned stems are illustrated in (143). Note that when GTA applies, lexical H tones are associated both the first vowel of a H-toned root and with the first vowel before it; this is the result of Tone Doubling (see note 36 above).

(143) Grammatical Tone Association (GTA)

a.	Floating L associates to FV	HL tu-a-[hum-ir-a-**à**]	H HL tu-á [túm-ir-a-**à**]
b.	Floating **H** associates to V1, if possible	HL tu-a-[h**ú**m-ir-a-**à**]	--- (H on V1)
c.	Floating **H** associates to the Penult	--- no floating **H**	H H L tu-á-[túm-ir-**á**-**à**]

Immediately after grammatical H tone assignment, Delinking (144) occurs. Its application renders GTA opaque, since it delinks the lexical H tone whose presence on V1 forces a grammatical **H** tone to associate to the penultimate vowel in H-toned stems.

(144) Delinking



The last rule to apply in Stratum 2 is Pre-Macrostem H Deletion (145). Its effect is to delete a lexical H tone that has shifted (via Spreading and Delinking) onto a morpheme which lies outside of the Macrostem (e.g. TAM or a SM). It is therefore essentially equivalent to the Root H Deletion rule of H&V, modified so as to apply after tone shift.

(145) Pre-Macrostem H Deletion (Mutaka 1994, p. 78)[37]

H → Ø
|
V { (OM) [Root ... $]_{Stem}$ $\}_{Macrostem}$

Condition: Applies only in tenses where **HL** melody is assigned.

The only remaining rule is Macrostem Spreading, which spreads every Macrostem-internal H tone one vowel to the left. Mutaka posits that this rule applies within Stratum 3.

(146) Macrostem Spreading

H (linked to V_2; dotted association line to V_1)

V_1 V_2

Condition: V_2 is Macrostem-internal

The interaction of all these rules is illustrated in (147) and (148) below. Here, I provide derivations for toneless and H-toned stems, with and without object markers. The inputs to these derivations are the Stratum 1 outputs in (140), augmented with morphology introduced in Stratum 2 (i.e. inflectional prefixes and **HL** tones).

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[37] One problem with this rule concerns the affirmative morpheme *na-*. Since *na-* lies outside the Macrostem, the rule incorrectly predicts that a lexical H tone that shifts onto *na-* should be deleted. To correct for this, Mutaka (1995) posits that in Stratum 2, *na-* is prosodically incorporated into the Macrostem. However, because lexical H tones associated with *na-* do not undergo Macrostem Spreading (146) at Stratum 3, Mutaka must posit that *na-* is prosodically excluded from the Macrostem at Stratum 3.

(147) Derivations of verbs with toneless stems (Mutaka 1994)

a.	Input (Stratum 1 Phonology + Stratum 2 Morphology)	HL tu-a-{[humiraa]}	HL tu-a-{mu-[humiraa]}	
b.	Leftward Spread	---	---	Stratum 2
c.	Grammatical Tone Association	H L tu-a-{[h**ú**mira**à**]}	H L tu-a-{mu-[h**ú**mira**à**]}	
d.	Delinking	---	---	
e.	Pre-Macrostem H Deletion	---	---	
f.	Macrostem Doubling	H L tu-**á**-{[h**ú**mira**à**]}	H L tu-a-{m**ú**-[h**ú**mira**à**]}	Stratum 3

(148) Derivations of verbs with H-toned stems (Mutaka 1994)

a.	Input (Stratum 1 Phonology + Stratum 2 Morphology)	H HL tu-a-{[túmiraa]}	H HL tu-a-{mu-[túmiraa]}	
b.	Leftward Spread	H HL tu-á-{[túmiraa]}	H HL tu-a-{mú-[túmiraa]}	Stratum 2
c.	Grammatical Tone Association	H HL tu-á-{[túmir**áà**]}	H HL tu-a-{mú-[túmir**áà**]}	
d.	Delinking	H HL tu-á-{[tumir**áà**]}	H HL tu-a-{mú-[tumir**áà**]}	
e.	Pre-Macrostem H Deletion	HL tu-a-{[tumir**áà**]}	--- (All Hs in Macrostem)	
f.	Macrostem Doubling	HL tu-a-{[tum**í**r**áà**]}	H HL tu-á-{mú-[tum**í**r**áà**]}	Stratum 3

A major insight of Mutaka's analysis, which I incorporate into my own, is the recognition that Object Tone Doubling and Grammatical Tone Doubling both result from the same leftward spreading process, which crucially targets the Macrostem. Mutaka's recognition that the object marker and the Stem form an important morphological and phonological domain in Bantu is crucial the workings of the analysis proposed here.[38]

Another nominal point of similarity between our analyses, of course, is that we both adopt an analysis that is "stratal." However, the stratal grammars that we assume are quite different, and achieve rather different results. I discuss this at greater length in 7.4.

7.3 Black (1995)

The analysis of Black (1995) is similar to Mutaka's in many ways. Like Mutaka, Black assumes (a) that lexical <u>H</u> tones are underlyingly floating, (b) that grammatical **H** tones are initially assigned according to a V1/Penult pattern and (c) that a rule of Macrostem Doubling is responsible both for Object Tone Doubling and for Grammatical Tone Doubling. Despite these similarities, however, Black's analysis departs from Mutaka's in a number of interesting ways.

First, in Black's analysis, there is no synchronic process of leftward shift at all. While Mutaka posits that lexical <u>H</u> tones first associate with V1 and then shift leftwards onto a prefix vowel, Black posits that they are directly assigned to the first vowel before the stem according to the Stem Tone Association Rule (STAR) in (149).

[38] Though the term "Macrostem" is widely used, its provenance is seldom acknowledged. So far as I am able to determine, Mutaka (1990/1994) is the first to use this term in print, though Goldsmith and Sabimana (1989) posit the existence of a "Suprastem" in their analysis of the Kirundi verb. Mutaka (p.c.) credits Goldsmith with the coining of the word.

(149) Stem Tone Association Rule

$$\begin{array}{lll} & [\,\underline{H}\ldots &]_{Stem} \\ & / & \\ V & [\,V\ldots &]_{Stem} \end{array}$$

Second, Black assumes that the entire verb has the morphological organization in (150) below, which contains three major domains: the Stem, the Macrostem, and INFL, a domain which consists of all pre-Macrostem morphemes.

(150) $(\ \{\ \text{SM} + \text{TAM}\ \}_{\text{INFL}}\ \{\ \text{OM}\ [\ \text{Root} + \text{Suffix} + \text{Des}]_{\text{Stem}}\ \}_{\text{Macrostem}}\ )_{\text{Verb}}$

Black posits that these domains are evaluated in order of increasing size: the Stem is evaluated before the Macrostem, and the Macrostem and INFL are evaluated independently before they are evaluated together as part of a larger word. Within this framework, Black proposes that grammatical **H** tones should be analyzed as *boundary tones* to the Stem, which are assigned as soon as the Stem constituent is evaluated.[39]

This point is related to a third innovation of Black's analysis. She posits that boundary tones are responsible not just for the appearance of grammatical **H** tones within the stem, but also for the suppression of lexical $\underline{H}$ tones. Specifically, she posits that a **L** boundary tone assigned to the last vowel of INFL prevents lexical $\underline{H}$ tones from being assigned by STAR just in case INFL (rather than *na-* or an object marker) immediately precedes the root.[40]

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[39] This means that in Black's analysis, grammatical **H** tones are assigned much earlier than in Mutaka's. Indeed, in this analysis, grammatical **H** tones must be assigned before lexical $\underline{H}$ tones; while the former are assigned as soon as the Stem is evaluated, the latter cannot apply until the entire word is evaluated, since the STAR in (149) cannot apply until there is pre-Stem material that $\underline{H}$ can be associated to.

[40] It is not clear where *na* fits in in this analysis; Black considers it to lie outside of INFL, but it cannot be part of the Macrostem because H tones assigned to *na* do not double. See note 37 for a similar issue with Mutaka's analysis.

These assumptions collectively lead to a radically simplified derivation of Complex tone involving just three steps. This is shown first for H-toned stems in (151) below. In the first step, which takes place when INFL and the Stem/Macrostem are evaluated independently, a HL boundary tone sequence is assigned within the Stem and a final L boundary tone is assigned within INFL (151a). In the second step, the STAR attempts to associate the lexical H tone of the root to the first vowel before the stem. This is successful in forms with an object marker, since in these forms the first vowel before the stem is not the last vowel of INFL, with its L boundary tone. In vowels without an object marker, however, the first vowel before the Stem *is* the last vowel of INFL, so that its final L boundary tone blocks the application of STAR (151b). In the third and last step, all tones which associate within the Macrostem undergo leftward doubling, which has the power to overwrite the boundary L of INFL even while STAR does not (151c).

(151) Derivation of forms with H-toned stems, with and without object markers

a.	Stem, Macrostem, INFL	HL in Stem L in INFL	{ L}{[H H L]} {tu-angà}{[tumiránà]}	{ L}{ [H H L]} {tu-angà}{mu[tumiránà]}
b.	Verb Unit	Stem Tone Association Rule	--- (blocked by INFL L)	{ L}{ [H H L]} ({tu-angà}{mú[tumiránà]})
c.		Macrostem Doubling	{ L} {[H L]} ({tu-angà}{[tumíránà]})	{ }{ [H H L]} ({tu-angá}{mú[tumiránà]})

The derivation in (152) illustrates the analysis with toneless stems. Here, the main difference is simply how HL is assigned within the Stem according to the edge-in algorithm, and the fact that no lexical H tone is assigned by STAR.

(152) Derivation of forms with toneless stems, with and without object markers

a.	Stem, Macrostem, INFL	HL in Stem L in INFL	{ L}{[H L]} {tu-angà}{[húmiranà]}	{ L}{ [H L]} {tu-angà}{mu[húmiranà]}
b.	Word	Stem Tone Association Rule	--- (no root H)	--- (no root H)
c.		Macrostem Doubling	{ }{[H L]} ({tu-angá}{[húmíranà]})	{ L}{ [H L]} ({tu-angà}{mú[húmiranà]})

It is from this analysis that I adopt the idea that lexical H tones are overwritten by prefixal **L** tones. While Black assumes that the job of these **L** tones is to block the realization of H, I assume that they actively overwrite H tones so that they themselves can be realized.

7.4 Bracket erasure and stratality

A key property of the analysis developed in this chapter is that processes which refer to specific morphological domains apply as soon as those domains are first evaluated. First, grammatical **H** tone assignment, which refers to positions within the Stem, applies within the Stem stratum. Second, leftward doubling, which targets Macrostem-internal vowels, applies within the Macrostem stratum. Third, lexical H tone suppression, whose application is conditioned by which inflectional morphemes precede the stem, applies within the Verbal Unit stratum.

This property is not shared by the analyses of Mutaka (1994) or Black (1995), though both of these analyses adopt the basic stratal framework of Lexical Phonology (Kiparsky 1982; Mohanan 1982). For example, in the analyses of both Black and Mutaka, the rule of Macrostem Spreading applies only when the full Verbal Unit is evaluated. The rule must therefore look inside an internal domain constructed in a previous evaluation.

There are two main reasons why this is necessary in these analyses. First is the assumption that grammatical **H** tones are assigned according to a V1/Penult pattern. If a grammatical **H** tone is assigned to V1, then Macrostem Spreading must apply only upon the evaluation of the full Verbal Unit because it needs to be able to spread a **H** tone leftwards onto a preceding inflectional prefix, as in *tu-á-[húm-a-à]*. By contrast, if grammatical **H** tones are assigned to V2, then Macrostem spreading need only spread a tone from V2 to V1 – an obviously Macrostem-internal process.

The second reason why these analyses are not able to respect Bracket Erasure is that they posit that the leftward shift of lexical H̲ tones (either via Mutaka's Spreading+Delinking sequence or via Black's STAR) happens before Macrostem Doubling within the lexical phonology. As a result, in forms with object markers, Macrostem Doubling must double a H̲ tone from the first vowel of the Macrostem to the first vowel *before* the Macrostem. Once again, this prevents Macrostem Doubling from applying as soon as the Macrostem is constructed. By contrast, in the present analysis, where leftward shift is postlexical, the lexical process of Macrostem Doubling simply doubles a H̲ tone from V1 to the object marker – again, a Macrostem-internal operation.

Since this ordering of operations allows us to achieve the desirable result of allowing all phonological operations to apply without needing to explicitly reference morphological boundaries, this provides an additional, theory-internal reason to support the general claim that leftward shift in Kinande is uniformly a postlexical process, regardless of whether it occurs between words or within them.

8 Conclusion

In this chapter, I have argued that the lexical phonology of Kinande is organized stratally, with smaller morphological constituents evaluated before larger ones, potentially according to different constraint rankings. This has allowed us to account for two opaque tonal interactions. First, even though grammatical tone *placement* crucially relies on the fact that the OCP bans adjacent **H** tones on the tonal tier, grammatical tone *spreading* is able to bring H tones into contact with one another. In section 4.2, I argued that this was due to *constraint reranking*, specifically a reranking between IDENT-H and OCP in the transition from the Stem-level grammar to the Macrostem-level grammar. Second, the presence or absence of a lexical **H** tone is able to condition where grammatical **H** tones surface within the verb stem, even if the lexical tone itself does not surface. I have accounted for this through *cyclic evaluation*: since the grammatical **L** tone prefix which overwrites a lexical H̲ is not introduced until the Verbal Unit stratum, it cannot affect the earlier Stem-level conditioning of grammatical tone assignment by lexical tones.

Crucially, according to the analysis developed here, both of these opaque interactions result when a process applying within a *larger* domain takes place *after* a process applying within a smaller domain. This fact provides strong support in favor of cyclic evaluation constrained by Bracket Erasure, which predicts exactly this result.

5 Tone and Morphological Structure in Finite Verbs

1 Introduction

In this chapter, I present a new analysis of the tone patterns of finite verbs in Kinande, which leads to a radical simplification in their phonological descriptions as well as a deeper understanding of their morphology. We will see that once the tone patterns of finite verbs are properly understood, the arbitrarily ordered templatic morphology which characterizes most existing descriptions of Kinande verbal structure gives way to a highly structured system, in which the order of verbal elements, as well as their phonological properties, are largely predictable. This lays the groundwork for a more insightful analysis of the Kinande TAM system, and provides greater insight into how exactly this system, noted for its extreme degree of morphological complexity, relates to those of other Bantu languages.

The central data of this chapter concern the two tone patterns whose analysis has been the primary focus of previous chapters: *Simple tone* and *Complex tone*. Since their properties are both intricate and crucial to the discussion to follow, they are summarized for easy reference in (1) and (2) below, and exemplified in the forms in (3)-(5).

(1) Simple tone[1]

a. *Lexical H̲ tones*

If a verb has a H-toned stem (3b), a lexical H̲ tone appears on the first vowel before it (V0). This H̲ is directly followed (on V1) by a L tone inserted at the LP-PLP watershed.[2]

b. *Intonational tones*

If a verb lies both at the end of a *phonological phrase* (φ) and at the end of a *declarative intonational phrase* ($ι_D$), a $H_φ$ boundary tone surfaces on its penultimate vowel and a $L_ι$ boundary tone surfaces on its final vowel. If a verb lies in φ-medial position, no boundary tones are assigned, and the last two vowels of the verb are toneless.

(2) Complex tone

a. *Lexical H̲ tones*

If a H-toned root is preceded by either an object marker or the affirmative prefix *na-*, its lexical H̲ tone will surface just as in forms with Simple tone (4d-f). However, if neither an object marker nor *na-* are present, the realization of H̲ is suppressed. This is because in this case, the H̲ tone is overwritten upon the assignment of a **L** tone prefix (5d-f).

b. *Intonational tones*

$H_φ$ does *not* occur on the penultimate vowel when the verb is in $ι_D$-final position, because its assignment is blocked by a final low tone (4a-f, 5a-f). This low tone may be a lowered grammatical **H** tone, or it may be a L tone inserted at the LP-PLP watershed (cf. 2c). Either way, for verbs with Complex tone, φ-medial and $ι_D$-final realizations are identical.

c. *Grammatical **H** and **L** tones*

Toneless stems: A doubly-linked grammatical **H** tone surfaces on the first vowel of the stem and the first vowel before the stem (4abc, 5abc). It is followed, on the second vowel of the stem (V2), by a L tone inserted at the LP-PLP watershed. A grammatical **L** tones surfaces on the final vowel; it is underlyingly **H**, but lowers due to the OCP.

H-toned stems: A grammatical **L** tone is assigned to V2; it is underlyingly **H**, but lowers due to the OCP.[3] If the stem has at least three vowels, a doubly-linked grammatical **H** tone surfaces on its penultimate and antepenultimate vowels (4de, 5de). When present, this **H** is followed, on FV, by a L tone inserted at the LP-PLP watershed. If the stem has only two vowels, the only grammatical tone is assigned is the **L** on V2 (4f,5f).

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[1] The generalizations in (1) and (2) properly describe not *surface* forms, but the inputs to vowel contraction. In addition, they ignore the possibility that a stem's FV might bear a H tone originating from its right.

[2] This L tone may be overwritten by a H tone shifting from the right, e.g. $H_φ$ shifting from the FV in (3b); cf. Ch. 3.

[3] In stems with four vowels or fewer, this **L** tone will be overwritten by the **H** grammatical tone associated to the penultimate and antepenultimate vowels.

(3) Simple tone: infinitive forms[4]

		φ-medial	ι_D-final	Gloss
a.	*toneless stem*	e-ri-[hum-a]	e-ri-[hűm-ȁ]	'to hit'
b.	*H-toned stem*	e-rí̲-[tùm-a]	e-rí̲-[tűm-ȁ]	'to send'

(4) Complex tone: Finite verbs containing affirmative *na-*

	toneless stem	**φ-medial**	**ι-final**	**Gloss**
a.	Recent Past	tu-a-n**á**-[húm-à-**à**]	tu-a-n**á**-[húm-à-ȁ]	'we *did* hit (recently)'
b.	Present Stative	tu-Ø-n**á**-[lúh-ɟr**è**]	tu-Ø-n**á**-[lúh-ɟrȅ]	'we *are* tired'
c.	Potential	tu-anga-n**á**-[húm-à]	tu-anga-n**á**-[húm-ȁ]	'we can hit'
	H-toned stem	**φ-medial**	**ι-final**	**Gloss**
d.	Recent Past	tu-a-ná̲-[túm-**á**-à]	tu-a-ná̲-[túm-**á**-ȁ]	'we *did* send (recently)'
e.	Present Stative	tu-Ø-ná̲-[ts**é**m-ɟrè]	tu-Ø-ná̲-[ts**é**m-ɟrȅ]	'we *are* happy'
f.	Potential	tu-anga-ná̲-[tùm-**à**]	tu-anga-ná̲-[tùm-ȁ]	'we can send'

(5) Complex tone: Finite verbs without object markers or affirmative *na-*

	toneless stem	**φ-medial**	**ι-final**	**Gloss**
a.	Recent Past	tu-**á**-[húm-à-**à**]	tu-**á**-[húm-à-ȁ]	'we hit (recently)'
b.	Present Stative	t**ú**-Ø-[lúh-ɟr**è**]	t**ú**-Ø-[lúh-ɟrȅ]	'we are tired'
c.	Potential	tu-ang**á**-[húm-à]	tu-ang**á**-[húm-ȁ]	'we could hit'
	H-toned stem	**φ-medial**	**ι-final**	**Gloss**
d.	Recent Past	tu-a-[túm-**á**-à]	tu-a-[túm-**á**-ȁ]	'we sent (recently)'
e.	Present Stative	tu-Ø-[ts**é**m-ɟrè]	tu-Ø-[ts**é**m-ɟrȅ]	'we are happy'
f.	Potential	tu-anga-[tùm-**à**]	tu-anga-[tùm-ȁ]	'we could send'

The central empirical question this chapter focuses on is how Simple tone and Complex tone are distributed throughout the Kinande verb system. In previous work on this question, the unanimous view has been that within the set of finite indicative verbs, some verbs – such

[4] In all forms, the following conventions are used to help distinguish different types of tones:

- Underlined with acute accent (e.g. á̲): Lexical H̲ tones
- Bold with acute or grave accent (e.g. **á** or **à**): All grammatical **H** and **L** tones, including suffixal **H** tones which surface as **H**, suffixal **H** tones which lower to **L** due to the OCP, and prefixal **L** tones
- Double accute accent (e.g. a̋): H_φ boundary tone (importantly: *not* an extra-high tone)
- Double grave accent (e.g. ȁ): L_ι boundary tone
- Normal typeface with grave accent (e.g. à): L tone introduced in LP-PLP Watershed. These always occur in the original locations of shifted H̲ or **H** tones (cf. chapter 2).

as those just seen in (4) and (5) – receive Complex tone, while others – like the Immediate Past and Present Imperfective forms in (6) – receive Simple tone (Hyman and Valinande 1985; Mutaka 1994; Black 1995).

(6) Putative Simple tone in finite verbs

	toneless stem	**φ-medial**	**ι-final**	**Gloss**
a.	Imm. Past	tu-á-má-[hum-a]	tu-á-mâ-[hű̃m-ȁ]	'we just hit'
b.	Pres. Imperfective	tu-ká-[hum-a-a]	tu-ká-[hum-ấ-ȁ]	'we hit, we are hitters'
	H-toned stem	**φ-medial**	**ι-final**	**Gloss**
c.	Immediate Past	tu-á-má̲-[tùm-a]	tu-á-má̲-[tűm-ȁ]	'we just sent'
d.	Pres. Imperfective	tu-ká̲-[tùm-a-a]	tu-ká̲-[tùm-ấ-ȁ]	'we send, we are senders'

This supposed split is based on the fact that forms like those in (6) show many of the same tonal properties as infinitives: they (a) show a penultimate H_{φ} boundary tone in ι-final position, (b) invariably realize lexical H̲ tones on the first vowel before the verb root (even in the absence of an OM or *na-*), and (c) appear to lack grammatical **H** tones.

A central claim of this chapter is that despite initial appearances, the distinction between "Complex tone verbs" and "Simple tone verbs" within the finite indicative verb system is illusory. *All* finite indicative verbs are assigned Complex tone, and the large tonal differences between the verbs in (6) and those in (4) and (5) are due solely to differences in their *morphological structures*. In particular, verbs which transparently show Complex tone, like those in (4) and (5), contain *single* verb stems, while verbs that appear to show Simple tone, like those in (6), contain *multiple* verb stems, some of which have been previously misidentified as monomorphemic tense/aspect/mood (TAM) markers. The reason why these latter verbs superficially appear to lack Complex tone is that in forms with multiple stems, the grammatical **H** and **L** tones associated with Complex tone affect only the *first* stem, which is generally reduced (by regular contraction processes) to a single syllable. As a result, in these forms, the presence of Complex tone appears on the surface to be no more than the idiosyncratic tone of a TAM marker.

Consider, for example, the Present Imperfective, seen above in (6b,d). It appears to be defined by a combination of a TAM prefix *-ká-*, a desinence *-a-a*, and Simple Tone. According to this description, the tone on the TAM prefix is quite unusual: while almost every other tone in Kinande appears one vowel to the left of its underlying or initially assigned position, the tone of *-ká-* appears to have remained on its underlying sponsor. Different authors have proposed a range of explanations for this: Hyman and Valinande (1985) posit that only tones originating within a restricted morphological domain are subject to leftward tone shift, and that *-ká-* lies outside of this domain; Mutaka (1994: pp. 51-52) suggests that *-ká-* is exempt from leftward tone shift due to diacritic marking; and Black (1995) proposes that the H tone of *-ká-* does not shift because it is underlyingly linked to an input vowel, whereas (in her analysis) tones that do shift are underlyingly floating. Thus, all of these authors are forced to complicate the analysis of Kinande tone in order to account for the mysterious tonal properties of *-ká-*.

However, the mystery surrounding the apparently "fixed" H tone of *-ká-* disappears completely once we recognize two key facts. First, *-ká-* is not a simple TAM prefix, but rather an *auxiliary stem* which consists underlyingly of the H-toned root *-ká̱-* and the desinence *-a-a*. Second, although *-ká̱-* is underlyingly H-toned, the "fixed" high tone which surfaces on it is *not* a lexical H̱ tone. Instead, it is the surface manifestation of *grammatical* **H** tones that are assigned throughout the auxiliary stem [*ká̱-a-a*], and subsequently subjected to hiatus-induced contraction. According to this analysis, the tone of the Present Imperfective arises through the derivation in (7), which follows the analysis of Complex tone developed in chapter 4.

(7) Reanalysis of Present Imperfective

Stem Stratum					
a.	Cycles prior to tone assignment			[ká-a-a]	[hum-a-a]
b.	1st **H** cycle			[ká-**à**-a]	[hum-a-a]
c.	2nd **H** cycle			[ká-**à**-**á**]	[hum-a-a]
Macrostem Stratum					
d.	Stratum-final evaluation (Leftward Spread)			[ká-**á**-**á**]	[hum-a-a]
Verbal Unit Stratum					
e.	**L** cycle (H tone suppression)			[k**à**-**á**-**á**]	[hum-a-a]
f.	TAM cycle		Ø	[k**à**-**á**-**á**]	[hum-a-a]
g.	SM cycle	tú	Ø	[k**à**-**á**-**á**]	[hum-a-a]
Postlexical					
h.	LP-PLP Watershed (Fall Conversion)	tû	Ø	[k**à**-**á**-**â**]	[hum-a-a]
i.	φ-Level (Fall Expansion, H_φ Assignment)	tù	Ø	[k**á**-**á**-**à**]	[hum-a-a̋]
j.	ι-Level (L_ι Assignment, H_φ Shift)	tù	Ø	[k**á**-**á**-**à**]	[hum-a̋-ȁ]
k.	υ-Level (Vowel Contraction)	tù		[k**á**]	[humâ]

We begin, in the Stem stratum, with two separate stems: the auxiliary stem [*ká-a-a*] and the main stem [*hum-a-a*] (7a). Two grammatical **H** tones are assigned to the first of these stems according to the standard V2/FV pattern: a grammatical **H** tone assigned to V2 is immediately lowered because of the preceding lexical H tone of *ká* (7b), leaving the second grammatical **H** tone to surface faithfully on the FV (7c). In the Macrostem stratum (7d), this **H** tone spreads one vowel to the left, overwriting the L on V2. In the VU stratum, the lexical H tone of the root *ká* is overwritten as the **L** tone prefix described in (2a) is evaluated (7e), prior to the evaluation of the null TAM marker (7f) and the SM *tú-* (7g). At the end of the Lexical Phonology, then, we have an auxiliary stem [k**à**-**á**-**á**], with a grammatical **L** tone on V1 and a doubly-linked **H** tone associated with the penultimate and final vowels. After Fall Conversion (7h) and Fall Expansion (7i) causes this doubly-linked **H** tone to shift to the left, we have exactly the standard surface tone pattern for a H-toned stem with Complex tone: penultimate and antepenultimate **H** tones and a final L tone (cf. 2c): [ká-á-à]. When this stem undergoes vowel contraction before the low-toned syllable [hu], we obtain the single H-toned syllable [ká] seen on the surface (7k), due to tonal absorption (ch. 2, section 2.2.2). Meanwhile, in the following main stem, the absence of grammatical tones permits the free assignment of all intonational boundary tones (7i, 7j), so that H_{φ} surfaces on the penultimate vowel and L_{ι} surfaces on the final vowel.

Obviously, this derivation appears to be more complicated than one which simply stipulates that a TAM marker *ká* exceptionally bears a fixed H tone. Crucially, however, all of the complexity inherent in this derivation comes for free: we need nothing beyond what we already need in order to analyze the more obvious cases of Complex tone assignment seen in chapter 4. By contrast, the "simplicity" gained by a fixed-H hypothesis comes at a considerable expense: a problematic enrichment in the inventory of tonal types (i.e. the addition of "fixed" H tones which are immune to leftward tone shift), and a concomitant loss of generality in the application of phonological rules.

Moreover, we will see throughout this chapter that the decompositional approach to verbal morphology and tone just illustrated with the Present Imperfective can be extended to *all* finite indicative verb forms in Kinande. That is, all finite indicative verbs which appear to assign Simple Tone will be shown, upon closer analysis, simply to show Complex tone that is obscured by complex morphological structure. The picture of the verbal system that we will be left with then, is one where the morphology is somewhat more complex (though more structured) than that traditionally supposed, but where the phonology is entirely regular.

The rest of chapter will proceed as follows. In section 2, I provide a brief overview of the finite indicative verbs of Kinande, providing general information about their meaning and the tone patterns that they are assigned. I then use this data in section 3 to make two initial arguments that pre-stem H tones in verbs that putatively receive Simple tone (henceforth, "Simple tone verbs") are actually grammatical **H** tones resulting from the assignment of Complex tone. This provides some initial evidence that pre-stem elements in Simple tone verbs are not mere morphemes but rather verb *stems*, since verb stems are the normal targets of grammatical **H** tone assignment. Further support for this idea is provided in section 4. Here, I show that certain "optional TAM prefixes" must actually be analyzed as *optional auxiliary stems*, whose final desinences crucially vary according to TAM, just like the main verb stem. Since these optional auxiliary stems show exactly the same tonal properties as several of the TAM-defining prefixes in Simple tone verbs, this lays the groundwork for analyzing the latter as verb stems as well. This is the subject of section 5. Here, I analyze the inflectional elements that appear in Simple tone verbs, and show how their tonal properties can be derived from the assignment of Complex tone to well-motivated but phonologically obscured verb stems. These verb stems include auxiliary verb stems like those considered in section 4, but also copular verb stems which participate in *copula + locative verbal noun* constructions, and other verb stems which participate in *inflected verb + infinitive verb* constructions. In section 6, I conclude by discussing the ways in which this phonological reanalysis simplifies our view of Kinande's morphological system, and helps to clarify its relation to those of other Bantu languages.

2 Overview of the finite verb system

Kinande verbs express different combinations of tense, aspect, mood, polarity and clause type through different combinations of stem-external *prefixes*, stem-internal *desinences*[5], and *tone*. Following other work in Bantu inflectional morphology (e.g. Marlo and Odden 2007), I will refer to each such combination as a *tense*, even when its purpose is convey aspectual or

[5] I use the somewhat dated term *desinence* so that I can have a single word that refers both to single suffixes like *-a* and suffix combinations like *-ɪr-e* and *-a-a*.

modal information rather than temporal information. In this section, I provide an overview of what I consider to be the core tenses of the Kinande verb system – the affirmative (i.e. non-negative) verbs that appear in matrix clauses – so that individual tenses considered in the course of later discussion may be placed within their larger context.[6]

As we will see, Matrix Clause Affirmative (MCA) forms express a wide range of temporal, aspectual, and modal distinctions. However, only one of these is ever encoded in any given verb form. Thus, forms that express tense proper (e.g. the Recent Past in (4a) and (5a)) are interpreted by default as perfective, while forms that express aspect (e.g. the Imperfective in (6b)) are interpreted by default as present. This is shown most clearly by the steps one must take in order to express both tense and aspect at the same time. To express non-perfective aspect with a non-present time, one must use multiple verbs, each of which shows its own TAM morphology and subject marker. This can be done by expressing *tense* in an inflected copula, and then expressing aspect in either a following finite verb or a following imperfective participle. These possibilities are exemplified below in (8) and (9), respectively; in these examples, the copular root is H-toned *-bé̱-*, which surfaces as either *-b-* or *-by-* due to vowel contraction.

(8) Copula + Inflected Verb

a.	tu-ká-ndí̱-[b]	í[7]	tu-ki-ná-[húm-à-à]	'we will still be hitting (later today)'
	HODFUT.COPULA	CONN	CONTINUE.HIT	
b.	tu-a-[b']	í	tu-ká-[hum-á̋-à̀]	'we used to hit (recently)'
	FACRECPST.COPULA	CONN	IMPERFECTIVE.HIT	

---

[6] The data presented in this section comes from a number of different sources, and is confirmed by my own work with native speakers. An especially valuable (though difficult to obtain) source of information on Kinande tense forms is Musubaho (1982). Other helpful sources include Valinande (1984), Mutaka (1994), and Mutaka and Kavutirwaki (2011).

[7] This "connective" morpheme links two inflected verbs in Copula + Verb constructions. I assume that its H tone originates from the following subject marker (see note 10).

(9) Copula + Participle Construction

a. tu-a-[by-á] tú-ka-[hṹm-ȁ][8] 'we were hitting (recently)'
FACREMPST.BE IMPVPART.HIT

Since each tense expresses just one inflectional category, it makes sense to divide the tenses of Kinande into those that express aspect, those that express tense proper, and those that express mood. In the sections to follow, each of these are discussed in turn.

2.1 Aspectual forms

In the chart in (10) below, I present the core MCA tenses that express aspect. For expository reasons, I describe each verb with a template that follows the traditional view of the Kinande verb system. Thus, all material intervening between the SM and the main Stem is presented as a sequence of TAM markers, and verb stems are treated as taking either Simple or Complex tone. If they are viewed as taking Complex tone, their main stems are marked (in their templatic representations) with superscripted **H-H** suffixes and a **L** prefix; if they are viewed as taking Simple tone, their main stems are unmarked.

Below each template, the tense is exemplified with actual verb forms. The first of these contains a toneless verb root (either *-hum-* 'hit' or *-luh-* 'be tired') while the second contains a H-toned root (either *-túm-* 'send' or *-tsém-* 'be happy'). All forms contain the first plural SM *tu-*, which surfaces as *tw-* before a vowel. Finally, all examples are given in ɩ-final position. This allows us to easily confirm a form's tone pattern: those with penultimate H_φ show Simple tone, while those with no penultimate H_φ show Complex tone.

[8] This participle is similar in form to the MCA Imperfective in (1b), but is tonally distinct and has the desinence *-a* instead of *-a-a*. The tonal difference derives from the fact that the MCA form shows (obscured) Complex tone while the participial form does not. The H tone which surfaces on the SM *tu-* in the participle is the lexical H tone of the auxiliary root *-ká-* which, in MCA forms, is always suppressed.

(10) Present Tense Aspectual Forms

a. Perfective	SM-*á-mâ*-[ROOT-*a*]	
	tw-á-mâ-[hű́m-ȁ]	'we hit (this instant)'
	tw-á-má̲-[tű́m-ȁ]	'we send (this instant)'
b. Imperfective	SM-*ká*-[ROOT-*a-a*]	
	tu-ká-[hum-ấ-ȁ]	'we are hitting, we habitually hit'
	tu-ká̲-[tum-ấ-ȁ]	'we are hitting, we habitually send'
c. Inceptive	SM-*limu*-[ROOT-*a*]	
	tu-limu-[hű́m-ȁ]	'we are starting to hit'
	tu-limú̲-[tű́m-ȁ]	'we are starting to send'
d. Progressive Emphatic	SM-*nému*-[ROOT-*a*]	
	tu-nému-[hű́m-ȁ]	'we're hitting now/we *are* hitting'
	tu-némú̲-[tű́m-ȁ]	'we're sending now/we *are* sending'
e. Stative	SM-*Ø*-^{L}[ROOT-*ɟre*]$^{H-H}$	
	tú-[l**ú**h-ɟr**è**]	'we are tired'
	tu-[ts**é**m-ʄrè]	'we are happy'
f. Recent Perfect/Stative	SM-*a*-^{L}[ROOT-*ɟre*]$^{H-H}$	
	tw-**á**-[l**ú**h-ɟr**è**]	'we've been tired for a little while'
	tw-a-[ts**é**m-ʄrè]	'we've been happy for a little while'
g. Remote Perfect/Stative	SM-*a*-[ROOT-*ɟre*]^{L}	
	tw-a-[luh-ɟr**è**]	'we've been tired for a long time'
	tw-á̲-[tsem-ɟr**è**]	'we've been happy for a long time'
h. Persistive (Actions)	SM-*ki-na*-^{L}[ROOT-*a-a*]$^{H-H}$	
	tu-ki-n**á**-[h**ú**mà**à**]	'we are still hitting'
	tu-ki-ná̲-[t**ú**m**á**à]	we are still sending'
i. Persistive (States)	SM-*ki-na*-^{L}[ROOT-*ɟre*]$^{H-H}$	
	tu-ki-n**á**-[l**ú**h-ɟr**è**]	'we are still tired'
	tu-ki-ná̲-[ts**é**m-ʄrè]	'we are still happy'
j. Limitative (Actions)	SM-*ki*-^{L}[ROOT-*a-a*]$^{H-H}$	
	tu-kí-[h**ú**m-à-**à**]	'all that we continue to do is hit'
	tu-ki-[t**ú**m-**á**-à]	'all that we continue to do is send'

k.	Limitative	SM-*ki*-^{L}[Root-*ɟre*]$^{H\text{-}H}$	
	(States)	tu-kɨ́-[lúh-ɟrè]	'all that we are now is tired'
		tu-ki-[tsém-ɟrè]	'all that we are now is happy'
l.	Gnostic	SM-*Ø*-^{L}[Root-*a*]$^{H\text{-}H}$	
	(used mainly in	tú-[húmà]	'we hit'
	proverbs)	tu-[tùmà]	'we send'

Though the chart is mostly self-explanatory, a few notes on some forms may be helpful. First, as I have attempted to convey in the glosses, both the Persistive (10h,i) and Limitative (10j,k) tenses express continuation of a past action or state, but differ in how the present state compares to the past one. The Persistive asserts only that an action/state was ongoing in the past, and that it continues into the present. The Limitative implies a diminution; the action/state was somehow greater in the past than in the present. Thus, the sentence *tu-kɨ́-[húm-à-à] Kábirâ* 'we are still hitting Kabira' might be used in a situation where we used to hit many people, but now hit only Kabira, while *nyi-ki-[wɟt'] e-bi-ryató bi-sấtù* 'I have three shoes' might be used in a situation where one has three shoes now, but used to have eight.[9]

Second, although the Recent and Remote Perfect/Stative forms (10f,g) refer to times other than the present, they are nevertheless aspectual rather than temporal: they primarily express that a state is currently ongoing, and then provide additional information about when that state began. Phonologically, the Recent and Remote Perfect/Stative forms differ only in tone. While the Recent form is assigned Complex tone, the Remote form is assigned a different tone pattern, which it shares only with the Factual Remote Past form in (13d). Like the Complex tone pattern, this "Remote" tone pattern (which was briefly discussed in chapter 4 in the discussion of Spurious tone) prevents the realization of H_{φ}, and so may be inferred to

[9] The pre-contraction form of the verb in this sentence is tu-Ø-[ú-ɟtè] 'we have', an irregular stative form derived from a H-toned root -*ú*- and the suffix -*ite*. On the use of irregular -*ite*, cf. Mutaka and Kavutirwaki (2011, p. xlvi).

assign a L tone to a verb stem's FV. Unlike the Complex tone pattern, however, it does not assign grammatical **H** tones within the stem, and it does not delete a root's lexical H̲ tone in the absence of an object marker or *na-*. (In fact, it does the exact opposite, deleting a root's H̲ tone only in the *presence* of an object marker or *na-*.) I will not discuss this "Remote" tone pattern any further, but indicate its presence in verb forms by a superscripted L. For more discussion and analysis of this pattern, see Mutaka (1994, Ch. 6) and Black (1995).

Finally, in the template given for the Present Perfective form in (10a), I have marked a H tone over the initial hyphen of *-́mâ-*; this is meant to indicate that a H tone surfaces on whatever morpheme immediately precedes *-́mâ-*, and not just on the *-a-* morpheme which happens to precede it in the example forms. This may be seen clearly when affirmative *-na-* 'indeed' is added to Perfective forms: the results are *tw-a-ná-mâ-hűm-ȁ* 'we have indeed just hit' and *tw-a-ná-má̱-tűm-ȁ* 'we have indeed just sent,' with H surfacing on *-na-* rather than *-a-*.

2.2 Temporal forms

Other than the present tense which is implicitly expressed by all aspectual forms, Kinande verb forms express six different tenses: two futures and four pasts. Let us examine the simpler future forms first. These distinguish between two future times: the *hodiernal* future (i.e. the future of later today) and the *post-hodiernal* future (i.e. the future of tomorrow or later). These forms are plainly derived from Imperfective and Progressive forms; the element *-ndi-* appears to express futurity, while *-sya-* appears to express post-hodiernality. (We will return to these elements – neither of which, I argue, are single morphemes – in sections 4 and 5).

(11) Future forms

a.	Hodiernal Future	SM-*ká-ndi*-[Root-*a*]	
		tu-ká-ndi-[hűm-ȁ]	'we will hit (later today)'
		tu-ká-ndí̱-[tűm-ȁ]	'we will send (later today)'
b.	Post-Hodiernal Future (1)	SM-*ká-ndi-sya*-[Root-*a*]	
		tu-ká-ndi-sya-[hűm-ȁ]	'we will hit (tomorrow or later)'
		tu-ká-ndi-syá̱-[tűm-ȁ]	'we will send (tomorrow or later)'
c.	Post-Hodiernal Future (2)	SM-*ká-sya*-[Root-*a-a*]	
		tu-ká-sya-[hum-a̋-ȁ]	'we will hit (tomorrow or later)'
		tu-ká-syá̱-[tum-a̋-ȁ]	'we will send (tomorrow or later)'
d.	Emphatic Hodiernal Future	SM-*nému-ndi*-[Root-*a*]	
		tu-nému-ndi-[hűm-ȁ]	'we *will* hit (later today)'
		tu-nému-ndí̱-[tűm-ȁ]	'we *will* send (later today)'
e.	Emphatic Post-Hodiernal Future	SM-*nému-ndi-sya*-[Root-*a*]	
		tu-nému-ndi-sya-[hűm-ȁ]	'we *will* hit (tomorrow or later)'
		tu-nému-ndi-syá̱-[tűm-ȁ]	'we *will* send (tomorrow or later)'

Turning now to past forms, we see in (12) and (13) that these distinguish four different times by imposing a subjective recent/remote distinction on top of the hodiernal/post-hodiernal distinction seen in future forms. Thus, we see reference to (a) times located on the same day as the speech time, and considered by the speaker to be relatively recent (b) times located on the same day as the speech time, and considered by the speaker to be relatively remote, (c) times located on some day before the speech time, and considered by the speaker to be relatively recent, and (d) times located on some day before the speech time, and considered by the speaker to be relatively distant. These different times will be respectively referred to as the *immediate* past, the *hodiernal* past, the *recent* past, and the *remote* past.

In addition, we see that different past tense forms are used depending the overall information structure of the sentence. Very roughly, what Valinande (1984) calls an *Informative* past tense is used when the topic of the sentence is the entire verbal predicate, but what he calls a *Factual* past tense is used when the topic of the sentence is a post-verbal object or adjunct. For example, the sentence *Mó-tu-ká-[langir᷅] é-ŋ-gokò* 'We saw a chicken,' with an Informative Hodiernal Past verb, would be a good answer to the question "What did you *do* today?," while *Tú-lya-[langir᷅] é-ŋ-gokò* 'We saw a chicken,' with a Factual Hodiernal Past verb, would be a good response to the question "What did you *see* today?" More work is required on the exact semantic difference between Informative and Factual forms (see Baker (2003), who argues that the pre-SM morpheme *mo* is a focus head, for some discussion of this). In (12) below, I provide the Informative Past forms, and in (13) I provide the Factual forms.

(12) Informative Past Forms

a.	Informative Immediate Past	*mo*-SM-*a-ná-ma-ꜝbi*- [Root-*a*] [10]	
		mó-tw-a-ná-má-bi-[hűm-ȁ]	'we hit (just now)'
		mó-tw-a-ná-má-bí̱-[tűm-ȁ]	'we sent (just now)"
b.	Informative Hodiernal Past	*mo*-SM-*ká*-[Root-*a-a*]	
		mó-tu-ká-[hum-a̋-ȁ]	'we hit (a bit ago today)'
		mó-tu-ká̱-[tum-a̋-ȁ]	'we sent (a bit ago today)'
c.	Informative Recent Past	*mo*-SM-*a*-$^{\text{L}}$[Root-*ịre*]$^{\text{H-H}}$	
		mó-tw-**á**-[h**ú**m-ịr**è**]	'we hit (recently, before today)'
		mó-tw-a-[t**ú**m-ịrè]	'we sent (recently, before today)'
d.	Informative Remote Past	*mo*-SM-*a*-$^{\text{L}}$[Root-*a*]$^{\text{H-H}}$	
		mó-tw-**á**-[h**ú**m-à]	'we hit (long ago)'
		mó-tw-a-[t**ù**m-**à**]	'we sent (long ago)'

[10] Although *mo* always surfaces with a H tone, I assume that this originates from the SM which always follows it. In general, verbal morphemes which precede the SM are almost always H-toned; this includes not just *mo-* but also negative *si-* and counterfactual *nga-* (cf. chapter 3, section 3). However, the latter two morphemes are *not* H-toned when preceding verbs that receive the Remote tone pattern briefly discussed just above in 2.1. This suggests that the morphosyntactic features of a Kinande verb can affect the tone of its subject markers as well as its stem. This phenomenon is well documented in other Bantu languages, e.g. Shona (Odden 1983: 155-160).

(13) Factual Past forms

a.	Factual Immediate Past	SM-*ká-́bi*-[ROOT-*a*]	
		tu-ká-bi-[hű́m-ȁ]	'we hit (just now)'
		tu-ká-bí̲-[tű́m-ȁ]	'we sent (just now)"
b.	Factual Hodiernal Past	SM-́*lya*-[ROOT-*a-a*]	
		tú-lya-[hum-a̋-ȁ]	'we hit (a bit ago today)'
		tú-lyá̲-[tum-a̋-ȁ]	'we sent (a bit ago today)'
c.	Factual Recent Past	SM-*a*-^{L}[ROOT-*a-a*]$^{H\text{-}H}$	
		tw-**á**-[h**ú**m-à-**à**]	'we hit (recently, before today)'
		tw-a-[**tú**m-**á**-à]	'we sent (recently, before today)'
d.	Factual Remote Past	SM-*a*-[ROOT-*a-a*]^{L}	
		tw-a-[hum-a-**à**]	'we hit (long ago)'
		tw-á̲-[tum-a-**à**]	'we sent (long ago)'

2.3 Modal forms

Finally, under the heading of "modal forms" I include two related verb forms which express possibility and advisability. In these forms, I have represented the TAM prefix as monomorphemic -*anga*-, but this may be better analyzed as bimorphemic -*a-nga*-. I know of no evidence that can decide this question one way or the other.

(14) Modal forms

a.	Modal of Possibility	SM-*anga*-na-^{L}[ROOT-*a*]$^{H\text{-}H}$	
		tw-anga-n**á**-[h**ú**mà]	'we can hit'
		tw-anga-ná̲-[tùm-**à**]	'we can send'
b.	Modal of Advisability	SM-*anga*-^{L}[ROOT-*a*]$^{H\text{-}H}$	
		tw-ang**á**-[h**ú**mà]	'we should hit'
		tw-anga-[t**ù**m**à**]	'we should send'

3 Initial evidence for disguised Complex tone

Now that we have surveyed the main MCA tenses of Kinande according to their meanings, it will be helpful to re-organize them according to their tone patterns. In (15), I list all "Complex tone" forms, and in (16) I list all "Simple tone" forms. Within each list, forms are sorted by their initial TAM marker.

(15) Forms that transparently show Complex Tone

a.	Informative Recent Past	*mó*-SM-*a*-$^{\text{L}}$[Root-*įre*]$^{\text{H-H}}$	e.g. mó-tw-**á**-[h**ú**m-į̀r**è**]
b.	Informative Remote Past	*mó*-SM-*a*-$^{\text{L}}$[Root-*a*]$^{\text{H-H}}$	e.g. mó-tw-**á**-[h**ú**m-à]
c.	Recent Perfect/Stative	SM-*a*-$^{\text{L}}$[Root-*įre*]$^{\text{H-H}}$	e.g. tw-**á**-[l**ú**h-į̀r**è**]
d.	Factual Recent Past	SM-*a*-$^{\text{L}}$[Root-*a-a*]$^{\text{H-H}}$	e.g. tw-**á**-[h**ú**m-à-**à**]
e.	Persistive (Actions)	SM-*ki-na*-$^{\text{L}}$[Root-*a-a*]$^{\text{H-H}}$	e.g. tu-ki-n**á**-[h**ú**mà**à**]
f.	Persistive (States)	SM-*ki-na*-$^{\text{L}}$[Root-*įre*]$^{\text{H-H}}$	e.g. tu-ki-n**á**-[l**ú**h-į̀r**è**]
g.	Limitative (Actions)	SM-*ki*-$^{\text{L}}$[Root-*a-a*]$^{\text{H-H}}$	e.g. tu-k**í**-[h**ú**m-à-**à**]
h.	Limitative (States)	SM-*ki*-$^{\text{L}}$[Root-*įre*]$^{\text{H-H}}$	e.g. tu-k**í**-[l**ú**h-į̀r**è**]
i.	Modal of Possibility	SM-*anga-na*-$^{\text{L}}$[Root-*a*]$^{\text{H-H}}$	e.g. tw-anga-n**á**-[h**ú**m-à]
j.	Modal of Advisability	SM-*anga*-$^{\text{L}}$[Root-*a*]$^{\text{H-H}}$	e.g. tw-ang**á**-[h**ú**m-à]
k.	Stative	SM-*Ø*-$^{\text{L}}$[Root-*įre*]$^{\text{H-H}}$	e.g. t**ú**-[l**ú**h-į̀r**è**]
l.	Gnostic	SM-*Ø*-$^{\text{L}}$[Root-*a*]$^{\text{H-H}}$	e.g. t**ú**-[h**ú**mà]

(16) Forms appearing to show Simple Tone

a.	Inform. Immediate Past	*mó*-SM-*a-ná-mâ´bi*-[Root-*a*]	e.g. mó-tw-a-ná-má-bi-[hűm-ȁ]
b.	Perfective	SM-*a´mâ*-[Root-*a*]	e.g. tw-á-mâ-[hűm-ȁ]
c.	Inform. Hodiernal Past	*mó*-SM-*ká*-[Root-*a-a*]	e.g. mó-tu-ká-[hum-a̋-ȁ]
d.	Imperfective	SM-*ká*-[Root-*a-a*]	e.g. tu-ká-[hum-a̋-ȁ]
e.	Factual Immediate Past	SM-*ká´bi*-[Root-*a*]	e.g. tu-ká-bi-[hűm-ȁ]
f.	Hodiernal Future	SM-*ká-ndi*-[Root-*a*]	e.g. tu-ká-ndi-[hűm-ȁ]
g.	Post-Hodiernal Future (1)	SM-*ká-ndi-sya*-[Root-*a*]	e.g. tu-ká-ndi-sya-[hűm-ȁ]
h.	Post-Hodiernal Future (2)	SM-*ká-sya*-[Root-*a-a*]	e.g. tu-ká-sya-[hum-a̋-ȁ]
i.	Inceptive	SM-*limu*-[Root-*a*]	e.g. tu-limu-[hűm-ȁ]

j. Progressive/Emphatic SM-*nému*-[Root-*a*] e.g. tu-nému-[hű́m-ȁ]
k. Emph. Hodiernal Future SM-*nému-ndi*-[Root-*a*] e.g. tu-nému-ndi-[hű́m-ȁ]
l. Emph. Post-Hod. Future SM-*nému-ndi-sya*-[Root-*a*] e.g. tu-nému-ndi-sya-[hű́m-ȁ]
m. Factual Hodiernal Past SM-*́lya*-[Root-*a-a*] e.g. tú-lya-[hum-ā́-ȁ]

When all of the forms are laid out like this, two striking generalizations emerge. First, Complex tone forms and Simple tone forms have nearly complementary sets of initial TAM markers: only the former have *-ki-*, *-anga-*, or *-Ø-*, and only the latter have *-ká-*, *-limu-*, *-nému-*, or *́-lya-*. Only *-a-* is used by both sets of forms, and even here there is complementarity: *-a-* is the *only* TAM morpheme which precedes the stem in Complex tone forms (15c,d), while in Simple tone forms it is always followed by *́-mâ-* (16a,b).

Second, while TAM prefixes in Complex tone forms are *never* associated with any inherent tone of their own, inherent tone is almost *always* observed in the prefixes of Simple tone forms: *-ká-* and *-nému-* appear to have fixed tones that do not shift to the left; *́-lya-* and *́-bi-* appear to have normal, leftward-shifting tones; and *́-má-* appears to have both. The only TAM marker that appears to be toneless is *-limu-*.

This complementarity between H tones within the stem and H tones before the stem is suspicious, and unexpected if Simple tone and Complex tone can be freely assigned to verb forms. However, it falls out automatically from the hypothesis advanced in the introduction: that the H tones which appear within the stem in (15) and the H tones that appear to be associated with TAM prefixes in (16) are actually one and the same.

Further evidence that this idea is correct comes when we look outside of the finite indicative verb system, and examine counterfactual forms. In counterfactual clauses, we find verb forms that are segmentally identical to Main Clause Affirmative (MCA) forms, but tonally distinct. For example, we saw in chapter 4 (section 1.2) that when Complex tone verbs are placed in counterfactual clauses, their Complex tone is lost. This is shown by (a) the absence of grammatical **H** tones within the stem, (b) the absence of lexical H tone suppression and (c) the absence of a final L tone which would otherwise block H_{φ}. We see all of these effects in (17), where we see counterfactual counterparts for many of the Complex tone forms in (15) above.

(17) Counterfactual versions of tenses assigned Complex tones in their MCA forms

a.	Stative	*nga* SM-*Ø*-[Root-*įre*]	
	(cf. 10e)	ngá tu-[luh-į̋rȅ]	'if we were tired'
		ngá tú-[tsem-į̋rȅ]	'if we were happy'
b.	Recent	*nga* SM-*a*-[Root-*įre*]	
	Perfect	ngá tw-a-[luh-į̋rȅ]	'if we had been tired for a little while'
	(cf. 10f)	ngá tw-á-[tsem-į̋rȅ]	'if we had been happy for a little while'
c.	Persistive	*nga* SM-*ki-na*-[Root-*a-a*]	
	Actions	ngá tú-ki-[hum-a̋-ȁ]	'if we were still hitting'
	(cf. 10h)	ngá tú-kí-[tsem-a̋-ȁ]	'if we were still sending'
d.	Persistive	nga SM-*ki-na*-[Root-*įre*]	
	States	ngá tú-ki-na-[luh-į̋rȅ][11]	'if we were still tired'
	(cf. 10i)	ngá tú-ki-ná-[tsem-į̋rȅ]	'if we were still happy'
e.	Factual	*nga* SM-*a*-[Root-*a-a*]	
	Recent Past	ngá tw-a-[hum-a̋-ȁ]	'if we had hit (recently)'
	(cf. 13c)	ngá tw-á-[tum-a̋-ȁ]	'if we had sent (recently)'
f.	Modal	nga SM-anga-[Root-a]	
	(cf. 14a)	ngá tw-anga-[hű́m-ȁ]	'if we could hit'
		ngá tw-angá-[tű́m-ȁ]	'if we could send'

If counterfactuality is indicated by the absence of Complex tone, then we should expect, under the standard view of the Kinande verb system, that the Simple tone verbs in (16)

[11] The H tone which emerges on the vowel before *-ki-* in the counterfactual is unexpected, and I have no satisfactory explanation for it at this time. This would appear to suggest that *-ki-* is underlyingly H-toned, but it is not clear why this H tone would not emerge in forms with Complex tone.

above should not change in counterfactual clauses; if they do not have Complex tone to begin with, the loss of Complex tone should not affect them. However, these forms *do* change. We see this below in (18), where the MCA forms of Simple tone verbs and their Counterfactual counterparts are shown side by side. (Here, glosses are omitted for clarity of presentation.)

(18) MCA vs. Counterfactual forms (where MCA appears to show Simple tone)

		MCA	Counterfactual
a.	Imperfective	SM-*ká*-[Root-*a*-*a*]	*nga* SMˊ-*ka*-[Root-*a*-*a*]
		tu-ká-[hum-a̋-ȁ]	ngá tú-ka-[hum-a̋-ȁ]
		tu-ká̲-[tum-a̋-ȁ]	ngá tú-ká̲-[tum-a̋-ȁ]
b.	Hodiernal Future	SM-*ká-ndi*-[Root-*a*]	*nga* SMˊ-*ka-ndi*-[Root-*a*]
		tu-ká-ndi-[hűm-ȁ]	ngá tú-ka-ndi-[hűm-ȁ]
		tu-ká-ndí̲-[tűm-ȁ]	ngá tú-ka-ndí̲-[tűm-ȁ]
c.	Post-Hodiernal Future (1)	SM-*ká-ndi-sya*-[Root-*a*]	*nga* SMˊ-*ka-ndi-sya*-[Root-*a*]
		tu-ká-ndi-sya-[hűm-ȁ]	ngá tú-ka-ndi-sya-[hűm-ȁ]
		tu-ká-ndi-syá̲-[tűm-ȁ]	ngá tú-ka-ndi-syá̲-[tűm-ȁ]
d.	Post-Hodiernal Future (2)	SM-*ká-sya*-[Root-*a*-*a*]	*nga* SMˊ-*ka-sya*-[Root-*a*-*a*]
		tu-ká-sya-[hum-a̋-ȁ]	ngá tú-ka-sya-[hum-a̋-ȁ]
		tu-ká-syá̲-[tum-a̋-ȁ]	ngá tú-ka-syá̲-[tum-a̋-ȁ]
e.	Factual Immediate Past	SM-*káˊbi*-[Root-*a*]	*nga* SMˊ-*kaˊbi*-[Root-*a*]
		tu-ká-bi-[hűm-ȁ]	tú-ká-bi-[hűm-ȁ]
		tu-ká-bí̲-[tűm-ȁ]	tú-ká-bí̲-[tűm-ȁ]
f.	Progressive Emphatic	SM-*nému*-[Root-*a*]	*nga* SM-*nemu*-[Root-*a*]
		tu-nému-[hűm-ȁ]	ngá tu-nemu-[hűm-ȁ]
		tu-némú̲-[tűm-ȁ]	ngá tu-nemú̲-[tűm-ȁ]
g.	Emphatic Hodiernal Future	SM-*nému-ndi*-[Root-*a*]	*nga* SM-*nemu-ndi*-[Root-*a*]
		tu-nému-ndi-[hűm-ȁ]	ngá tu-nemu-ndi-[hűm-ȁ]
		tu-nému-ndí̲-[tűm-ȁ]	ngá tu-nemu-ndí̲-[tűm-ȁ]
h.	Emphatic Post-Hodiernal Future	SM-*nému-ndi-sya*-[Root-*a*]	*nga* SM-*nemu-ndi-sya*-[Root-*a*]
		tu-nému-ndi-sya-[hűm-ȁ]	ngá tu-nemu-ndi-sya-[hűm-ȁ]
		tu-nému-ndi-syá̲-[tűm-ȁ]	ngá tu-nemu-ndi-syá̲-[tűm-ȁ]

i.	Inceptive	SM-*limu*-[ROOT-*a*]	*nga* SM-*limu*-[ROOT-*a*]
		tu-limu-[hűm-ȁ]	ngá tu-limu-[hűm-ȁ]
		tu-limú̲-[tűm-ȁ]	ngá tu-limú̲-[tűm-ȁ]
j.	Perfective	SM-*a*́-*mâ*-[ROOT-*a*]	*nga* SM-*a*-*ma*-[ROOT-*a*]
		tw-á-mâ-[hűm-ȁ]	ngá tw-a-ma-[hűm-ȁ]
		tw-á-má̲-[tűm-ȁ]	ngá tw-a-má̲-[tűm-ȁ]
k.	Factual Hodiernal Past	SM-́*lya*-[ROOT-*a*-*a*]	*nga* SM-*lya*-[ROOT-*a*-*a*]
		tú-lya-[hum-a̋-ȁ]	ngá tu-lya-[hum-a̋-ȁ]
		tú-lyá̲-[tum-a̋-ȁ]	ngá tu-lyá̲-[tum-a̋-ȁ]

Comparing the MCA and Counterfactual forms above, we find consistent differences in the tone of the *initial TAM marker*. In (18a-e), *-ka-* appears to have a *fixed* H tone in MCA forms, but an *anticipating* H tone in Counterfactual forms. In (18f-h), *-nemu-* appears to have a fixed tone in MCA forms, but *no* tone in Counterfactual forms. In (18j), *-ma-* appears to have both a fixed tone and an anticipating tone in MCA forms, but no tone in Counterfactuals. In (18k) *-lya-* appears to have an anticipating H tone in MCA forms, but no tone in Counterfactuals. Only *-limu-* (18i) has the same shape in both forms, appearing toneless in both.

Given that the difference between MCA forms and Counterfactual forms in (17) clearly involves the presence vs. absence of Complex tone, the simplest explanation for the tonal alternations in (18) is that they also arise from that same difference. That would be possible so long as material before the main stem could realize Complex tone. As it turns out, we have independent evidence that pre-stem material can do exactly this. This is the topic of section 4.

4 Optional auxiliary stems and Complex tone

In addition to the tense-defining TAM prefixes seen in the previous section, there are other pre-stem elements that are described by Valinande (1984) and Mutaka (1994) as *optional*

TAM markers. These can be added to a form in order to augment its meaning, but are never required. In addition, they occur not just in finite forms but also in infinitives. Below, I list these elements, together with (ɩ-final) infinitive forms that contain them.

(19) Non-tense-defining TAM markers

a.	itive	-ya-	'go and X'	e-ri-ya-[hű́m-ȁ]	'to go and hit'
b.	ventive	-sya-	'come and X'	e-ri-sya-[hű́m-ȁ]	'to come and hit'
c.	future	-sya-	'future'	e-ri-sya-[hű́m-ȁ]	'to hit in the future'[12]
e.	initiative	́-ta-	'start by X'	e-rí-ta-[hű́m-ȁ]	'to start by hitting'
d.	repetitive	́-sya-	'repeat X'	e-rí-sya-[hű́m-ȁ]	'to hit again'
f.	completive	́-bi-	'finish X'	e-rí-bi-[hű́m-ȁ]	'to finish hitting'

There are three things to note about the list above. First, one of the elements that can optionally appear in infinitives – future *-sya-* – has already made an appearance as a tense-defining morpheme in the post-hodiernal future forms seen in (11b,c,e). Indeed, one might want to consider *-sya-* to be an optional morpheme in these future forms, since its meaning is entirely compositional. This illustrates the very thin boundary between tense-defining TAM prefixes and optional ones; the latter, it seems, may be rather easily co-opted by the tense system and thereby join the former.

Second, the optional TAM markers fall into two tonal classes. Itive *-ya-*, ventive *-sya-* and future *-sya-* are all underlyingly toneless, since they contribute no H tones to the infinitive forms in which they appear. Completive *́-bi-*, initiative *́-ta-*, and repetitive *́-sya-* are all underlyingly H-toned, since they cause a H tone to surface on the first vowel which precedes them. Thus the optional TAM prefixes appear to show the same range of underlying tone contrasts as verb roots.

[12] Though doubtless historically related, ventive *sya* and future *sya* are synchronically distinct, as shown by the fact that one can combine both in a single *e-ri-sya-sya-[húm-à]* 'to come to hit in the future.'

Third, one of the optional TAM prefixes has an independent life as a fully-fledged verb stem, while another, while not an independent verb stem in its own right, is clearly related to one. First, *-ya-* 'go and X,' also occurs as a free verb stem *[i-a]* → *[y-a]* 'go,' which is seen, for example, in the infinitive *e-ri-[y-a]* 'to go' (Mutaka 1994: p. 111). Second, initiative *ˊta-* is related to the verb stem *[táng-a]*; this is noted by Mutaka and Kavutirwaki (2011, p. 158) in their dictionary entry for the infinitive *e-rí̱-[tàng-a]* 'to start.'

These last two points give us reason to believe that the optional TAM prefixes began life as verb stems. Moreover, all of these prefixes (except *ˊbi-*, to which I will return in 5.3) have exactly the phonological shape – CGV, GV, or CV – that would result from the contraction of a vowel-final verb root followed by the vowel [a].[13] Let us suppose, then, that this is their morphological structure, and that the "optional TAM prefixes" are actually *optional auxiliary stems*. Under this analysis, the data in (19) may be re-cast as in (20) below.

(20) Non-tense-defining TAM markers as auxiliary verb stems

a.	itive	[i-a]	'go and X'	e-ri-[i-a]-[hű̃m-ȁ]	'to go and hit'
b.	ventive	[si-a]	'come and X'	e-ri-[si-a-[hű̃m-ȁ]	'to come and hit'
c.	future	[si-a]	'future'	e-ri-[si-a]-[hű̃m-ȁ]	'to hit in the future'
d.	initiative	[tá̱-a]	'start by X'	e-rí̱-[ta-a]-[hű̃m-ȁ]	'to start by hitting'
e.	repetitive	[sí̱-a]	'repeat X'	e-rí̱-[si-a]-[hű̃m-ȁ]	'to hit again'

Evidence that this analysis is correct – that the optional TAM prefixes *are* in fact verb stems – comes from two sources: tone, and a somewhat bizarre phenomenon involving the desinence *-i̱re*. We will examine each of these in turn.

[13] Valinande (1984) and Mutaka (1994) both analyze elements like *ya* and *sya* as arising from underlying VV sequences, and Mutaka occasionally states (e.g. pp. 108-109) that they are bimorphemic [i-a] and [si-a]. However, there is no indication that he views these morphemes sequences as stems that are morphologically comparable to the primary stem.

4.1 Tonal evidence that optional TAM prefixes are optional auxiliary stems

We just saw that itive *-ya-*, ventive *-sya-* and future *-sya-* are underlyingly toneless, since they contribute no H tones to the infinitive forms in which they appear. They also appear to be toneless in "Simple tone" MCA forms, e.g. in the Hodiernal Future tense.

(21) Toneless optional TAM markers added to Future tense *tu-ká-ndi-[hű̃m-ȁ]* 'we will hit'

a. tu-ká-ndi-ya-[hű̃m-ȁ] 'we will go and hit'
b. tu-ká-ndi-sya-[hű̃m-ȁ] 'we will come and hit'
c. tu-ká-ndi-sya-[hű̃m-ȁ] 'we will hit (tomorrow)'

We also just saw that initiative *-́ta-* and repetitive *-́sya-* are underlyingly H-toned, based on the fact that they place a H tone on the vowel immediately preceding them in infinitive forms. This too, is duplicated in Simple tone forms.

(22) H-toned optional TAM markers added to Future tense tu-ká-ndi-[hű̃m-ȁ] 'we will hit'

a. tu-ká-ndí-ta-[hű̃m-ȁ] 'we will start by hitting'
b. tu-ká-ndí-sya-[hű̃m-ȁ] 'we will hit again'

Naively, then, we expect that this pattern will continue in Complex tone forms. For example, when optional TAM markers combine with the Potential form *tw-angá-[hú́m-à]* 'we could hit,' we expect the resulting forms to be those in (23) below. That is, we expect that a toneless TAM marker should not affect the overall tone pattern of the verb in any way (23a,b,c), and that the only effect of a H-toned TAM marker should be to place its H tone on the first vowel to its left (23d,e).

(23) *Expected* result when "optional TAM markers" are added to *tw-angá-[húm-à]* 'we could hit'

a.	itive	*ya*	*tw-anga-yá-[húm-à]
b.	ventive	*sya*	*tw-anga-syá-[húm-à]
c.	future	*sya*	*tw-anga-syá-[húm-à]
d.	initiative	*-́ta*	*tw-angá-tá-[húm-à]
e.	repetitive	*-́sya*	*tw-angá-syá-[húm-à]

Instead, however, we see the radically different forms in (24), which show a suite of unexpected properties. First, itive *-ya-*, ventive *-sya-* and future *-sya-*, which appeared to be entirely toneless in (19) and (21), now place H tones on the vowels which immediately precede them (24a-c). Second, initiative *-́ta-* and repetitive *-́sya-*, which placed H tones on the preceding vowel in (19) and (21), now do not (24d-e). Third, initiative *-tá-* (but not repetitive *-́sya-*) surfaces with its own falling tone (24d). Fourth, in all forms, grammatical **H** tones which are expected to surface on the first vowel of the stem [*hum-a*] and on the first vowel before the stem do not appear (24a-e). Fifth and finally, in all forms, a L tone which is expected to surface on the final vowel of [*hum-a*] does not appear, so that H_{φ} appears on the penultimate vowel when the verb is in ι-final position (24a-e).

(24) *Actual* result when "optional TAM markers" are added to *tw-angá-*[*húm-à*] 'we could hit'

a.	itive	*ya*	tw-angá-ya-[hű̃m-ȁ]	'we could go and hit'
b.	ventive	*sya*	tw-angá-sya-[hű̃m-ȁ]	'we could come and hit'
c.	future	*sya*	tw-angá-sya-[hű̃m-ȁ]	'we could hit tomorrow'
d.	initiative	*-́ta*	tw-anga-tâ-[hű̃m-ȁ]	'we could start by hitting'
e.	repetitive	*-́sya*	tw-anga-sya-[hű̃m-ȁ]	'we could hit again'

Similarly strange effects are observed when optional TAM prefixes are introduced into Potential forms with H-toned stems, such as *tw-anga-*[*tùm-à*] 'we should send.' Naively, we might expect that after we add an optional TAM prefix, the underlyingly H-toned verb stem [*tú̱m-a*] will (a) continue to show a final **L** tone which blocks H_{φ} and (b) continue to show the effects of lexical H̲ tone suppression, so that its lexical H̲ tone will not surface in the absence of a preceding object marker or *na-* (25a-e).

(25) *Expected* result when "optional TAM markers" are added to *tw-anga-*[***tùm-à***] 'we could send'

a.	itive	*ya*	*tw-anga-ya-[**tùm-à**]
b.	ventive	*sya*	*tw-anga-sya-[**tùm-à**]
c.	future	*sya*	*tw-anga-sya-[**tùm-à**]
d.	initiative	*-́ta*	*tw-angá-ta-[**tùm-à**]
e.	repetitive	*-́sya*	*tw-angá-sya-[**tùm-à**]

However, neither of these expectations are met: once we add an optional TAM prefix, both lexical H̲ tones and H_φ surface freely (26a-e). Meanwhile, the optional TAM prefixes show the same odd properties as in (24): toneless stems place a H tone on the first vowel before them (23a-c), while H-toned stems do not (23d-e).

(26) *Actual* result when "optional TAM markers" are added to *tw-anga-*[*tum-à*] 'we could send'

a.	itive	*ya*	tw-angá-yá̱-[tűm-ȁ]	'we could go and send'
b.	ventive	*sya*	tw-angá-syá̱-[tűm-ȁ]	'we could come and send'
c.	future	*sya*	tw-angá-syá̱-[tűm-ȁ]	'we could send tomorrow'
d.	initiative	*-́ta*	tw-anga-tá̱-[tűm-ȁ]	'we could start by sending'
e.	repetitive	*-́sya*	tw-anga-syá̱-[tűm-ȁ]	'we could send again'

We can summarize all of these effects as follows: the main verb stem loses all symptoms of Complex tone at the exact same time that optional TAM prefixes start showing unusual tonal properties. Since we have already hypothesized that these prefixes are actually optional auxiliary verb stems, let us see how much we can explain simply by assuming that they are assigned the Complex tone patterns that are missing from the main stem.

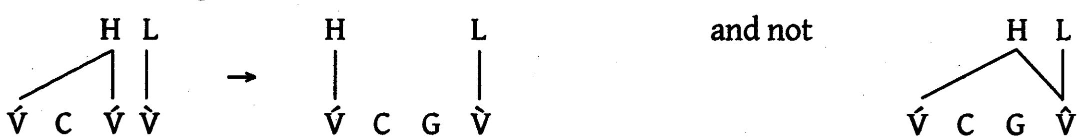
We can start with the toneless auxiliary stems. When toneless stems with two vowels are assigned Complex tone, they will normally show grammatical **H** tones on the first vowel of the root and on the first vowel before the root, and a L tone on V2. Thus, if the optional auxiliary stems with the shape [i-a] and [si-a] are assigned grammatical tones before the toneless main stem [*hum-a*], we expect the pre-contraction tone pattern in (27).

(27) Expected result of Complex tone assignment to toneless auxiliary stems (pre-contraction)

a.	itive	[i-a]	tw-angá-[í-à]-[hűm-ȁ]
b.	ventive	[si-a]	tw-angá-[sí-à]-[hűm-ȁ]
c.	future	[si-a]	tw-angá-[sí-à]-[hűm-ȁ]

At this point, an intricate but important fact about vowel contraction comes into play: whenever the second vowel of a doubly-linked H tone undergoes *glide formation* (rather than deletion) while contracting with a following L-toned vowel, it does *not* transfer its H tone onto the following vowel. As a result, this vowel surfaces as low-toned. Let us call this generalization, informally represented in (28) below, "Glide Delinking."[14]

(28) Glide Delinking



We see the effects of Glide Delinking in (29) below, where toneless [CV-V] main stems undergo contraction after being assigned Complex tone. In each form, when the H-toned V1 contracts with the L-toned V2/FV, the sole vowel remaining in the stem is L-toned.

(29) Glide Delinking in main verb stems with CV roots

	Pre-Contraction	Post-Contraction	
a.	tw-angá-[só-à]	tw-angá-[swà] 'we should grind'	*tw-angá-[swâ]
b.	tw-angá-[lú-à]	tw-angá-[lwà] 'we should argue'	*tw-angá-[lwâ]
c.	tw-angá-[í-à]	tw-angá-[yà] 'we should go'	*tw-angá-[yâ]

[14] Note that this rule is distinct from the rule of *tonal absorption*, initially discussed in chapter 2 (section 2.2.2). Tonal absorption causes what we would otherwise expect to be a falling-toned vowel to become *high*-toned before a phonetically L-toned vowel. Glide delinking causes what we would otherwise expect to be a falling-toned vowel to be *low*-toned, regardless of the tone of the vowel which follows it.

While a full analysis of Glide Delinking would lead us too far astray from our present focus, I assume that it arises as a result of two main factors: a general dispreference for contour tones, and the extreme perceptual similarity between V́CGV̀ and V́CGV̂ sequences. Both of these would involve a fall from a H tone at the end of the first vowel to a low tone at the end of the second, and would differ only in the steepness of that fall, much of which would take place during the glide. I assume that the difficulty of maintaining this contrast, coupled with its relative unimportance (in both cases, the H tone remains linked to the preceding vowel) leads speakers to simply neutralize it in favor of V́CGV̀, which avoids an undesirable contour tone.

Now going back to the forms in (27), we see that these satisfy the structural description for Glide Delinking, so that vowel contraction within the auxiliary stem yields a L tone. This produces exactly the surface forms observed in (24a-c) which initially appeared so anomalous. Thus, the assumption that toneless optional TAM morphemes are actually toneless auxiliary stems, coupled with independently needed processes of tone assignment and vowel contraction, produces exactly the correct results.

(30) Toneless auxiliary stems and a toneless main stem

			Pre-Contraction (ɩ-final)	Post-Contraction = (23a-c)
a.	itive	[i-a]	tw-angá-[ɩ́-à]-[hʊ̋m-ȁ] 'we should go to hit'	tw-angá-[yà]-[hʊ̋m-ȁ]
b.	ventive	[si-a]	tw-angá-[sɩ́-à]-[hʊ̋m-ȁ] 'we should come to hit'	tw-angá-[syà]-[hʊ̋m-ȁ]
c.	future	[si-a]	tw-angá-[sɩ́-à]-[hʊ̋m-ȁ] 'we should hit tomorrow'	tw-angá-[syà]-[hʊ̋m-ȁ]

In (31), we see that assigning Complex tone to toneless auxiliary stems also produces the correct tone patterns seen in (26a-c), where the itive, ventive, and future auxiliary stems are introduced into forms with H-toned main stems. Here, the only difference is that the contracted stems themselves surface with a H tone rather than a L tone. This H tone is simply the lexical H̲ of the following H-toned root, which shifts back onto the auxiliary stem's final vowel (and overwrites its final L tone) prior to vowel contraction.

(31) Toneless auxiliary stems and a H-toned main stem

			Pre-Contraction (ɩ-final)	Post-Contraction = (24a-c)
a.	itive	[i-a]	tw-ang**á**-[ɩ́-á̲]-[tűm-ȁ]	tw-ang**á**-[**y**á̲]-[tűm-ȁ]
			'we should go to send'	
b.	ventive	[si-a]	tw-ang**á**-[sɩ́-á̲]-[tűm-ȁ]	tw-ang**á**-[syá̲]-[tűm-ȁ]
			'we should come to send'	
c.	future	[si-a]	tw-ang**á**-[sɩ́-á̲]-[tűm-ȁ]	tw-ang**á**-[syá̲]-[tűm-ȁ]
			'we should send tomorrow'	

We can now turn to the H-toned optional TAM markers, looking first at repetitive *-́sya-*. By hypothesis, this is actually the H-toned stem [*sɩ́-a*]. Since it contains only two vowels, the assignment of Complex tone should produce a grammatical **L** tone on V2 (=FV), but no grammatical **H** tones. Moreover, its own lexical H̲ tone should be suppressed, since the stem is not preceded by an OM or *na-* (cf. 2a). As shown in (32a), these assumptions generate exactly the correct results when *-́sya-* is introduced into a Potential form with a toneless main stem: the absence of any H tone on or before the syllable [sya]. Moreover, this account makes a highly specific prediction about how the tone of *-́sya-* should vary according to the morphemes which precede it: if it is truly a contracted H-toned stem that is assigned Complex tone, then its lexical H̲ tone should appear if it is immediately preceded by the affirmative morpheme *na-*. As shown in (32b), this prediction is correct.

(32) H-toned [*sí-a*] and a toneless main stem

		Pre-Contraction	Post-Contraction
a.	[sí-a]	tw-anga-[sì-**à**]-[hŭ́m-ȁ]	tw-anga-[sy**à**]-[hŭ́m-ȁ]
		'we should hit again'	
b.	w/ *na-*	tw-anga-ná̱-[sì-**à**]-[hŭ́m-ȁ]	tw-anga-ná̱-[sy**à**]-[hŭ́m-ȁ]
		'we can hit again'	

In (33), we see that the correct tone patterns are also derived when *-́sya-* is introduced into a Potential form with a H-toned main stem. These are just like the forms in (32), except that a H̱ tone which originates from the main stem's H-toned root shifts onto to the final vowel of [*sí-a*] prior to vowel contraction. Pre-contraction V̀V́ sequences always result in surface H tones, so this results in a surface high tone on the syllable [sya].

(33) H-toned [*sí-a*] and a H-toned main stem

		Pre-Contraction	Post-Contraction
a.	[sí-a]	tw-anga-[sì-á̱]-[tŭ́m-ȁ]	tw-anga-[syá̱]-[tŭ́m-ȁ]
		'we should send again'	
b.	w/ *na-*	tw-anga-ná̱-[sì-á̱]-[tŭ́m-ȁ]	tw-anga-ná̱-[syá̱]-[tŭ́m-ȁ]
		'we can send again'	

Finally, we turn to initiative *-́ta-*. Recall that this showed an unexpected *falling* tone in (24d), where it preceded the toneless main stem [*hum-a*]. The same analysis that we developed for repetitive *-́sya-* will actually predict this, provided that we make one additional assumption: that *-́ta* is a H-toned optional auxiliary stem whose root vowel is underlyingly *long*.[15] A long

[15] One question, of course, is why *-́ta-* should have an underlying long vowel. Here, the related root *-táng-* may provide a useful clue: the length of *-́ta-* may be a reflection of lengthening before a NC cluster. While not active in Kinande now, this process is common in Bantu (Hyman 2003b), and was likely active in the language's past. As noted by Kenstowicz (2008), this would help to account for the unusual tonal properties of certain nouns with the historical tone pattern LH. While many nouns with this tone pattern have historically undergone leftward tone doubling followed by leftward shift (e.g. Proto-Bantu **-càká* → **e-ki-sáká* → *e-kí-sákà*) those with medial NC clusters appear to show leftward shift without doubling (**-pàndé* → **e-ki-pandé* → *e-ki-hándè*). As Kenstowicz

root vowel, in combination with the final vowel *-a*, forms the stem [*tá̱a-a*]. With three vowels, this stem is long enough to realize grammatical **H** tones, which, prior to contraction, will occur on its penultimate and antepenultimate vowels, i.e. [***táá***-*à*]. As shown in (34a), contraction of this stem before the main stem [hűmȁ] correctly yields the falling-toned [t**â**]. In addition, just as with *ˊsya-*, whether or not *ˊta-* assigns its own lexical H̲ tone depends on whether or not it is preceded by *na-*: when *na-* is present (33b), we see a H tone on the vowel preceding *ˊta-* as well as the falling tone on *ˊta-* itself.

(34) H-toned [*táa-a*] and a toneless main stem

		Pre-Contraction	Post-Contraction
a.	[táa-a]	tw-anga-[t**áá**-à]-[hűm-ȁ]	tw-anga-[t**â**]-[hűm-ȁ]
		'we could start by hitting'	
b.	w/ *-na-*	tw-anga-ná̱-[t**áá**-à]-[hűm-ȁ]	tw-anga-ná̱-[t**â**]-[hűm-ȁ]
		'we can start by hitting'	

Finally, the forms where *ˊta* occurs in a Potential form with a H-toned main stem are derived as in (35). Here, the contracted auxiliary stem surfaces with a H tone rather than a falling tone. This is because the L tone on the stem-final vowel in (34) is overwritten by the lexical H̲ tone shifting leftwards from the H-toned main stem, so rather than a contraction from [***táá***-*à*] to [t**â**], we see a contraction from [t**áá**-á̱] to [tá̱].

(35) H-toned [*táa-a*] and a H-toned main stem

		Pre-Contraction	Post-Contraction
a.	[táa-a]	tw-anga-[t**áá**-á̱]-[tűm-ȁ]	tw-anga-[tá̱]-[tűm-ȁ]
		'we could start by sending'	
b.	w/ *-na-*	tw-anga-ná̱-[t**áá**-á̱]-[tűm-ȁ]	tw-anga-ná̱-[tá̱]-[tűm-ȁ]
		'we can start by sending'	

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notes, this fact is predicted if NC clusters historically caused lengthening. In that case, tone doubling followed by leftward shift would have caused a doubled high tone to surface on an initial long vowel, which would have then shortened to produce to present-day HL pattern (e.g. **pàndé* → **e-ki-pàándé* → **e-ki-páándè* → *e-ki-hándè*).

At this point, it is extremely important to emphasize that within this analysis, the desinence of the optional auxiliary stem must be *-a*. If the desinence were instead *-a-a*, then we would expect repetitive *´-sya* to show a falling tone in the same contexts that initiative *´-ta* does, since its stem would also contain the three vowels necessary for the realization of grammatical **H** tones on its penultimate and antepenultimate vowels.

The reason why this is so important is that it leads to a crucial realization about the nature of multiple verb stem structures: *the desinences of all the verb stems must agree.* In the forms just discussed, the desinence of the optional auxiliary stem was *-a* because the desinence of the main stem was *-a*. However, in verbs where the desinence of the main verb stem is *-a-a*, the desinence of the optional auxiliary stem is *-a-a* as well. We know this because in these forms, repetitive *´-sya- does* behave just like initiative *´-ta-*.

We see this first in the Factual Recent Past form in (36) below. In this form, which ends in the desinence *-a-a*, *´-sya* surfaces not as L-toned, as in (32), but as H-toned.

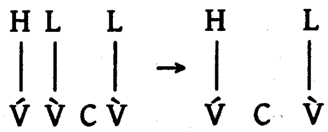
(36) Contraction of [*sí-**á**-à*] before a surface L-toned vowel

Pre-contraction	Post-contraction	
tu-a-[sí-**á**-à]-[hum-a̋-ȁ]	tu-a-[s**yá**]-[humâ]	'we hit again (recently)'

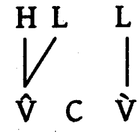
This is exactly what we predict in this context, where the contraction of [*sí-**á**-à*] occurs before the low-toned syllable [hu]. This is because falling tones never surface before L-toned vowels in Kinande: they are always changed to H tones in the process of *tonal absorption* (cf. chapter 2, section 2.2.2).[16]

[16] Note that Glide Delinking is not applicable here, since it concerns only cases where the second vowel of a doubly-linked H tone undergoes glide formation. Here, it is the first vowel of the doubly-linked H tone that undergoes glide formation

(37) Tonal absorption (cf. Contour Simplification rule of Mutaka (1994: p. 139))



and not



However, if the first vowel following *´sya-* bears a H tone, then we predict that any falling tone that emerges from the contraction of [*sí-**á**-à*] should be preserved. We can provide this H tone if we shorten the main stem, replacing the CVC root *-hum-* 'hit' with the CV root *-so-* 'grind.' This way, all three vowels in the main stem will undergo contraction, so that H_{φ} ends up surfacing on the first vowel after *´sya-*. In this context, as shown in (38), the expected falling tone on *´sya-* appears on the surface.

(38) Contraction of [*sí-**á**-à*] before (a) a surface L-toned vowel and (b) a surface H-toned vowel

Pre-Contraction	Post-Contraction	
tu-a-[sí-**á**-à]-[so-a̋-ȁ]	tu-a-[syâ]-[swâ]	'we ground again (recently)'

The appearance of a falling tone on repetitive *´sya* in this context confirms its identity as a H-toned auxiliary stem that is assigned Complex tone; this hypothesis predicts exactly how this element will appear as low-toned (32), high-toned (36), or falling-toned (38) according to its morphological and phonological context. In addition, it also firmly establishes that the desinence of the auxiliary stem must be the same as the desinence of the main stem. Put another way, what we are seeing is that the desinence required by a particular tense must occur in all stems belonging to the same verb.

This finding is replicated in the behavior of repetitive *´sya-* in Informative Recent Past forms (39) and in Continuative forms (40). In the former, the tense requires the desinence *-a*, and *´sya-* surfaces as L-toned. In the latter, the tense requires the desinence *-a-a*, and *´sya-* surfaces either as high-toned (40b) or as falling-toned (40d), depending on the surface tone of the following vowel. Thus, the tone of ˊ*sya* is perfectly correlated with the desinence assigned by a tense form. This makes sense only if ˊ*sya*- is a stem that contains that same desinence.

(39) Repetitive ˊ*sya* surfaces as L-toned in the Informative Recent Past

		Pre-contraction	Post-contraction	Gloss
a.	w/o ˊ*sya*	mó-tu-**á**-[h**ù**m-à]	(same)	'we hit (long ago)'
b.	w/ ˊ*sya*	mó-tu-a-[s**ì**-**à**]-[hűm-ȁ]	mó-tw-a-[**sy****à**]-[hűm-ȁ]	'we hit again (long ago)'

(40) Repetitive ˊ*sya* surfaces as H-toned or falling-toned in verb forms with the desinence *-a-a*

		Pre-contraction	Post-contraction	Gloss
a.	w/o ˊ*sya*	tu-ki-n**á**-[h**ú**m-à-**à**]	(same)	'we're still hitting'
b.	w/ ˊ*sya*	tu-ki-ná̲-[s**í**-**á**-à]-[hum-a̋-ȁ]	tu-ki-ná̲-[sy**á**]-[humâ]	'we're still hitting again'
c.	w/o ˊ*sya*	tu-ki-n**á**-[s**ó**-à-**à**]	tu-ki-n**á**-[sw**à**]	'we're still grinding'
d.	w/ ˊ*sya*	tu-ki-ná̲-[s**í**-**á**-à]-[so-a̋-ȁ]	tu-ki-ná̲-[sy**â**]-[swâ]	'we're still grinding again'

The tonal evidence presented in this section, then, provides strong evidence that what have previously been considered to be optional TAM morphemes are auxiliary verb stem whose desinences crucially vary according to tense. In the next section, I present further evidence for this by showing how they combine with the desinence morpheme *-ire*.

4.2 Evidence from *-ire* attraction

We saw above that when optional auxiliary stems are introduced into verb forms that show Complex tone transparently in their absence, they are assigned the grammatical **H** and **L** tones that would normally be assigned to the main stem. Therefore, we no longer expect that the addition of itive *ya* to an Informative Recent Past form like that in (41a) would result in the form in (41b), where the main stem is assigned grammatical tones normally. Instead, we expect the form in (41c), where the toneless auxiliary stem [*i-a*] is assigned Complex tone and then contracts. As shown, however, this form is incorrect too. What we actually see is the form in

(41d). In this form, the desinence *-įre*, instead of combining with the primary verb stem and taking [i-a] as an auxiliary stem, instead combines directly with the auxiliary root *-i-* 'go' to form the stem [*i-įre*]. This stem becomes the main verb stem of the Informative Recent Past, and is therefore assigned Complex tone before contracting to [*y-į̀rè*] (with Glide Delinking). All material from the main stem is then expelled into a following infinitive complement[17], together with another copy of the auxiliary root *-i-*, now embedded within the auxiliary stem [*i-a*] → [*ya*], whose desinence *-a* matches that of the following infinitival stem [*hum-a*].

(41) Itive *ya* combining with the Informative Recent Past

a.	mó-tw-**á**-[húmį̀r**è**]			'we hit (recently)'
b.	*mó-tu-a-[i-**á**]-[húmį̀r**è**]	→	*mó-tw-a-[y**á**]-[húm-į̀r**è**]	
c.	*mó-tu-**á**-[í-à]-[humį̋rȅ]	→	*mó-tw-**á**-[yà]-[hum-į̋rȅ]	
d.	mó-tu-**á**-[**í**-į̀r**è**] i-[i-a]-[hű́m-ȁ]	→	mó-tw-**á**-[y-į̀r'] i-[ya]-[hű́m-ȁ]	'we went and hit (rec.)'

This complicated process occurs not just with the itive root *-i-* 'go,' which we saw to lead a double life as both a main verb root and an auxiliary verb root, but with other auxiliary verb roots as well. In (42a-c), we see it affecting ventive *-si-*, repetitive *-sí̱-*, and initiative *-tá̱a-*.[18] In addition, in (42d) we see that the initiative root *-táa-* can also occur in a construction which is almost the same, but where it appears in the infinitive and where the related free root *-táng-* 'begin' appears in the inflected verb (Mutaka and Kavutirwaki 2011: p. 158).

[17] The infinitive complement is generally an *augmentless* infinitive. When not preceded by the augment *e-*, the class 5 NC prefix *ri-* surfaces as *i-*, here producing the infinitive *i-*[*hum-a*].

[18] Future *-si-* cannot combine with any tense form ending in *-įre*. This is due to semantic reasons: *-įre* appears only in past tense or perfect forms which are incompatible (in Kinande, at least) with elements expressing futurity.

(42) Result of combining mó-tw-**á**-[h**ú**mȷ̨rè] 'we hit (recently) with ...

		root	Pre-Contraction (ı-final)	Post-Contraction
a.	ventive	si	mó-tu-**á**-[s**í**-ȷ̀r**è**] i-[si-a]-[hű́m-ȁ] 'we came to hit (recently)'	mó-tw-**á**-[sȷ̀r] i-[sya]-[hű́mȁ][19]
b.	repetitive	sí̱	mó-tu-a-[s**í**-**ȷ́**rè] í̱-[si-a]-[hű́m-ȁ] 'we hit again (recently)'	mó-tw-a-[s**ȷ́**r] í̱-[syà]-[hű́mȁ]
c.	initiative	tá̱a	mó-tu-a-[t**àá**-**ȷ́**rè] í̱-[taa-a]-[hű́m-ȁ] 'we started by hitting'	mó-tw-a-[t**ȷ́**r] í̱-[tà]-[hű́mȁ][20]
d.	free root	táng	mó-tu-a-[t**á**ng-**ȷ́**rè] í-[taa-a]-[hű́m-ȁ] 'we started by hitting'	mó-tw-a-[t**á**ng-**ȷ́**r] í̱-[tà]-[hű́mȁ]

While I will not attempt a full analysis of this phenomenon here, it appears to arise from the following morphological considerations. First, as we already saw in the previous section, every stem within a multi-stem verb must have the same desinence, which is a function of the verb's tense. Second, it seems that *-ȷre* is subject to a morpheme-specific requirement that it must stand in a very local relationship with the prefixal morphology with which it co-occurs. Specifically, it must appear in the verb's *first stem.* These two requirements jointly ensure that if a verbal unit contains a stem ending in *-ȷre*, it cannot contain any other stem. It cannot contain a stem ending *-a* or *-a-a*, since then the desinences would disagree. At the same time, it cannot contain another stem ending in *-ȷre*, since then one of the *-ȷre*-final stems would stand in a non-local relationship with the inflectional prefixes. The solution, then, is to force the appearance of two verbal units: an inflected one that hosts *-ȷre* within the first and only verb stem, and an infinitive one which hosts all material from subsequent stems. (See

[19] It is interesting here that ventive [*sí-ȷ̀r**è***] contracts to low-toned [*sȷ̀rè*] rather than [*sȷ́rè*]. Since this contraction does not produce any glide on the surface, we would expect the contraction of H-toned [sí] and L-toned [ȷ̀] to yield a H tone before a vowel that surfaces with a L tone, due to tonal absorption (37). On the other hand, a L tone resulting from contraction of H and L is an expected result for Glide Delinking. This may be evidence, then, that the contraction of [*sí-ȷ̀re*] proceeds through the intermediate form [*syȷ̀re*] before deleting the high glide before [ȷ̨].
[20] The vowel quality resulting from the contraction of [***tàá**-ȷ́rè*] to [*tȷ́rè*] is somewhat unexpected, given that when the main root *-tá-* 'bury' contracts with *-ȷre*, it produces a mid vowel: *mó-tu-a-*[***tá**-ȷ́rè*] → *mó-tw-a-*[***té**rè*] 'we buried.' It is not clear what causes this difference between the auxiliary root *-táa-* and the main root *-tá-* 'bury.'

Baker (2003) for a similar analysis of this phenomenon, as well as an explanation for why the auxiliary verb root is repeated in the infinitive complement.)

In this phenomenon, the "optional TAM prefixes" once more behave like stems; this is the only explanation for why *-ịre*, a stem-final desinence suffix, would be able to combine with them. The general conclusion of this section, then, is that verbs in Kinande may contain more than one verb stem, and that when they do, both grammatical tones and desinence suffixes are attracted to the first. In the next section, we apply this basic lesson to the analysis of tense-defining TAM markers.

5 A reanalysis of pre-stem morphology

In section 3, we observed that in almost all MCA tenses that appear to show Simple tone, elements before the main stem – typically identified as TAM markers – are associated with some kind of high tone. In this section, we will see that these high tones can be uniformly analyzed as the surface manifestations of Complex tone.

In (43), the full list of tenses that appear to show Simple tone is presented once more.

(43) Tenses appearing to be assigned Simple tone

a. Imperfective	SM-*ká*-[ROOT-*a*-*a*]	e.g. tu-ká-[hum-a̋-ȁ]
b. Inform. Hodiernal Past	*mo*-SM-*ká*-[ROOT-*a*-*a*]	e.g. mó-tu-ká-[hum-a̋-ȁ]
c. Factual Immediate Past	SM-*ká*-*'bi*-[ROOT-*a*]	e.g. tu-ká-bi-[hűm-ȁ]
d. Hodiernal Future	SM-*ká*-*ndi*-[ROOT-*a*]	e.g. tu-ká-ndi-[hűm-ȁ]
e. Post-Hodiernal Future (1)	SM-*ká*-*ndi*-*sya*-[ROOT-*a*]	e.g. tu-ká-ndi-sya-[hűm-ȁ]
f. Post-Hodiernal Future (2)	SM-*ká*-*sya*-[ROOT-*a*-*a*]	e.g. tu-ká-sya-[hum-a̋-ȁ]
g. Factual Hodiernal Past	SM-*'lya*-[ROOT-*a*-*a*]	e.g. tú-lya-[hum-a̋-ȁ]
h. Perfective	SM-*a'*-*mâ*-[ROOT-*a*]	e.g. tw-á-mâ-[hűm-ȁ]
i. Inform. Immediate Past	*mo*-SM-*a*-*ná*-*mâ*-*'bi*-[ROOT-*a*]	e.g. mó-tw-a-ná-má-bi-[hűm-ȁ]
j. Inceptive	SM-*limu*-[ROOT-*a*]	e.g. tu-limu-[hűm-ȁ]

k. Progressive/Emphatic SM-*nému*-[Root-*a*] e.g. tu-nému-[hűm-ầ]
l. Emph. Hodiernal Future SM-*nému-ndi*-[Root-*a*] e.g. tu-nému-ndi-[hűm-ầ]
m. Emph. Post-Hod. Future SM-*nému-ndi-sya*-[Root-*a*] e.g. tu-nému-ndi-sya-[hűm-ầ]

In section 1, we saw how previous researchers (Hyman and Valinande 1985; Mutaka 1994; Black 1995) have classified the pre-stem inflectional elements appearing before the main stem as belonging to three main tonal categories: those that are *toneless* (*-limu-*, 43i; *-ndi-* 43f,g,k,l; *-sya-* 43g,h), those that have *fixed H tones* (*-ká-* 43c-h; *-nému-*, 43j-l), and those that have *anticipating H tones* (*-́lya*, 43m; *-́bi-* 43a). To this list, we might add a fourth category, consisting of elements with *both fixed and anticipating H tones* (*-́mâ-* 43a-b).[21] However, as we look at these forms in more detail, we will find that this system of classification is actually not very helpful. The "pre-stem elements" vary considerably in their morphological structures: some are individual morphemes, some are stems, and some are contractions of morphemes which do not form a morphological constituent. As a result, the reasons why they show the patterns they do vary widely.

Therefore, in exploring the tones of these elements, I will proceed according to my analysis of their morphological structure. In 5.1, I argue that *-ká-*, *-́lya*, and *-́mâ-* are all auxiliary stems which end either in *-a* or *-a-a*. In 5.2, I argue that *-limu-* and *-nému-* are not morphological constituents, but rather consist of irregular copular forms followed by a locative noun class prefix. In 5.3, I argue that *-́bi-* and *-ndi-* are also not morphological constituents, but consist of a reduced verb followed by an infinitive noun class prefix. In 5.4, I summarize by presenting a side by side comparison of (a) the traditional morphological and phonological analysis of the Kinande tense system and (b) the reanalysis proposed here.

[21] In the previous literature, only Mutaka (1994) analyzes *-́mâ-* in any depth. He proposes that it and what I analyze as a preceding *-a-* morpheme actually form a single morpheme *-amáá*, the H tones of which undergo leftward shift to produce *-ámáa* (p. 138).

5.1 Auxiliary stems

In this section, I look at the pre-verbal elements *-ká-*, *-́lya-*, and *-́mâ-*, which I analyze as auxiliary stems that are assigned Complex tone. More specifically, I argue that *-ká-* results from the assignment of Complex tone to the H-toned stem [*ká-a-a*], while *ˊlya* and *ˊmâ-* result from the assignment of Complex to the toneless stems [*li-a-a*] and [*ma-a-a*]. Since we have already examined *-ká-* in the introduction to this chapter, we can briefly examine it first.

5.1.1 Analyzing *-ká-* as the auxiliary stem [*ká-a-a*]

We saw in section 1 that the "fixed" H tone of *-ká-*, while treated as morphologically or phonologically exceptional in previous treatments of Kinande verbal tone, is entirely predicted if *-ká-* is analyzed as a H-toned auxiliary stem which is assigned Complex tone as analyzed in Chapter 4. If the underlying [*ká-a-a*] (44a) is assigned grammatical **H** tones according to the V2/FV pattern, it will have a **L** tone on V2 and a **H** tone on FV in the output of the Stem Stratum (44b). The **H** on FV will subsequently spread to the left (44c) in the Macrostem Stratum, and a grammatical **L** tone assigned in the VU will overwrite the stem's lexical H tone, producing the [***kà-á-á***] in the output of the Lexical Phonology (44d). Postlexical leftward shift, consisting of Fall Conversion at the LP-PLP Watershed (44e) and Fall Expansion in the evaluation of φ (44f), then produces the pre-contraction auxiliary stem [***ká-á***-*à*], while H_{φ} Assignment (44f) and L_{ι} Assignment (44g) produces the pre-contraction main-stem [hum-ắ-ằ]. Finally, [***ká-á-à***] contracts to high-toned [ká] before the low-toned vowel of the main stem, due to tonal absorption, while the final syllable of [*hum-ắ-ằ*] contracts to falling-toned [mâ] (44h).

(44) Derivation of "fixed H" on *-ká-*

a. Stem: Input to tone assignment		[ká̲-a-a] [hum-a-a]
b. Stem: Grammatical **H** tone assignment		[ká̲-**à**-**á**] [hum-a-a]
c. Macrostem: **H** tone spread		ká̲-**á**-**á**] [hum-a-a]
d. Verbal Unit: Grammatical **L** tone assignment	tú	[k**à**-**á**-**á**] [hum-a-a]
e. LP-PLPW: Fall Conversion	tû	[kà-**á**-**â**] [hum-a-a]
f. φ: Fall expansion H_φ Assignment	tù	[k**á**-**á**-**à**] [hum-ạ-a̋]
g. ι: L_ι Assignment	tù	[k**á**-**á**-**à**] [hum-a̋-ȁ]
h. υ: Vowel Contraction (w/ Tonal absorption)	tù	[k**á**] [humâ]

Two additional facts confirm that this analysis is correct. First, as we saw in 4.1, we can remove the effects of tonal absorption by shortening the main stem so that H_φ immediately follows *-ká-*. When we do this, *-ká-* surfaces not with a H tone, but with a falling tone.

(45) Present Imperfective form with *-so-* 'grind'

Pre-contraction	Post-contraction	
tù-[k**á**-**á**-**à**] [so-a̋-ȁ]	tù-[k**â**]-[swâ]	'we grind/we are grinders'

Crucially, this falling tone must result from the contraction of H and L tones, and cannot be viewed as a repair for a surface-based OCP constraint. We know this because, as demonstrated in (46), adjacent H tones in surface forms are ubiquitous. In (46a), a lexical H̲ tone is adjacent to penultimate H_φ. In (46b), a similar H̲-H_φ sequence is preceded by a grammatical **H** tone resulting from the contraction of [*k**á**-**á**-**à***]. In (46c), a lexical H̲ tone precedes a doubly-linked grammatical **H** tone. Finally, in (46d), adjacent vowels show (a) a H tone from a subject marker (see note 10), (b) a grammatical **H** tone assigned to the auxiliary stem [*i-a*], (c) a lexical H̲ tone and (d) H_φ. Any explanation of the falling tone of [kâ] based on the OCP must explain why none of these sequences are repaired. The falling tone emerges automatically, however, when we analyze *-ká-* as a stem that is assigned Complex tone.

(46) Adjacent H tones in Surface Forms

	Underlying		Surface (ɩ-final)	
a.	/e-ri-tu̱ma/	→	e-rí̱-[tű́mȁ]	'to send'
b.	/tu-^{L}[ká-a-a]$^{H\text{-}H}$-na-[tu̱m-a]	→	tu-[ká]-ná̱-[tű́mȁ]	'we are indeed senders'
c.	/tu-a-na-^{L}[tu̱m-a-a]$^{H\text{-}H}$	→	tu-a-ná̱-[túmáà]	'we indeed sent (recently)'
d.	/mó-tu-a-[i-a]-[tu̱m-a]	→	mó-tw-á-[yá̱]-[tű́mà]	'we went to send (long ago)'

The second fact in support of this analysis comes from counterfactual forms. If the fixed H tone of *-ká-* results from the assignment of Complex tone to the stem [*ká-a-a*], then we predict that in the *absence* of Complex tone (a) *-ká-* will no longer appear to show a "fixed" H tone (since this derives from the assignment of grammatical **H** tones) and (b) *-ká-* will place a lexical H̱ tone on the vowel before it (since it is no longer subject to H̱ tone suppression). As shown in (47), these two predictions are correct.

(47) Evidence from counterfactual forms for underlying [*ká-a-a*]

	Main Clause Affirmative	Counterfactual
Imperfective	SM-*ká*-[Root-*a-a*]	*nga* SḾ-*ka*-[Root-*a-a*]
	tu-ká-[hum-ấ-ȁ]	ngá tú-ka-[hum-ấ-ȁ]
	tu-ká̱-[tum-ấ-ȁ]	ngá tú-ká̱-[tum-ấ-ȁ]

One final point regarding *-ká-* concerns its final desinence. Note that the H tone which surfaces on *-ká-* in MCA forms crucially requires that the underlying stem [*ká-a-a*] have three vowels; otherwise, the auxiliary stem will be too short for grammatical **H** tones to surface within the stem. Since auxiliary stems and main stems must agree in their desinences, this leads us to expect that verb forms which contain *-ká-* as an auxiliary stem should show the desinence *-a-a* in the main stem as well. As seen in (43) above, this is true in many forms, but never when *-ká-* is followed by either *-ndi-* or *-́bi-*. We will see in 5.3 that these elements actually introduce new infinitive verbal units. Thus, the generalization that all stems within a single verbal unit must agree in desinence will be maintained.

5.1.2 Analyzing *ˉlya-* as the toneless stem [*li-a-a*]

The verbal element *ˉlya-* is found in only one tense, the Factual Hodiernal Past. It places a H tone on the vowel which immediately precedes it. This is normally the subject marker (48a), but it can also be the affirmative morpheme *-na-* (58b).

(48) Factual Hodiernal Past forms with *-lya-*
  a. tú-lya-[hum-ấ-ầ] 'we hit (earlier today)'
  b. tu-ná-lya-[hum-ấ-ầ] 'we indeed hit (earlier today)'

In this way, the tonal behavior of *ˉlya-* is exactly parallel to that of ventive *-sya-* when it receives Complex tone. This leads to an obvious analysis: *ˉlya-* is also a toneless auxiliary stem that is assigned Complex tone. According to this analysis, underlying [*li-a-a*] (49a) is assigned a grammatical **H** tone on V2 and a grammatical **L** tone on FV in the Stem stratum (49b). In the Macrostem stratum, the **H** tone on V2 spreads left onto V1 (49c). In the VU stratum, inflectional prefixes are added (49d). This includes the prefixal **L** tone, but this cannot surface because of the doubly-linked H tone on V1 (geminate faithfulness; cf. chapter 4). This produces, at the end of the LP, the stem [*lí-á-à*]. After the doubly-linked H tone within this stem undergoes Fall Conversion (49e) and Fall Expansion (49f), the pre-contraction form of the stem is [*lí-à-à*], where the initial **H** tone is also linked to the preceding vowel. This satisfies the structural description for Glide Delinking, so that vowel contraction within the auxiliary stem produces low-toned [*lyà*] (49h). Meanwhile, in the main stem, H_φ is assigned to the final vowel

(49f) and is subsequently shifted back onto the penult upon the addition of L_ι (49g); contraction of penultimate H_φ and final L_ι produces the surface falling tone on the final syllable (49h).

(49) Derivation of "anticipating H" of *´lya-*

a.	Stem: Input to tone assignment		[li-a-a] [hum-a-a]
b.	Stem: Grammatical **H** tone assignment		[li-**á**-**à**] [hum-a-a]
c.	Macrostem: **H** tone spread		[**lí**-**á**-**à**] [hum-a-a]
d.	Verbal Unit: Grammatical **L** tone assignment	tú	[**lí**-**á**-**à**] [hum-a-a]
e.	LP-PLPW: Fall Conversion	tû	[**lí**-**â**-**à**] [hum-a-a]
f.	φ: Fall expansion, H_φ Assignment	**tú**	[**lí**-à-**à**] [hum-a-a̋]
g.	ι: L_ι Assignment	**tú**	[**lí**-à-**à**] [hum-a̋-ȁ]
h.	υ: Vowel Contraction (w/ Glide Delinking)	**tú**	[ly**à**] [humâ]

Analyzing *´lya-* as a toneless auxiliary stem, then, derives its tonal properties without any new stipulations. Now, this would also be true if we simply analyzed *´lya-* as a H-toned morpheme that was *not* assigned Complex tone. Then, we would expect its underlying H tone to surface on the preceding vowel simply due to postlexical tone shift. This analysis, however, is not able to account for the Counterfactual forms below, repeated from (18k).

(50) Evidence from Counterfactual forms for underlyingly toneless [*li-a*]

	Main Clause Affirmative	Counterfactual
Factual Hodiernal	SM*´lya*-[Root-*a*-*a*]	*nga* SM-*lya*-[Root-*a*-*a*]
Past	tú-lya-[hum-a̋-ȁ]	ngá tu-lya-[hum-a̋-ȁ]
	tú-lyá̱-[tum-a̋-ȁ]	ngá tu-lyá̱-[tum-a̋-ȁ]

In these forms, where no Complex tone is assigned, *´lya-* appears to be entirely toneless: it bears no H tone of its own, and places no H tone on the preceding vowel. This is just what we expect if *´lya-* is a toneless auxiliary stem [*li-a-a*] that is assigned Complex tone, but not if it is simply a H-toned morpheme. I therefore conclude that the analysis of *-́lya* as a toneless auxiliary stem is correct.

5.1.3 *-́mâ* as a toneless auxiliary stem [*ma-a*]

The pre-stem element *-́mâ-* is found in two of the forms listed in section 2: the Present Perfective and the Informative Immediate Past, the structures of which are repeated in (51) below. In this section, I will focus on the derivation of the Present Perfective form in (51a); its analysis, in addition to the analysis of *-́bi* in 5.3, will also explain the structure of the Informative Immediate past form in (51b).

(51) Forms containing *-́mâ-*

a. Perfective	SM-*a-́mâ*-[Root-*a*]	e.g. tw-á-mâ-[hű́m-ȁ]
b. Inform. Immediate Past	*mo*-SM-*a-ná-mâ-́bi*-[Root-*a*]	e.g. mó-tw-a-ná-má-bi-[hű́m-ȁ]

In realizing a H tone both on its own first vowel and on the vowel before it, *-́ma-* shows the normal result of assigning Complex tone to a toneless stem, such as ***tw-á***-[***hű́m-a-ȁ***] 'we hit (recently). Let us assume, then, that *-́mâ-* is a toneless auxiliary stem. Since the main stem contains the desinence *-a*, we can assume that the desinence of this auxiliary stem contains *-a* as well. In (52), we see that assigning Complex tone to [*ma-a*] produces exactly the correct tone pattern seen in (51a) above.

(52) Derivation of "fixed and anticipating H" of *-́mâ-*

a.	Stem: Input to tone assignment		[ma-a] [hum-a]
b.	Stem: Grammatical **H** tone assignment		[ma-**á**] [hum-a]
c.	Macrostem: **H** tone spread		[m**á**-**á**] [hum-a]
d.	Verbal Unit: Grammatical L tone assignment	tú a	[m**á**-**á**] [hum-a]
e.	LP-PLPW: Fall Conversion	tû a	[m**á**-**â**] [hum-a]
f.	φ: Fall expansion $H_φ$ Assignment	tù **á**	[m**á**-**à**] [hum-a̋]
g.	ι: $L_ι$ Assignment	tù **á**	[m**á**-**à**] [hűm-ȁ]
h.	υ: Vowel Contraction (no Glide Delinking)	tw **á**	[m**â**] [hűm-ȁ]

Note that this derivation is almost entirely identical that of *-́lya-* (and also itive *-ya-*, ventive *-sya-* and future *-sya-*). As may be seen by comparing (52h) with (49h), the two derivations differ mainly in the very last step of contraction, where *-́lya-* is subject to Glide Delinking while *-́mâ-* is not.

Once more, we can confirm our analysis by examining counterfactual forms: in these forms, where Complex tone is not assigned, *-́mâ-* surfaces as entirely toneless.

(53) Evidence from Counterfactual forms for underlyingly toneless [*ma-a*]

	Main Clause Affirmative	Counterfactual
Perfective	SM-*a-́mâ*-[Root-*a*]	*nga* SM-*a-ma*-[Root-*a*]
	tw-á-mâ-[hűm-ȁ]	ngá tw-a-ma-[hűm-ȁ]
	tw-á-m<u>á</u>-[tűm-ȁ]	ngá tw-a-m<u>á</u>-[tűm-ȁ]

Finally, while I am not able to suggest a diachronic origin for all of the auxiliary stems seen in Kinande, this does seem to be possible with *-́mâ-*. This almost certainly derives from Proto-Bantu *-*mad-* 'finish' (Bastin et al. 2002). Though this does not appear to have survived as a normal (i.e. non-auxiliary) root in Kinande in any form, Nurse (2008) provides many examples in which this root has been grammaticalized (often with the shape -*mV*-) to express such meanings as past perfective, past perfect, and completive. In addition, the root has survived in closely related languages; Polak-Bynon (1975: pp. 293-294), for example, notes the connection between the tense marker *-ma-* and the root *-mal-* 'finish' in her investigation of Shi, whose verb system is in some respects strikingly similar to that of Kinande (see the discussion of *-ndi-* in 5.3).

5.1.4 Auxiliary stem summary

In this section, we have seen that information about TAM in Kinande can be expressed through *auxiliary verb stems* which (a) precede the main stem (b) take the same desinence as the main stem and (c) realize grammatical **H** tones which would otherwise be realized within the main stem. Though these auxiliary stems may initially appear to be simple TAM morphemes, close consideration of their tonal properties reveals their true nature. In the next two sections, we will look at two other ways in which elements that appear to be monomorphemic TAM markers reveal, through their tone patterns, that they actually embody more complex structures, namely COPULA+LOCATIVE constructions (5.2) and VERB+INFINITIVE constructions (5.3).

5.2 *-limu-* and *-némmu-* as elements of COPULA+LOCATIVE structures

The elements that I consider in this section are *-limu-* and *-nému-*, which are found in the inceptive and progressive/emphatic forms shown in (54) below.

(54) Main Clause Affirmative Inceptive and Progressive/Emphatic forms

a.	Inceptive	tu-limu-[hű́m-ȁ]	'we are starting to hit'
b.	Progressive/Emphatic	tu-nému-[hű́m-ȁ]	'we are hitting (now)/we *are* hitting'
c.	Emphatic Future	tu-nému-ndi-[hű́m-ȁ]	'we *will* hit'

For expository reasons, I have until now represented these two elements as monomorphemic, since they appear to function as single TAM markers expressing inceptive and progressive aspect, respectively. However, one obvious objection to this is the presence of [mu] in both elements, suggesting bimorphemic *-li-mu-* and *-né-mu-*. This is the analysis posited by Valinande (1984: p. 33), though he does not discuss any particular evidence for it. Mutaka (1994) follows this analysis, and moreover provides a motivation for it beyond the recurrence of *-mu-*: as shown in (55) below, both *-li-* and *-né-* have independent lives as irregular forms of the copula. Note that *né* appears to result from an irregular contraction between *-li-* and a preceding affirmative morpheme *-na-*; this explains the fact that *-na-* cannot co-occur with *-li-*, and that *-né-* expresses the meaning that this morpheme combination would express.[22]

(55) Irregular forms of the copula: MCA forms

a.	tu-[li]	ba-lɨ̧tò	'we are heavy'	
b.	tu-[né]	ba-lɨ̧tò	'we really are heavy'	*tu-ná-li ba-lɨ̧to

Based on this evidence, Mutaka (pp. 53-55) suggests that both *-li-* and *-né-* might be historical remnants of the copula.[23] This evidence is reinforced by the following data from counterfactuals: as shown in (56) and (57), the inceptive and progressive forms are tonally parallel to copular forms not just in their MCA form, but in their counterfactual forms as well. In particular, when appearing in counterfactual clauses, all forms surface as entirely toneless.

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[22] It is tempting to relate this process to the phenomenon of *imbrication* observed in verb stems ending in *-ire*; in this process, a stem-final liquid or nasal deletes, triggering coalescence between the last pre-desinence vowel and the [+ATR] [i̧] vowel of *-i̧re*. When the stem-final vowel is *-a*, the result of contraction is [e] (e.g. *mó-tw-a-[sakal-i̧re]* → *mó-tw-a-[sakere]* 'we covered the roof with straw (recently).' This is obviously similar to the deletion of [l] and the coalescence of [l] here and the resulting coalescence of [a] and [i] to [e]. Note, however, that the latter process involves [-ATR] [i] rather than [+ATR] [i̧], occurs in a different morphological context (over the prefix-stem boundary instead of stem-internally) and does not respect a minimality condition by which imbrication is restricted to stems with at least three vowels. The exact relation between these two processes, then, requires further investigation. (For more on imbrication in Kinande, cf. Mutaka 1994, pp. 21-23).

[23] Mutaka (p.c.) attributes this observation to Larry Hyman.

(56) Counterfactual Inceptive and Progressive/Emphatic forms

a.	Inceptive	ngá tu-limu-[hű́m-ȁ]	'if we were starting to hit ...'
b.	Progressive/Emphatic	ngá tu-nemu-[hű́m-ȁ]	'if we were hitting ... '
c.	Emphatic Future	ngá tu-nemu-ndi-[hű́m-ȁ]	'if we were to hit later ...'

(57) Irregular forms of the copula: Counterfactual forms

a. ngá tu-li ba-lı̧́tò 'if we were heavy ...'

b. ngá tu-ne ba-lı̧́tò 'if we really were heavy'

I will assume, then, that the initial *-li-* and *-né-* morphemes of the progressive and inceptive forms are simply copular forms (even in the synchronic grammar) so that the Inceptive and Progressive forms have the structure in (58).

(58) Revised conception of Progressive/Inceptive forms

a.	Inceptive	tu-[li]	mu-[hum-a]	
		SM-COP	?-[ROOT-a]	'we are starting to hit'
b.	Progressive	tu-[né]	mu-[hum-a]	
		SM-COP.AFF	?-[ROOT-a]	'we are hitting'

At this point, two questions arise. First, what is the source of the H tone of *-né-* in the MCA form of the progressive? Second, what is the morpheme *-mu-*? Regarding the first question, I note that when asked about the possibility of combining copular *tu-li* with the affirmative morpheme *na-*, my primary consultant asserts that while this combination is not possible, if it *were* possible, the result would be **tu-ná-li*, with a H tone preceding *-li-*. I will treat this as an intermediate form in the derivation of *tu-né*, and will assume that the H on *ná* is preserved when it contracts with *-li-* to form *-né-*. This of course, pushes the question back: what is the origin of the H tone on *na*?

Two clues are offered by the counterfactual forms in (56) and (57). First, we see that the H tone of *-nému-* disappears in the counterfactual, indicating that it is somehow conditioned by the assignment of Complex tone (56b, 57b). Second, we see that *li* is underlyingly toneless, since it places no H tone on the preceding vowel when no Complex tone is assigned (56a, 57a).

This turns out to be all we need to derive the tones of the copula in all forms: we must simply assume that Complex tone is assigned to a toneless stem [*li*]. To see how this works in MCA forms, consider the derivations in (59), where MCA *tu-li* and *tu-ná-li→tuné* are derived side by side. First, in the Stem stratum, when toneless [li] (59a) is assigned Complex tone, its sole vowel receives a grammatical **H** tone. The analysis developed in chapter 4 predicts that this happens in the first cycle in which a suffixal **H** tone is assigned. Normally, the first **H** tone is attracted to V2, but in this one irregular stem, there is no V2. The tone therefore associates to FV, which also happens to be V1 (59b). In the subsequent Macrostem stratum (59c), this tone does not spread, since there is no vowel within the Macrostem for it to spread onto. Then, in the Verbal Unit stratum, the fate of the grammatical **H** tone depends on the presence or absence of *na-*. If *na-* is present, then it will host the prefixal **L** tone that is assigned as part of Complex tone. If *na-* is not present, however, then the prefixal **L** tone will associate to the first and only vowel of the verb stem, overwriting the grammatical **H** tone assigned there (59e). Finally, after tone shift, we obtain the desired results: *tu-lì* and *tu-ná-lì* (59f). When the latter undergoes an irregular contraction process, the result is H-toned *tu-né* (59g).

(59) Derivation of MCA *tu-lì* and *tu-né*

a.	Underlying		[li]			[lí]
b.	Stem		[lí]			[lí]
c.	Macrostem		[lí]			[lí]
	Verbal Unit					
d.	*na-* cycle		[lí]		na	[lí]
e.	*L- cycle*		[lì]		nà	[lí]
f.	*SM cycle*	tú	[lì]	tú	nà	[lí]
h.	Postlexical Shift	tù	[lì]	tù	ná	[lì]
i.	Contraction (irr.)	tùlì			tuné	

Interestingly, if this analysis is correct, it represents the one instance in the language where H tone suppression is able to affect a grammatical **H** tone. This is because the assignment of Complex tone's prefixal **L** only can only ever result in H tone suppression when V1 is occupied by a H tone that is *singly-linked.* Outside of the irregular stem [*li*], only lexical H tones ever occur singly-linked on V1, so H tone suppression normally looks like a process that affects only them. What we are seeing above, however, is evidence that H tone suppression does not discriminate between a singly-linked lexical H tone and a singly-linked grammatical **H** tone: in the rare case that the latter arises, prefixal **L** will overwrite it. This is an encouraging result, because it provides evidence that outside of the strata in which tones are first assigned, different types of H tones are not distinguished from one another. This is just what we expect if tones cannot retain diacritically-marked information about their origins.

Having concluded, then, that the irregular fixed tone seen on *-né-* is the result of Complex tone assignment applying within the irregular stem [*li*], we can now move on to our second question: the identify of *-mu-*. This is quite clearly a class 18 locative noun class marker, descended from historical **mu-* (Meeussen 1967), which means that the Inceptive and Progressive forms are *Copula+Locative* constructions with the structures in (60) below.

(60) Revised conception of Progressive/Inceptive forms

a.	Inceptive	tu-[li]	mu-[hum-a]	'I am in hitting'
		SM-COP	NC.18-[ROOT-a]	
b.	Progressive	tu-[né]	mu-[hum-a]	'I am indeed in hitting'
		SM-COP.AFF	NC.18-[ROOT-a]	

As noted by Nurse (2008: p. 139), such structures are extremely widespread in Bantu languages. He writes:

Progressives deriving from locatives are the commonest type across Bantu. Most Bantu languages have three active locative classes, or at least traces of them, used with nouns, and indicated prefixally, either replacing or added on to, the primary nominal prefix. They are **pa* (Class 16), **ku* (17) and **mu* (18), which translate roughly as 'at, to, in', respectively, although there is considerable variation in their semantic range from language to language. In a neglected article, Bastin (1989a, 1989b) shows numerous Bantu languages with constructions that derive in one way or other from an original construction *-li+mu+ku-*, where *-li* is a locative verb 'be (in/at)', *mu-* is the locative prefix 'in', and *ku-* marks the verbal noun (infinitive). This construction can be rendered as 'be in/at verb-ing.'

Within this context, it is interesting that the Copula+Locative construction has come to express inceptive aspect as well as progressive aspect. Given the affirmative morpheme's general meaning of 'indeed,' this situation may have arisen through gradual semantic bleaching: perhaps an originally emphatic declaration of progressive aspect, incorporating both the affirmative morpheme *na* and *li-mu+V*, lost its emphatic force over time to be equated simply with non-emphatic progressive aspect. This may have left the morphologically non-emphatic *li+mu+V* construction with a "reduced" meaning expressing that one is currently engaged in *part* of an action, i.e. its very beginning.

Two last points concern the synchronic status of (a) the noun class prefix *mu-* and (b) the entire Copula+Locative construction. First, as in many Interlacustrine Bantu languages (Bastin 2003), the historical locative prefix **mu-* (as well as the prefixes **ku* and **pa*) is only very rarely observed as a *noun class prefix* in the modern Kinande. Mutaka and Kavutirwaki (2011) cite only two forms where this prefix appears: [o-mw-ísíryâ] 'the next house' and [ó-mw-ḭtsǻngê] 'dawn'. Nonetheless, class 18 morphemes of the shape *mu-* are still very active in expressing locativity. Demonstrative prefixes, for example, are still derived from *mu-* just as they are from other noun class prefixes (Valinande 1984: pp. 797-799).

(61) Demonstrative prefixes with *mu-* (cl. 18) and *ki-* (cl. 7)

a.	Near speaker, within reach	*mu-no* 'here inside this house'	*ki-no* 'this thing here'
b.	Near speaker, out of reach	*o-mụ̀* 'here inside that house'	*e-kị̀* 'that thing here'
c.	Near listener	*o-mű-ȍ → omô* 'there inside that house by you'	*e-kí̋-ȍ → e-ky-ô* 'that thing there'
d.	Far from speaker and listener	*mu-lyǎ̈* 'inside that house over there'	*ki-lyǎ̈* 'that thing over there'

Moreover, the near-listener demonstrative pronoun *omo* – which contains the prefix *mu-* in obscured form (cf. 61c) – is now very generally used to form locative expressions from non-locative nouns, as in the example below:

(62) Use of locative *omo* (Mutaka and Kavutirwaki 2011: p. 4)

e-ri-[leberery'] omo ka-bengeryő sí-ryowénè
INF.LOOK LOC NC.12-SMALL_WINDOW NEG-BE_GOOD
'to look through a small hole in the wall is not good'

For these reason, I think it reasonable to conclude that class 18 *mu-* is still an active locative marker in Kinande, even if it is no longer present as a standard noun class prefix. This makes it rather plausible, in my view, that the morpheme sequences *li-mu* and *né-mu* continue to be interpreted synchronically as Copula+Locative constructions. Indeed, the highly systematic tonal alternations between the MCA and counterfactual forms observed in (54)-(57) above support this view. I have analyzed these alternations as arising from the same process of Complex tone assignment that applies productively in regular verbs. The most straightforward interpretation of this fact is that the Inceptive and Progressive tenses continue to be analyzed synchronically as Copula+Locative constructions that contain copular verbs within them.

5.3 Future *-ndi-* and Completive *ꜝbi-* in VERB+INFINITIVE constructions

The final two morphemes to consider are future *-ndi-* and completive *ꜝbi-*. To understand their essential properties, it is enough to consider the forms presented in (63).

(63) Forms with Future *-ndi-* and Completive *-ndi-*

a.	Inform. Hodiernal Past	*mó*-SM-*ká*-[ROOT-*a-a*]	e.g. mó-tu-ká-[hum-a̋-ȁ]
b.	Imperfective	SM-*ká*-[ROOT-*a-a*]	e.g. tu-ká-[hum-a̋-ȁ]
c.	Post-Hodiernal Future (2)	SM-*ká-sya*-[ROOT-*a-a*]	e.g. tu-ká-sya-[hum-a̋-ȁ]
d.	Hodiernal Future	SM-*ká-ndi*-[ROOT-*a*]	e.g. tu-ká-ndi-[hűm-ȁ]
e.	Post-Hodiernal Future (1)	SM-*ká-ndi-sya*-[ROOT-*a*]	e.g. tu-ká-ndi-sya-[hűm-ȁ]
f.	Factual Immediate Past	SM-*káꜝbi*-[ROOT-*a*]	e.g. tu-ká-bi-[hűm-ȁ]

In the three forms in (63a-c), we find that H-toned *ká* co-occurs with a main stem ending in *-a-a*. This is exactly what we expect. We know that the H-toned stem [*ká̱-a-a*] must contain the desinence *-a-a*, because otherwise it would be too short to show the grammatical **H** tones that contract to [*ká*]. Moreover, we know that the desinences of all stems within a verb form must agree. Therefore, we expect to find *-a-a* in the main stem as well.

From this perspective, the addition of *-ndi-* or *ꜝbi-* to produce the forms in (63d-f) produces a surprising result: structures in which the auxiliary stem has the desinence *-a-a*, but the main stem has *-a*. Given our analysis up to this point, this should not be possible unless the auxiliary stem and the main stem belong to two separate verbs. My proposal, then, is that they do: in these forms, while the auxiliary stem [*ká*] belongs to a fully inflected verb whose stems all end in *-a-a*, the main stem belongs to an *infinitive* verb whose stem ends in *-a*. This is possible because *-ndi-* and *ꜝbi-* are not actually TAM markers, or even individual morphemes, but rather contractions of (a) a verb stem ending in *-a* or *-a-a* and (b) the unaugmented infinitival prefix *i-*.[24] These structures are illustrated in (64):

(64) Verb+Infinitive Structures

a. *Hodiernal Future*

Underlying	tu-[ká̱-a-a]-[nd-a-a] i-[hum-a]	
Pre-Contraction	tu-[k**á**-**á**-à]-[nd-a-a] i-[hű́m-ȁ]	
Surface	tu-[ká]-[nd] i-[hű́m-ȁ]	'we will hit'

b. *Post-Hodiernal Future*

Underlying	tu-[ká̱-a-a]-[nd-a-a] i-[si-a]-[hum-a]	
Pre-Contraction	tu-[k**á**-**á**-à]-[nd-a-a] i-[si-a]-[hű́m-ȁ]	
Surface	tu-[ká]-[nd] i-[sy-a]-[hű́m-ȁ]	'we will hit (tomorrow)'

c. *Factual Immediate Past*

Underlying	tu-[ká̱-a-a]-[bi̱-a-a] i-[hum-a]	
Pre-Contraction	tu-[k**á**-**á**-á̱]-[bi-a-a] i-[hű́m-ȁ]	
Surface	tu-[ká]-[b] i-[hű́m-ȁ]	'we just hit'

In (64a,b), we find infinitive stems introduced by the verb root [nd-a-a]. This odd looking stem, I propose, derives from a reduction of the verb stem [*gend-a*] 'go.' According to this proposal, the future forms of Kinande derive from GO+INFINITIVE constructions. This, of course, is an extremely common source of future forms; it has been active, for example, in both of the primary languages of Kinande scholarship, so that the form in (64a) may be translated extremely literally by either *We are going to hit* or *Nous allons frapper.*

Two pieces of evidence confirm that this analysis is correct. The first is internal to Kinande: in addition to the standard form of the future given in (65a), there are also the variants in (65b-c) below. This exact range of variation only makes sense in light of a historical, non-contracted GO+INFINITIVE construction **tu-Ø-[ká̱-a-a]-[gend-a-a] i-[hum-a]*.

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[24] See note 17 for more on the unaugmented infinitival prefix.

(65) Variants of Hodiernal Future derived from *tu-ká-gend' i-húm-a*

a. tu-ká-ndi-hűmȁ 'we will hit'
b. tu-kéndi-hűmȁ 'we will hit'
c. tu-kê-hűmȁ/tu-kî-hűmȁ 'we will hit'

The second, clinching piece of evidence comes from the closely related language Shi. Here, we see the exact construction just posited for earlier stages of Kinande, but with an unreduced version of the verb root *-gend-* 'go.' (Interestingly, this construction uses a class 5 infinitive, even though the infinitive is usually class 15 (with NC prefix *ku-*) in Shi.)

(66) GO+INFINITIVE construction in Shi

a. rhw-á:-[gé:ǹd'] i-[súník-á]
SM.1P-PRES-[GO-FV] NC.5-[PUSH-FV] 'we are going to push'

The preceding data establish the diachronic origins of *-ndi-* in Kinande, and confirm that it participates in a Verb+Infintive construction. I posit a similar analysis of Completive *-́bi*. We first saw this morpheme in (19f), above listed among the other "optional TAM markers" which can appear in infinitive forms. There, we saw that it places a H tone on the morpheme which precedes it. I therefore assume that *-́bi-* is a H-toned verb stem that is contracted with the noun class prefix of a following infinitive complement, as illustrated in (67) below.

(67) Forms with Completive -́bi

a. e-rí-bi-[hűm-ȁ] e-rí̱-[bV-a] i-[húm-a] 'to have already hit'
b. tu-ká-bi-[hűm-ȁ] tu-[ka-á-á̱]-[bV̱-a-a] i-[hűm-ȁ] 'we just hit'

The exact identity of this verb stem's root is difficult to determine. One attractive possibility is that it is the (regular) copular root *-bé-*. The main difficulty with this analysis concerns how the completive morpheme combines with the suffix *-ire*. As shown in (68), when a COMPLETIVE+INFINITIVE construction is combined with a Recent or Remote Perfect/Stative form in order to express how long an action has been completed, the vowel that results from the contraction of *ˊbV-* and *-įre* is [i]. However, as shown in (69), when straightforward instances of the copular root *-bé-* combine with the suffix *-įre*, the resulting vowel is [e].

(68) ˊbV- + į → [bi]: Perfect and Pluperfect forms

		SIMPLE ROOT	COMPL ROOT + INF
a. Recent Perfect	Underlying	tu-a-^{L}[luh-įre]$^{H\text{-}H}$	tu-a-^{L}[bV̲́-įre]$^{H\text{-}H}$ i-[luh-a]
SM-*a*-^{L}[ROOT-*įre*]$^{H\text{-}H}$	Pre-Contraction	tu-**á**-[l**ú**h-į̀r**è**]	tu-a-[b**V́-į́rè**]' i-[lű̋h-ȁ]
	Surface	tw-**á**-[l**ú**hį̀r**è**]	tw-a-[b**í**r]' i-[lű̋hȁ]
	Gloss	'we have been tired (for a little while)'	'we have already been tired (for a little while)'
b. Remote Perfect	Underlying	tu-a-[luh-įre]^{L}	tu-a-[bV̲́-įre]^{L} i-[luh-a]
SM-*a*-[ROOT-*įre*]^{L}	Pre-Contraction	tu-a-[luh-įr**è**]	tu-á̲-[bV-įr**è**] i-[lű̋h-ȁ]
	Surface	tw-a-[luhįr**è**]	tw-á̲-[bir]' i-[lű̋hȁ]
	Gloss	'we have been tired (for a long time)'	'we have already been tired (for a long time)'

(69) Copular *-bé-* + *įre* → [be] (Copula + adjective *ba-lįto* 'heavy')

a. Recent Perfect	Underlying	tu-a-^{L}[bé-įre]$^{H\text{-}H}$	ba-lįto
SM-*a*-^{L}[ROOT-*įre*]$^{H\text{-}H}$	Pre-Contraction	tu-a-[bé-į́r**è**]	ba-lį̋tȍ
	Surface	tw-a-[b**érè**]	ba-lį̋tȍ
	Gloss	'we have been heavy (for a little while)'	
b. Remote Perfect	Underlying	tu-a-[bé̲-įre]^{L}	ba-lįto
SM-*a*-[ROOT-*įre*]^{L}	Pre-Contraction	tu-á̲-[be-įr**è**]	ba-lį̋tȍ
	Surface	tw-á-[ber**è**]	ba-lį̋tȍ
	Gloss	'we have been tired (for a long time)'	

Whether or not this difficulty for a copula-based analysis of *ˊbi-* can be overcome is not clear. For now, then, I will simply posit that the completive root is *ˊbi*, which will derive the correct contraction properties in (68) without problems.

5.4 Summary: phonological simplification of the Kinande tense system

At this point, we have developed analyses for all of the verbal morphemes encountered in the core MCA tenses of Kinande. In (70)-(74) below, I summarize these results by showing side by side (a) the traditional analysis of the Kinande TAM system, and (b) the reanalysis proposed in this chapter.

In this side-by-side comparison, the phonological simplification achieved by the reanalyzed system become immediately obvious. In the traditional analysis, each verb must be separately marked as receiving either Simple tone or Complex tone, and each of its prefixes must be marked as bearing either a fixed H tone, an anticipating H tone, or no H tone. In the reanalysis proposed in this section, neither of these is necessary. Here, just two forms fail to receive Complex tone: the two Remote forms in (70g) and (73d). These may be assumed to receive their own idiosyncratic tone patterns before Complex tone is assigned (either morphologically or phonologically), and thereby block its assignment. This leaves Complex tone as entirely general tone pattern, which is assigned in all MCA clauses to the first stem of the first verb. Moreover, the tonal properties of all elements before the main stem are now entirely predictable on the basis of a simple H vs. Ø contrast, interacting with general principles of Complex tone assignment and vowel contraction.

(70) Present Tense Aspectual Forms

		Traditional analysis	Reanalysis
a.	Perfective	SM-*á-mâ*-[Root-*a*]	SM-*a*-[ma-*a*]-[root-*a*]
b.	Imperfective	SM-*ká*-[Root-*a-a*]	SM-*Ø*-[k<u>á</u>-*a-a*]-[root-*a-a*]
c.	Inceptive	SM-*limu*-[Root-*a*]	SM-*Ø*-[li] *mu*-[root-*a*]
d.	Progressive/Emphatic	SM-*nému*-[Root-*a*]	SM-*Ø-na*-[li] *mu*-[root-*a*]
e.	Stative	SM-*Ø*-^{L}[Root-*įre*]$^{H\text{-}H}$	SM-*Ø*-[Root-*įre*]
f.	Recent Perfect/Stative	SM-*a*-^{L}[Root-*įre*]$^{H\text{-}H}$	SM-*a*-[Root-*įre*]
g.	Remote Perfect/Stative	SM-*a*-[Root-*įre*]^{L}	SM-*a*-[Root-*įre*]^{L}
h.	Persistive (Actions)	SM-*ki-na*-^{L}[Root-*a-a*]$^{H\text{-}H}$	SM-*ki-na*-[Root-*a-a*]
i.	Persistive (States)	SM-*ki-na*-^{L}[Root-*įre*]$^{H\text{-}H}$	SM-*ki-na*-[Root-*įre*]
j.	Limitative (Actions)	SM-*ki*-^{L}[Root-*a-a*]$^{H\text{-}H}$	SM-*ki*-[Root-*a-a*]
k.	Limitative (States)	SM-*ki*-^{L}[Root-*įre*]$^{H\text{-}H}$	SM-*ki*-[Root-*įre*]
l.	Gnostic	SM-*Ø*-^{L}[Root-*a*]$^{H\text{-}H}$	SM-*Ø*-[Root-*a*]

(71) Future Tense forms

		Traditional analysis	Reanalysis
a.	Hod. Future	SM-*ká-ndi*-[Root-*a*]	SM-*Ø*-[k<u>á</u>-*a-a*]-[(ge)nd-*a-a*] i-[root-*a*]
b.	Post-Hod Future 1	SM-*ká-ndi-sya*-[Root-*a*]	SM-*Ø*-[k<u>á</u>-*a-a*]-[(ge)nd-*a-a*] i-[si-a]-[root-*a*]
c.	Post-Hod Future 2	SM-*ká-sya*-[Root-*a-a*]	SM-*Ø*-[k<u>á</u>-*a-a*]-[si-*a-a*]-[root-*a-a*]
d.	Emphatic Hod Fut.	SM-*nému-ndi*-[Root-*a*]	SM-*Ø-na*-[li] *mu*-[(ge)nd-*a*] i-[root-*a*]
e.	Emph. Post-Hod Fut	SM-*nému-ndi-sya*-[Root-*a*]	SM-*Ø-na*-[li] *mu*-[(ge)nd-*a*] i-[si-*a*]-[root-*a*]

(72) Informative Past Forms

	Traditional analysis	Reanalysis
a. Immediate Past	*mó*-SM-*a*-*ná*-*ma*-*ꜝbi*- [Root-*a*]	*mo*-SM-*a*-*na*-[ma-*a*]-[bí̱-*a*] i-[root-*a*]
b. Hodiernal Past	*mó*-SM-*ká*-[Root-*a*-*a*]	*mo*-SM-Ø-[ká-*a*-*a*]-[root-*a*-*a*]
c. Recent Past	*mó*-SM-*a*-^{L}[Root-*ire*]$^{H\text{-}H}$	*mo*-SM-*a*-[Root-*ire*]
d. Remote Past	*mó*-SM-*a*-^{L}[Root-*a*]$^{H\text{-}H}$	*mo*-SM-*a*-[Root-*a*]

(73) Factual Past forms

	Traditional analysis	Reanalysis
a. Immediate Past	SM-*ká*-*ꜝbi*-[Root-*a*]	SM-Ø-[ká̱-*a*-*a*]-[bí̱-*a*-*a*] i-[root-*a*]
b. Hodiernal Past	SM-*ꜝlya*-[Root-*a*-*a*]	SM-Ø-[li-*a*-*a*]-[hum-*a*-*a*]
c. Recent Past	SM-*a*-^{L}[Root-*a*-*a*]$^{H\text{-}H}$	SM-*a*-[Root-*a*-*a*]
d. Remote Past	SM-*a*-[Root-*a*-*a*]^{L}	SM-*a*-[Root-*a*-*a*]^{L}

(74) Modal forms

	Traditional analysis	Reanalysis
a. Modal of Possibility	SM-anga-na-^{L}[Root-*a*]$^{H\text{-}H}$	SM-*anga*-*na*-[Root-*a*]
b. Modal of Advisability	SM-anga-^{L}[Root-*a*]$^{H\text{-}H}$	SM-*anga*-[Root-*a*]

6 Conclusion

The Kinande verb system has acquired a well-deserved reputation for extreme morphological complexity. Nurse (2008), for example, describes the system as a "morphologist's dream" (Appendix 1), writing that of all of the Bantu verb forms that he has examined,

> the longest string found so far consists of some twenty morphemes, from Mutaka's language, Nande (found in Nurse and Philippson 2003:9). (p. 21)
>
> Unlike in most Bantu languages, up to seven (more?) TAM markers may co-occur (Nurse & Philippson 2003:9), and that in a total string numbering up to twenty or so morphemes. (Appendix 1)

In this chapter, I hope to have shown that Kinande verbal morphology is actually even *more* complex than Nurse describes, but at the same time much more structured. Consider, for example, the verb form referred to in the first quote above. Nurse's presentation of this form, following the traditional analysis, is presented in (75a). Its reanalysis, according to the proposals of this chapter, is presented in (75b). In both (a) and (b), glosses are my own.

(75) Extreme morphological complexity (Nurse and Philippson 2003: p. 9)[25]
  a. tu-né-mu-ndi-syá-tá-sya-ya-{ba-[king-ul-ir-an-is-i-a]}-kyo
  SM-COP-LOC-FUT-POSTHOD-AGN_1-AGN_2-GO_2-OM-{[CLOSE-REVERSE-APP-REC-CAU_1-CAU_2-DES]}-OBJ
  b. tu-Ø-na-[li] mu-[(ge)nd-a] i-[si-á]-[taa-á]-[si-a]-[i-a]-ba-[king-ul-ir-an-is-i-a]-kyo
  SM-TAM-AFF-[COP] NC.18-[GO-DES] NC.5A-[FUT-DES]-[REPEAT-DES]-[REPEAT-DES]-[GO-DES]- {...}
  We will make it possible one more time for them to open it for each other.

As presented by Nurse, this form consists of 17 morphemes, 7 of which are analyzed as TAM morphemes. In the reanalysis presented here, the form has 25 morphemes, *fifteen* of

[25] In addition to its initiative meaning, -́ta- commonly occurs preceding repetitive -́sya- in order to mean "again." This is its role here, which I gloss as AGN_1.

which are used in the expression of tense and aspect. More importantly, however, under the analysis developed here, these morphemes do not simply form a long, arbitrarily ordered string. Fifteen pre-stem morphemes can appear in this form because it employs all three ways that multiple verb stems can combine in a single form. At the very highest level, what we have here is COPULA+LOCATIVE construction, in which the only fully conjugated verb is the irregular emphatic copula *tu-né*. This copula takes the locative verbal noun *mu-[gend-a]* as its complement, which in turn takes as its complement an extended infinitive noun containing five auxiliary stems and one primary stem. Thus, we can represent the overall structure of (75) as in (76). (Here, I replace the long primary stem seen in (76) with the simpler stem [*hum-a*].)

(76) Large scale structure of Bantu's longest verb

tu-né
'we are indeed'

+ mu-[(ge)nd-a]
' '(in) going'

+ i-[si-a]-[táa-a]-[sí-a]-[i-a]-ba+[hum-a]
'to later, once more, go and and hit them'

Recognizing this level of internal structure helps us to understand the exact ways in which Kinande verbs are more complex than those observed in other Bantu languages. To begin with, the complexity of the Kinande verb does *not* lie in an abundance of tense markers, by which I mean specifically single morphemes that intervene between the subject marker and the verb stem. As inspection of the reanalyzed verb system in 5.4 will readily reveal, once we have accounted for auxiliary stems, copula+locative constructions, and infinitive complement constructions, we are left with only four true TAM markers: *Ø*, *a*, *(a)nga)* and *ki*. These markers are all extremely widespread throughout Bantu, and do not distinguish Kinande in any particular way.

Similarly, the appearance of both COPULA+LOCATIVE structures and VERB+INFINITIVE structures are also quite widespread. Both of these structures occurs widely in Bantu languages as means of expressing temporal and aspectual distinctions (Nurse 2008).

The unique innovation of Kinande, then, lies in its ability to combine multiple stems within a single verb form. These stems all share a single subject marker and a single true TAM marker when they occur in finite forms, and they all share a single infinitive prefix (class 5) or a single locative prefix (class 18) when they occur in non-finite forms. Moreover, they may be entirely optional, such as itive [*i-a*]/[*i-aa*], or they may be incorporated into the TAM system as exponents of tense or aspect, such as [*ma-a*], [*li-a-a*], or [*ká̠-a-a*]. When these auxiliary stems combine with one another and interact with the Copula+Locative and Verb+Infinitive structures made available in other Bantu languages, the result is the highly complex structures seen above.

Finally, it is worth closing with the observation that under the analysis developed here, the tone patterns of even these highly complex structures fall out automatically from the exact same phonological principles that are needed to account for simpler forms. This, of course, is exactly what we would hope in a system of such complexity, and reinforces the degree to which the phonological processes analyzed throughout this dissertation form part of an active and fully generative system.

Conclusion

Throughout this dissertation, we have seen how the surface tone pattern of a Kinande verb can vary dramatically depending on its exact morphological and phonological makeup. We have seen, for example, that the most common tone pattern assigned to finite verbs, the *Complex* tone pattern discussed in detail in chapters 4 and 5, can produce very different surface results depending on

(a) whether or not the verb's root bears a lexical H tone

no:	tw-ang**á**-[h**ú**maniri**rà**]	'we should hit each other on purpose'
yes:	tw-anga-[tùmànír**í**rà]	'we should send each other on purpose'

(b) whether or not the verb stem contains more than two vowels

no:	tw-anga-[tùm**à**]	'we should send'
yes:	tw-anga-[tùmànír**í**rà]	'we should send each other on purpose'

(c) whether or not the verb stem is preceded by an object marker

no:	tw-anga-[tùm**à**]	'we should send'
yes:	tw-angá-mú-[tùm**à**]	'we should send him'

(d) whether or not the verb stem is preceded by the affirmative morpheme *na*

no:	tw-anga-[tùmàn**í**r**í**rà]	'we should send each other on purpose'
yes:	tw-anga-ná-[tùmàn**í**r**í**rà]	'we can send each other on purpose'

(e) whether or not the verb stem contains a passive or causative suffix

no:	tw-ang**á**-[h**ú**màniri**rà**]	'we should hit each other on purpose'
yes:	tw-ang**á**-[h**ú**misiríryâ]	'we should make (s.o.) hit on purpose'

(f) whether or not the verb's root ends in a vowel

no:	tw-ang**á**-[h**ú**m**à**]	'we should hit'
yes:	tw-ang**á**-[sw**à**]	'we should grind'

(g) whether or not the verb contains an auxiliary verb stem

no:	tw-ang**á**-[h**ú**màniri**rà**]	'we should hit each other on purpose'
yes:	tw-ang**á**-[yà]-[humanirírà]	'we should go and hit each other on purpose'

The mostly free combination of these factors leads to a staggering number of different ways in which Complex tone can surface within a verb. Despite this, native speakers have no difficulty in selecting a tone pattern for any arbitrarily chosen verb form, revealing that they have internalized a grammar that encodes the key regularities which lie beneath the surface variability. In order to do so, however, they must posit underlying representations that are considerably removed from surface forms. This may be seen in (1), which shows the wide gulf between the consistent underlying representations demanded by a unified analysis of verbal tone and the varying surface forms that they give rise to.

(1) Underlying and surface representations of verbs with Complex tone

	Underlying	Surface	Gloss
a.	L H₁ H₂ → $L \quad H_1 H_2$ tu-anga- [hum-an-irir-a]	$H_1 \; L \; L_2$ twangá[húmànirirà]	we should hit other on purpose
b.	$L \; H \quad H_1 H_2$ tu-anga- [túm-an-irir-a]	$L \; L_1 \; H_2 \; L$ twanga[tùmàníránà]	we should send each other on purpose
c.	$L \; H \quad H_1 H_2$ tu-anga- [túm-a]	$L \; L_1$ twanga[tùmà]	we should send
d.	$L \; H \quad H_1 H_2$ tu-anga- mu-[túm-a]	$H \; L \; L_1$ twangámú[tùmà]	we should send him
e.	$L \; H \quad H_1 H_2$ tu-anga- na-[túm-an-irir-a]	$H \; L \; L_1 \; H_2 \; L$ twanganá[tùmàníránà]	we can send each other on purpose
f.	$L \quad H_1 H_2$ tu-anga- [hum-is-irir-i̧-a]	$H_1 \; L \; H_2 \; H_\varphi \; L_1$ twangá[húmìsiríryâ]	we should make (someone) hit on purpose
g.	$L \quad H_1 H_2$ tu-anga- [so-a]	$H_1 \; L_2$ twangá[swà]	we should grind
h.	$L \quad H_1 H_2$ tu-anga [i-a] [hum-an-irir-a]	$H_1 \; L \quad H_\varphi L_1$ twangá[yà][humanirírà]	we should go and hit each other on purpose

I have emphasized the ways in which the mapping from underlying forms to surface forms involves numerous instances in which a phonological generalization established by one process is obscured by the effects of another process that applies later. On the one hand, this has included situations which are opaque in the classic sense of Kiparsky (1973): the effects of a process are observed on the surface even though its triggering context is not present (counterbleeding opacity), or the effects of a process are not observed even though its triggering context is present (counterfeeding opacity). On the other hand, this has also included cases in which the original *morphological domain* of a process (e.g. tone assignment, tone spread) is obscured by a subsequent process (e.g. spread, shift) that transfers its effects outside of that domain. In (2) below, I catalog the interactions we have observed of both types.

(2) Opaque interactions within the derivation of Kinande Verbs

	Phonological Generalization ...	*Opacified by ...*	*cf.*
a.	Lexical tone contrast Domain: Root/Stem H̲ tones are *lexically restricted* to the first vowel *of* the stem.	Leftward shift Domain: Phonological Phrase (φ) H̲ tones *surface* on the first vowel *before* the stem.	ch. 2 ch. 4, esp. *3.2*
b.	Grammatical **H** tone placement Domain: Stem **H** tones are *initially assigned* to V2 and FV.	Leftward shift Domain: Phonological Phrase (φ) **H** tones *surface* on V1 and V0, or the Penult and Antepenult.	ch. 2 ch. 4, esp. *3.3*
c.	Grammatical **H** tone placement Domain: Stem **H** tones are *initially assigned* within the verb stem.	Leftward spread, shift Domain: Macrostem, φ **H** tones can sometimes *surface* outside of the verb stem.	ch. 4, esp. *3.3, 4*
d.	Grammatical **H** tone lowering Domain: Stem A H̲ tone on V1 causes a **H** tone on V2 to lower.	Lexical tone suppression Domain: Verbal Unit (VU) The conditioning H̲ tone is overwritten by a prefixal **L**.	ch. 4, esp. *3.3, 5*
e.	Grammatical **H** tone lowering Domain: Stem A H̲ tone on V1 causes a **H** tone on V2 to lower.	Leftward spreading Domain: Macrostem **H** tones that spread from FV to V2 do not lower after a H̲ on V1.	ch. 4, esp. *3.3, 4.2*
f.	Leftward tone spread Domain: Macrostem Leftward spread *initially applies* only within the Macrostem.	Leftward shift Domain: Phonological Phrase (φ) *On the surface*, spread tones can span a Macrostem boundary.	ch. 2 ch. 4, esp. *3.3*
g.	$H_φ$ blocking Domain: Phonological Phrase (φ) The assignment of $H_φ$ is blocked by a word-final L tone.	$T_ι$ Assignment Domain: Intonational Phrase (ι) The conditioning L tone is overwritten by $L_ι$ or $H_ι$.	ch. 3, esp. *1, 4.1*

A fundamental generalization that emerges from (2) is that in all cases where two phonological processes interact opaquely, a process applying within a *smaller* domain is always obscured by a process applying within a *larger* domain, and never vice-versa. This result is by no means logically necessary. It is predicted only under the assumption that cyclic evaluation is the only means by which ordering relations may be established between two processes. The results of this study, then, suggest that cyclic evaluation, in which parallel constraint evaluation is triggered upon the evaluation of new morphological material or new morphological/phonological domains, provides just the right amount of serialism in order to account for ordering-based opaque interactions between processes.

At the same time, I have argued that cyclic evaluation is not in and of itself sufficient to account for the full range of opaque effects in Kinande. In particular, I have argued that *constraint reranking* is necessary in order to account for (a) the fact that H tones shift postlexically but not in the lexical phonology (chapter 2) (b) the fact that vowel contraction is delayed until the very end of the phonology, even though vowel-vowel sequences are present underlyingly (chapter 3, section 5), and (c) the fact that within the lexical phonology, leftward high tone spreading creates OCP violations that cannot arise in the course of high tone assignment (chapter 4, section 4.2). I have therefore argued not just for cyclic evaluation, but for *stratal* evaluation, in which different morphological and/or phonological domains may be governed by different constraint rankings.

Finally, this work has sought to contribute to an understanding of the fundamental constraints which drive tonal interactions. This is most apparent in chapter 2, where I argued that bounded leftward shift is driven by constraints against tonal crowding (*CROWD) rather than constraints that directly demand that H tones move (e.g. ALIGN, *SPONSOR). I argued that a crowding-based approach is empirically supported by the distribution of L tones and falling tones in Kinande, so that the theory-internal consideration that a crowding-based analysis is more satisfying than a movement-based analysis within Optimality Theory guides us to a genuine insight about the language. My sense is that that many more insights of this nature will arise in further attempts to understand tonal phenomena as resulting from the interaction of well-motivated constraints. I am certainly not the first to suggest this, of course; works exploring constraint-based analyses of tonal interaction, include, for example, Bickmore (1996), Myers (1997), Cassimjee and Kisseberth (1998), Yip (2000), Zoll (2003) and Zhang (2009). However, one barrier to a full embrace of this project has always been the clearly derivational nature of tone. In this dissertation, I have argued that insights gained by the constraint-based analysis of tone and the insights gained through the study of serial interactions need not be mutually exclusive. Indeed, the rich abundance of ordering-based opaque tonal interactions offers a promising testing ground for the sorts of serial ordering that an adequate theory of grammar must be able to account for.

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