Theory and description in African Linguistics

Selected papers from the 47th Annual Conference on African Linguistics

Edited by

Emily Clem

Peter Jenks

Hannah Sande

Contemporary African Linguistics

./langsci/graphics/lan

Contemporary African Linguistics

Editors: Akinbiyi Akinlabi, Laura J. Downing

In this series:

1. Payne, Doris L., Sara Pacchiarotti & Mokaya Bosire (eds.). Diversity in African languages: Selected papers from the 46th Annual Conference on African Linguistics.
2. Persohn, Bastian. The verb in Nyakyusa: A focus on tense, aspect and modality.
3. Kandybowicz, Jason, Travis Major & Harold Torrence (eds.). African linguistics on the prairie. Selected papers from the 45th Annual Conference on African Linguistics.

ISSN: 2511-7726

Theory and description in African Linguistics

Selected papers from the 47th Annual Conference on African Linguistics

Edited by

Emily Clem

Peter Jenks

Hannah Sande

Emily Clem, Peter Jenks & Hannah Sande (ed.). 2018. *Theory and description in African Linguistics: Selected papers from the 47th Annual Conference on African Linguistics* (Contemporary African Linguistics). Berlin: Language Science Press.

This title can be downloaded at:
http://langsci-press.org/catalog/book/000

ISBN: no digital ISBN
no print ISBNs!
ISSN: 2511-7726
no DOI
Source code available from www.github.com/langsci/000
Collaborative reading: paperhive.org/documents/remote?type=langsci&id=000

Cover and concept of design: Ulrike Harbort
Fonts: Linux Libertine, Libertinus Math, Arimo, DejaVu Sans Mono
Typesetting software: XeLaTeX

Language Science Press
Unter den Linden 6
10099 Berlin, Germany
langsci-press.org

Storage and cataloguing done by FU Berlin

no logo

Contents

Part I

Phonetics and phonology

Chapter 1

Metrically conditioned vowel length in Dagaare

Arto Anttila
Stanford University

Adams Bodomo
University of Vienna

There is little evidence for stress in Dagaare, but vowel length alternations in nominal and verbal morphology reveal the presence of a word-initial metrical foot. New evidence for the foot hypothesis comes from action nominals formed with the suffix /-UU/: if the root is CV, the root lengthens and the suffix shortens; if the root is CVV the suffix shortens; if the root ends in C nothing happens. Similar length alternations appear more idiosyncratically with number and aspect suffixes. A metrical analysis provides a simple account of these vowel length alternations.

1 Introduction

Dagaare (Gur, Mabia; **Naden1989**, **Bodomo1997**) is a two-tone language of northwestern Ghana.[1] There is little direct evidence for metrical stress, but vowel alternations in nominal and verbal morphology suggest the presence of a word-initial metrical foot (**Anttila&Bodomo2009**). New evidence for the foot hypothesis comes from vowel length alternations in action nominals, the topic of the present paper.

[1]The data represent the Jirapa district dialect of which the second author is a native speaker. Most of the data are previously unpublished; some can be found in (**Kennedy1966**; **Bodomo1997**; **Anttila&Bodomo2009**), which are referred to in the text. The examples are given in **Bodomo1997**'s (**Bodomo1997**: 37) orthography. The digraphs <ky>, <gy>, <ny> stand for IPA [tʃ], [dʒ], [ɲ], respectively.

Kennedy1966 gives the vowel inventory for Dagaare word-medial syllables shown in Table **??**.

Table 1: Dagaare vowels (**Kennedy1966**)

	−round		+round	
	+ATR	−ATR	+ATR	−ATR
+high, −low	i, ii	ɪ, ɪɪ	u, uu	ʊ, ʊʊ
−high, −low	e, ie	ɛ, ɪɛ	o, uo	ɔ, ʊɔ
−high, +low		a, aa		

Vowel length is contrastive in Dagaare. High and low vowels can be short or long, but there is a striking gap in Kennedy's inventory: long mid vowels are missing. **Kennedy1966** notes that word-medially "there are high and low long vowels, but no mid long vowels" and suggests that in terms of the phonological system the diphthongs [ie], [ɪɛ], [uo], [ʊɔ] are in fact the missing long vowels /ee/, /ɛɛ/, /oo/, /ɔɔ/. This is an attractive interpretation because it makes the long vowel pattern symmetrical.

The problem is that long mid vowels do exist on the surface. There are even near-minimal pairs that demonstrate a phonemic contrast between a long mid vowel and the corresponding diphthong: *béé* 'or' vs. *bíé* 'child.SG', *gɔ̀ɔ́* 'left' vs. *gúɔ̀* 'thorn.SG'. Examples of long mid vowels are shown in Table **??**. /E/ stands for a [−high, −low, −round] vowel and /I/ for a [+high, −low, −round] vowel, both underspecified for ±ATR]; /V/ stands for a [−high] vowel underspecified for [±back], [±round], and [±ATR].[2]

However, Kennedy's insight is nevertheless well founded: long mid vowels are phonologically special. The long mid vowels in Table **??** are either underlying or result from the concatenation of two underlying short mid vowels; phonologically derived long mid vowels are systematically missing. In particular, the process of vowel lengthening stops short of creating long mid vowels as shown in Table **??**.

[2]Tone does not figure into the vowel length alternations, but a brief note is warranted. Underlyingly there is a three-way contrast between H, L, and toneless; on the surface there is a three-way contrast H, ꜜH, and L. Toneless morphemes surface as H or L depending on the context. We mark downstep as a raised exclamation point before a H toned syllable. Downstep seems analyzable as a floating L and contour tones as combinations of H and L. The underlying tone marking reflects our work in progress. For more details, see **Kennedy1966** and **Anttila&Bodomo2000**.

Table 2: Long mid vowels

Underlying	Surface		Underlying	Surface	
/béé/	béé	'or'	/bóò/	bóò	'which'
/pɔg-léé/	pɔ̀gléé	'woman-DIM'	/tòò-rÍ/	tòòrí	'ear-SG'
/gbɛ́-É/	gbɛ́ɛ̀	'leg-PL'	/dɔɔ-´/	dɔ́ɔ́	'man-SG'
/bar-ÈÉ/	bàrɛ̀ɛ́	'leave-PERF'	/ɔɔ-rV́ /	ɔ̀ɔ̀rɔ́	'chew-IMPF'
/téésì /	téésì	'test.SG'	/lɔ́ɔ́-rÍ/	lɔ́ɔ́rì	'lorry-SG'

Table 3: Vowel lengthening in suffixed nouns

	Root	Suffixed form		N + A Compound	
(a)	/bi-/	bíí-rí	'child-PL'	bì-fáá	'bad child'
	/pì-/	pìì-rí	'rock-SG'	pì -fáá	'bad rock'
	/kù-/	kùù-rí	'hoe-SG'	kù-fáá	'bad hoe'
	/gʊ́-/	gʊ́ʊ́-rì	'thorn-PL'	gʊ́-!fáá	'bad thorn'
(b)	/pò-/	pùò-rí	'back-SG'	pò-fáá	'bad back'
	/nɔ́-/	nɔ́ɔ́-rì	'mouth-SG'	nɔ́-!fáá	'bad mouth'
	/dò-/	dò-rí	'pig-PL'	dò-fáá	'bad pig'
	/dè-/	dè-rí	'room-PL'	dè-fáá	'bad room'
	/lè-/	lè-rí	'bead-SG'	lè-fáá	'bad bead'
	/gbɛ́-/	gbɛ́-rì	'leg-SG'	gbɛ́-!fáá	'bad leg'

Table **??** shows that the number suffix /-rÍ/ triggers vowel lengthening in high vowel stems, but not in mid-vowel stems where the result is either a diphthong or the vowel simply fails to lengthen, depending on the lexical item. The noun-adjective compound is given as a diagnostic for the underlying form of the noun: the nouns in Table **??** all have a short stem vowel. In contrast, the long mid vowel in *dɔ́ɔ́* 'man.SG' given in Table **??** is underlying: *dɔ̀ɔ̀-fáá* 'bad man'. Lengthening is lexically conditioned even in high vowel stems: there are words like *bí-rì* 'seed-SG' and *yí-rì* 'house-SG' where lengthening does not happen. Finally, the data illustrate a characteristic aspect of Dagaare number morphology: /-rÍ/ may mean either singular or plural depending on the stem, an instance of "polarity morphology" that has attracted the attention of semanticists (**Grimm2012**).

Vowel lengthening also occurs in singular forms with no overt suffix. **Anttila&Bodomo2009** propose that in such cases the root vowel lengthens in order to satisfy a bimoraic

foot template.

Table 4: Vowel lengthening in unsuffixed nouns

	Root	Suffixed form		N + A Compound	
(a)	/bi-/	bíé	'child.SG'	bì-fáá	'bad child'
	/gʊ́-/	gʊ́ɔ̀	'thorn.SG'	gʊ́-ꜜfáá	'bad thorn'
(b)	/dè-/	dìé	'room.SG'	dè-fáá	'bad room'
	/dò-/	dùó	'pig.SG'	dò-fáá	'bad pig'

Here is the reasoning: the singular form is a phonological word; therefore it must contain at least one foot; therefore it must be minimally bimoraic (**McCarthyPrince1996**). In Dagaare this generalization holds for almost all nouns.[3] In contrast, function words, weak forms of pronouns, and citation forms of verbs can be monomoraic. The question is why the vowel does not simply lengthen, yielding **bíí*, **gʊ́ɔ̀*, **dèé*, and **dòó*. **Anttila&Bodomo2009** propose that this is due to two constraints: **bíí* and **gʊ́ɔ̀* are blocked by a constraint against word-final high vowels; **dèé*, and **dòó* are blocked by a constraint against long mid vowels. Crucially, both constraints only apply in phonologically derived environments. The optimal outcome is a rising diphthong: *bíé*, *gʊ́ɔ̀*, *dìé*, and *dùó*.

In sum, we have seen that all the nine vowels of Dagaare can be underlyingly either short or long (**Kennedy1966**). There are also underlying diphthongs, such as *tìɛ̀* 'shoot', *pùòrì* 'thank', *yíélì* 'sing', *lʊ́ɔ́r-áá* 'lion-SG'. However, long mid vowels [ee], [ɛɛ], [oo], [ɔɔ] are special in that they cannot be the result of lengthening.

This system of vowel length may seem complicated and one can reasonably question whether it has anything to do with foot structure. We will now provide new evidence suggesting that it indeed does. We first show that verbs exhibit parallel length alternations, complete with parallel exceptions. Particularly interesting is the action nominal paradigm where the length alternations are entirely regular and the foot template triggers both vowel lengthening and vowel shortening.

2 Length alternations in verbs

The key alternations in the verbal paradigm are illustrated in Table **??**.

[3] We are aware of four monomoraic (CV) nouns: *bâ* 'father.SG', *mă* 'mother.SG', *nû* 'hand.SG', *zû* 'head.SG'.

Table 5: Vowel length alternations in Dagaare verbs

	Root	Cit. form	Imperf.	Nominal	
(a)	/ba-/	bà	bàà-rá	báá-ʊ́	'stick into the ground'
	/baa-/	bàà	bàà-rá	báá-ʊ́	'grow (of child)'
(b)	/bar-/	bàrì	bà-rá	bár-ʊ́ʊ́	'leave'
	/báɾ̀r-/	bárrì	bár-ꜜrá	bárꜜr-ʊ́ʊ́	'bargain'
	/báàr-/	báárì	báá-ꜜrá	bááꜜr-ʊ́ʊ́	'finish'

The root and the citation form are identical except that consonant-final roots acquire a final epenthetic vowel in the citation form, either /i/ or /ɪ/ depending on ATR-harmony. This is because a Dagaare word must end in a vowel or in the velar nasal [ŋ]; in the latter case vowel epenthesis seems optional.[4] The imperfective suffix /-rV́/ copies its vowel quality from the root. Our main focus is on the action nominals where both roots and suffixes alternate. We assume that the underlying form of the suffix is /-ÚÚ/, where /U/ stands for a [+high, –low, +round] vowel underspecified for [±ATR]. Here are the key generalizations. First, a short root vowel lengthens before the suffix, e.g., /ba/ 'stick into the ground' becomes *báá-ʊ́* (long root vowel). Second, the suffix vowel is short after vowel-final roots, but long after consonant-final roots, e.g., /ba/ 'stick into the ground' yields *báá-ʊ́* (short suffix vowel), but /bar/ 'leave' yields *bár-ʊ́ʊ́* (long suffix vowel).[5]

Tables 6 and 7 illustrate vowel length alternations in CV verbs. The above generalizations hold without exception in action nominals: the root vowel is always long and the suffix vowel is always short. Vowel height matters to root vowel lengthening: low and high root vowels lengthen (Table **??**), e.g., /bà/, *báá-ʊ* 'stick into the ground' and /dì/, *díí-ú* 'eat', whereas mid root vowels diphthongize (Table **??**), e.g., /kyɛ/, *kyɪɛ-ʊ* 'cut' and /bɔ/, *bʊɔ-ʊ* 'want, look for'. The verbs are further divided into two sets (a) and (b) based on vowel length in the imperfective. We will return to the imperfective shortly.

[4] This word-final epenthetic /i/ or /ɪ/ is a systematic counterexample to the ban on word-final derived high vowels. It seems that the ban only holds in the lexical phonology and that these epenthetic vowels are postlexical.

[5] There exists another nominalizing suffix /-bÚ/, which results in doublets such as *dííú ~ dííbú* 'eating', *ɲʊ́ʊ́ ~ ímmʊ́* 'putting', *wóŋúú ~ wómmú* 'understanding', and *zíŋʊ́ʊ́ ~ zímmʊ́* 'sitting'. More examples can be found in **Durand1953**. We have not conducted a systematic study of this suffix variation, but we speculate that it may depend on dialect and speech rate. The variation is not completely free: some verbs allow /-ÚÚ/, but not /-bÚ/, e.g., *píírʊ́ʊ́*/**pííríbʊ́* 'sweep', *síírʊ́ʊ́*/**síírɾ́bʊ́* 'touch'.

Table 6: CV verbs, low and high vowel roots

	Root	Cit. form	Imperf.	Nominal	
(a)	/ba-/	bà	bàà-rá	báá-ʊ́	'stick into the ground'
	/da-/	dà	dàà-rá	dáá-ʊ́	'buy'
	/wa-/	wà	wàà-ná	wáá-ʊ́	'come'
	/kpá-/	kpá	kpáá-rà	kpáá-ɔ̀	'boil'
	/la-/	là	làà-rá	láá-ʊ́	'laugh'
	/mí-/	mí	míí-rè	míí-ù	'rain'
	/bʊ́-/	bʊ́	bʊ́ʊ́-rɔ̀	bʊ́ʊ́-ɔ̀	'come (of rain)'
	/bú-/	bú	búú-rò	búú-ù	'measure, calculate'
	/nyu̱-/	nyu̱	nyu̱u̱rɔ̀	nyu̱u̱-ù	'**drink**'[a]
	/zú -/	zú	zúú-rò	zúú-ù	'steal'
(b)	/tá-/	tá	tá-rà	táá-ɔ̀	'reach'
	/ɪ-/	ì	ì-rɛ́	íí-ʊ́	'do'
	/dî-/	dî	dí-ꜜrɛ́	díí-ꜜʊ́	'take'
	/di-/	dì	dì-ré	díí-ú	'eat'
	/kʊ-/	kʊ̀	kʊ̀-rɔ́	kʊ́ʊ́-ʊ́	'give, offer'
	/yí-/	yí	yí-rè	yíí-ù	'divorce a male'

[a]We mark contrastive nasalization with a subscript tilde to avoid clutter. The interpretation of nasalized vowels is controversial. **Kennedy1966** derives them via absolute neutralization from vowel-/m/ sequences, e.g., /fààm/ →*fa̱a̱* 'fail': "There is a clear hole in the final nasal pattern. Though n and ŋ occur word final, m does not. Therefore nasalized vowels which are not contiguous to nasals are interpreted as vowel-m sequences." **Bodomo1997** assumes that nasalization is phonemic and notes that it is mostly found in long vowels.

The imperfective paradigm is more complicated. The suffix /-rV́/ copies the root vowel except that a high vowel becomes mid, reflecting the constraint against word-final derived high vowels, e.g., /di/, *dì-ré* 'eat-IMPF'. The verbs are further divided into two sets (a) and (b) based on whether the root vowel undergoes lengthening and/or diphthongization. The choice is phonologically unpredictable: we have vowel lengthening in /ba/ *bàà-rá* 'stick into the ground-IMPF', but not in /tá/ *tá-rà* 'reach-IMPF' (Table **??**); we have diphthongization in /gyɛ́-/ *gyíɛ́-rɛ̀* 'refuse to take', but not in /nyɛ́-/ *nyɛ́-rɛ̀* 'see, understand' (Table **??**). This

[5]The action nominalization *zóó-ú* is a counterexample to our generalization that there are no derived long mid vowels. Another such verb is /go-/: *gò, gò-ró, góó-ú* 'wait for, keep watch'.

[5]With this verb, vowel lengthening results in [áá], not in the expected [ɪ́ɛ́].

Table 7: CV verbs, mid vowel roots

	Root	Cit. form	Imperf.	Nominal	
(a)	/kyɛ-/	kyɛ̀	kyìɛ̀-ré	kyíɛ́-ʊ́	‘cut’
	/kpɛ-/	kpɛ̀	kpìɛ̀-ré	kpíɛ́-ʊ́	‘enter’
	/gyɛ́-/	gyɛ́	gyíɛ́-rɛ̀	gyíɛ́-ʊ̀	‘refuse to take’
	/ŋmɛ-/	ŋmɛ̀	ŋmìɛ̀-rɛ́	ŋmíɛ́-ʊ́	‘beat’
	/gbe-/	gbè	gbìè-ré	gbíé-ú	‘grind roughly’
	/bɔ́-/	bɔ́	bʊ́ɔ́-rɔ̀	bʊ́ɔ́-ʊ̀	‘want, look for’
	/kɔ́-/	kɔ́	kʊ́ɔ́-rɔ̀	kʊ́ɔ́-ʊ̀	‘farm’
	/yɔ́-/	yɔ́	yʊ́ɔ́-rɔ̀	yʊ́ɔ́-ʊ̀	‘roam’
(b)	/ko-/	kò	kò-ró	kúó-ú	‘dry’
	/kó-/	kó	kó-rò	kúó-ù	‘get ready for rain’
	/tɛ́-/	tɛ́	tɛ́-rɛ̀	tíɛ́-ʊ̀	‘display’
	/zo-/	zò	zò-ró	zóó-ú	‘run’
	/nyɛ́-/	nyɛ́	nyɛ́-rɛ̀	nyáá-ʊ̀	‘see, understand’

makes the imperfective suffix /-rV́/ look rather similar to the number suffix /-rÍ/ which also exhibits lexically conditioned vowel lengthening.

Table 8: CVV verbs

	Root	Cit. form	Imperf.	Nominal	
(a)	/baa-/	bàà	bàà-rá	báá-ʊ́	‘grow (of child)’
	/fáà-/	fáà	fáá-ꜜrá fáá-ꜜʊ́	‘seize’	
		wàá	wàà-rá	wáá-ʊ́	‘be’
	/tɪɛ-/	tɪ̀ɛ̀	tɪ̀ɛ̀-rɛ́	tɪ́ɛ́-ʊ́	‘shoot’
	/fɪ̰ɛ̰-/	fɪ̰ɛ̰̀	fɪ̰ɛ̰̀-rɛ́	fɪ̰́ɛ́-ʊ́	‘whip’
	/dɪ̰ɛ̰-/	dɪ̰ɛ̰̀	dɪ̰ɛ̰̀-nɛ́	dɪ̰́ɛ́-ʊ́	‘play’
	/yuo-/	yùò	yùò-ró	yúó-ú	‘open’
(b)		tàá	tá-ꜜrá	táá-ʊ́	‘have, own’
	/gaa-/	gàà	gɛ̀-rɛ́	gáá-ʊ́	‘go’

Table **??** illustrates the same paradigms in CVV verbs. The pattern in action nominals is the same as with CV verbs: the root vowel is long and the suffix vowel is short. In imperfectives the root vowel typically remains long, but there

is an interesting minor pattern: some verbs undergo vowel *shortening* in the imperfective, e.g., *tá-ˡrá* 'have-IMPF' and *gè-ré* 'go-IMPF'.[6] These verbs provide evidence for a process of root vowel shortening which was not visible in CV verbs where we could only see root vowel lengthening. The verbs 'be' and 'have' are tonally idiosyncratic and given our uncertainty about the analysis we do not give underlying forms for them.

Table 9: CVC verbs

	Root	Cit. form	Imperf.	Nominal	
(a)	/bɔŋ-/	bɔ̀ŋ̀	bɔ̀n-nɔ́	bɔ́ŋ-ʊ́ʊ́	'know'
	/dʊ́g-/	dʊ́gí	dʊ́g-rɔ̀	dʊ́g-ʊ̀ʊ̀	'boil, brew'
	/ɪŋ-/	ɪ̀ŋ̀	ɪ̀ŋ-né	ɪ́ŋ-ʊ́ʊ́	'put'
	/biŋ-/	bìŋ̀	bìn-né~bìŋ-né	bíŋ-úú	'put down'
	/sîŋ-/	síŋ̀	síŋ-ˡné	síˡŋ-ʊ́ʊ́	'equal'
	/pɔg-/	pɔ̀gì	pɔ̀g-rɔ́	pɔ́g-ʊ́ʊ́	'(en)close'
	/sag-/	sàgì	sàg-rá	ság-ʊ́ʊ́	'answer'
	/sɛ́g-/	sɛ́gí	sɛ́g-rɛ̀	sɛ́g-ʊ̀ʊ̀	'write'
	/sʊŋ-/	sʊ̀ŋ̀ì	sʊ̀ŋ-nɔ́	sʊ́ŋ-ʊ́ʊ́	'help'
(b)	/bar-/	bàrì	bà-rá	bár-ʊ́ʊ́	'leave'
	/bur-/	bùrì	bù-ró	búr-úú	'soak'
	/ɛ̂r-/	ɛ́rì	ɛ́-ˡré	ɛ́ˡr-ʊ́ʊ́	'grind'
	/mar-/	màrì	mà-rá	már-ʊ́ʊ́	'paste'
	/sar-/	sàrì	sà-rá	sár-ʊ́ʊ́	'slip'
	/sɔ́r-/	sɔ́rí	sɔ́-rɔ̀	sɔ́r-ʊ̀ʊ̀	'count'
	/woŋ-/	wòŋ̀ì	wò-nó	wóŋ-úú	'understand'
	/yel-/	yèlì	yè-lé	yél-úú	'speak'
	/zɪŋ-/	zɪ̀ŋ̀ì	zì-né	zíŋ-ʊ́ʊ́	'sit'
(c)	/bal-/	bàlì	bàl-lá~bàl-á	bál-ʊ́ʊ́	'be tired'

We now turn to consonant-final roots. Table ?? illustrates the same paradigms in CVC roots. Here the action nominal suffix vowel is always long. The imperfective paradigm shows mixed behavior of the familiar kind: the initial syllable may be heavy (CVC.CV) as in (a) or light (CV.CV) as in (b), depending on the verb. One and the same verb may even allow both forms as in (c): /bal-rV́/ 'be.tired-

[6] The ablaut in *gè-ré* 'go-IMPF' is specific to this lexical item.

IMPF' may come out either as *bàl-lá* or *bàl-á*. Minimal pairs like /bɔŋ-rV́/, *bɔ̀n-nɔ́* 'know-IMPF' with a heavy initial syllable and /wòŋ-rV́/ *wò-nó* 'hear-IMPF' with a light initial syllable suggest that the choice between the two is lexical. Note that the suffixal /r/ assimilates in place and/or manner to the root-final consonant; the details will be set aside here.[7]

The same paradigms for CVCC verbs are shown in Table **??**. Again, the vowel in the action nominal suffix is always long. This time even the imperfective paradigm is uniform: the initial syllable is always heavy (CVC.CV), with no free or lexical variation.

Table 10: CVCC verbs

Root	Cit. form	Imperf.	Nominal	
/bârr-/	bárrì	bár-ꜜrá	bárꜜr-ʊ́ʊ́	'bargain'
/bɛll-/	bɛ̀llì	bɛ̀l-lɛ́	bɛ́ll-ʊ́ʊ́	'deceive'
/gɔll-/	gɔ̀llì	gɔ̀l-lɔ́	gɔ́ll-ʊ́ʊ́	'go around'
/kann-/	kànnì	kàn-ná	kánn-ʊ́ʊ́	'learn'
/kyɛll-/	kyɛ̀llì	kyɛ̀l-lɛ́	kyɛ́ll-ʊ́ʊ́	'listen'
/mánn-/	mánnì	mán-ꜜná	mánꜜn-ʊ́ʊ́	'measure'
/nyunn-/	nyùnnì	nyùn-nó	nyúnn-úú	'smell'
/pɛgl-/	pɛ̀glì	pɛ̀g-lɛ́	pɛ́gl-ʊ́ʊ́	'carry'
/pɛnn-/	pɛ̀nnì	pɛ̀n-nɛ́	pɛ́nn-ʊ́ʊ́	'rest'
/sîll-/	síllì	síl-ꜜlɛ́	sílꜜl-ʊ́ʊ́	'tell stories'
/tall-/	tàllì	tàl-lá	táll-ʊ́ʊ́	'walk fast'

Finally, Table **??** illustrates CVVC verbs. The action nominal suffix vowel is again always long and the imperfective paradigm is uniformly CVV.CV, with no variation.

Having the overtly vowel-final *sa̰a̰* 'spoil' listed among CVVC verbs deserves a comment. The citation form is clearly vowel-final, i.e., CVV, but there is good evidence that the root is underlyingly /saaŋ/: the velar nasal surfaces in the action nominal *sa̰a̰ŋ-ʊ́ʊ́*. It is as if the root-final /ŋ/ were present when the suffix vowel length is determined and then deleted leaving its nasal component behind, resulting in *sa̰a̰*. The coronal nasal in the imperfective *sa̰a̰-na̰* results from place

[7] The CVC verb /gbîr-/ 'sleep' has the exceptional paradigm *gbi rì*, *gbiꜜré* , *gʊ́sʊ́ꜜʊ́*. The action nominal is exceptional in having a short suffix vowel, but since it differs segmentally from the root in several ways, including its [ATR] value, we suspect it is probably based on a different lexeme.

Table 11: CVVC verbs

Root	Cit. form	Imperf.	Nominal	
/báàr-/	báárì	báá-ˈrá	bááˈr-ʊ́ʊ́	‘finish’
/naan-/	nàànì	nàà-ná	náán-ʊ́ʊ́	‘get ready, develop’
/saal-/	sààlì	sààl-á	sáál-ʊ́ʊ́	‘sharpen’
/sa̰a̰ŋ-/	sà̰à̰	sà̰à̰-ná̰	sá̰á̰ŋ-ʊ́ʊ̰́	‘spoil’
/piir-/	pìirì	pìì-ré	píír-úú	‘discover’
/pɪɪr-/	pìirì	pìì-rɛ́	píír-ʊ́ʊ́	‘sweep’
/sîr-/	síírì	síí-ˈrɛ́	sííˈr-ʊ́ʊ́	‘touch’
/yíèl-/	yíélì	yíé-ˈlé	yíéˈl-úú	‘sing’
/gíèr-/	gíérì	gíé-ˈré	gíéˈr-úú	‘belch’
/fúòr-/	fúórì	fúó-ˈró	fúóˈr-úú	‘sip’
/puor-/	pùòrì	pùò-ró	púór-úú	‘thank, greet, pray’
/kɔɔr-/	kɔ̀ɔ̀rì	kɔ̀ɔ̀-rɔ́	kɔ́ɔ́r-ʊ́ʊ́	‘delay’
/ɔɔr-/	ɔ̀ɔ̀rì	ɔ̀ɔ̀-rɔ́	ɔ́ɔ́r-ʊ́ʊ́	‘chew’

assimilation with the initial coronal consonant of the imperfective suffix /-rV́/. Parallel examples from nouns include *kʊ̰́ʊ̰́* ‘water’, underlyingly /kʊ̀ŋ-/, as in *kʊ̀ŋ-fáá* ‘bad water’. In the free form the velar stop deletes leaving nasalization behind and the mid vowel diphthongizes to fill the foot template, resulting in (*kʊ̰́ʊ̰́*).

Not all verbs with nasal vowels behave in the same way. Compare *sà̰à̰* ‘spoil’ to *dɪ̰̀ɛ̰̀* ‘play’ and *fɪ̰̀ɛ̰̀* ‘whip’. Unlike *sà̰à̰*, the latter two must be underlyingly vowel-final since the corresponding action nominals are *dɪ́ɛ́-ʊ́* and *fɪ́ɛ́-ʊ́*, with a short suffix vowel. However, the two differ in the imperfective: in *dɪ̰̀ɛ̰̀-nɛ́* the coronal stop of the imperfective suffix /-rV́/ becomes a nasal, whereas in *fɪ̰̀ɛ̰̀-rɛ́* it does not. We do not have a satisfactory analysis to offer and must leave the topic with these preliminary remarks.

3 Proposal

Our claim is that these vowel length alternations serve to optimize metrical structure. The key assumption is that the action nominal suffix /ÚÚ/ subcategorizes for a foot: the left edge of /-ÚÚ/ strives to be aligned with the right edge of a foot.

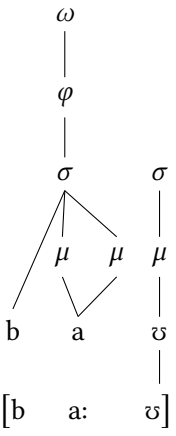
This demands a well-formed foot that respects alignment. Vowel length adjustments are a way to achieve this goal: a short root vowel lengthens to make up a minimal foot and a long suffix vowel shortens because it is unstressed.
We illustrate the analysis in Table **??** with two vowel-final verbs: /ba/ 'stick into the ground' and /baa/ 'grow (of child)'. The processes are described in terms of informal ordered rules. Foot boundaries are marked with parentheses and imply syllable boundaries.

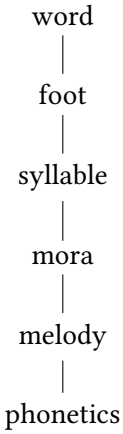
Table 12: The derivation of vowel length in V-final roots

Process	/ba-ʊ́ʊ́ /	/baa-ʊ́ʊ́ /	Motivation
Footing	(bá)ʊ́ʊ́	(báá)ʊ́ʊ́	Initial foot needed
V lengthening	(báá)ʊ́ʊ́	–	No degenerate feet
V shortening	(báá)ʊ́	(báá)ʊ́	No unstressed VV
	[bááʊ́]	[bááʊ́]	

/ba-ʊ́ʊ́/ undergoes both root vowel lengthening and suffix vowel shortening; /baa-ʊ́ʊ́/ only undergoes suffix vowel shortening. In both cases, the outcome is (*báá*)ʊ́, where the syllable containing the suffix vowel falls outside the foot, i.e., it is extrametrical. **Kennedy1966** calls such word-final light syllables *secondary syllables*. Their prosodic structure is illustrated in (**??**) below.

(1) A phonological word with a secondary syllable: (*báá*)ʊ́ 4



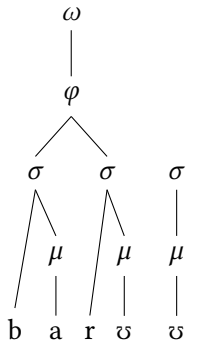


Consonant-final roots are different. Consider /bar/ 'leave': if suffix alignment were all that counts the input /bar-ʊ́ʊ́/ should be footed *(*bár*)ʊ́ʊ́, but that is not possible because it implies the syllabification **bár.ʊ́ʊ́* which is illegal in Dagaare. Suffix alignment and word prosody are driven into conflict and word prosody wins: the solution is (*bá.rʊ́*)ʊ́ where the long suffix vowel is split into two light syllables: the first is incorporated into the foot and the second remains extrametrical. This implies the syllabification CV.CV.V which is legal in Dagaare (**Kennedy1966**). Table **??** illustrates this for the consonant-final verbs /bar/ 'leave', /bàːr/ 'bargain' and /bààr/ 'finish' in terms of informal ordered rules. The prosodic structure of *bárʊ́ʊ́* is shown in (**??**) below.

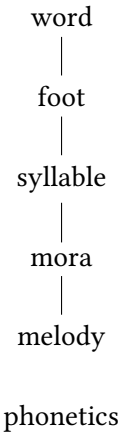
Table 13: The derivation of vowel length in C-final roots

Process	/bar-ʊ́ʊ́/	/bàːr-ʊ́ʊ́/	/bààr-ʊ́ʊ́/	Motivation
Footing	(bá.rʊ́)ʊ́	(bár.ˈrʊ́)ʊ́	(báá.ˈrʊ́)ʊ́	Initial foot needed
V lengthening	–	–	–	No degenerate feet
V shortening	–	–	–	No unstressed VV
	[bárʊ́ʊ́]	[bárˈrʊ́ʊ́]	[bááˈrʊ́ʊ́]	

(2) A phonological word with a secondary syllable: (*bárʊ́*)ʊ́



(4) [b a r ʊ :]



Summarizing, vowel length alternations in Dagaare action nominals can be understood from a metrical perspective. The three key facts, namely vowel lengthening in CV roots, suffix vowel shortening after vowel-final roots and absence of suffix vowel shortening after consonant-final roots receive a unified explanation. In the next section we will outline an optimality-theoretic analysis of action nominals.

4 Analysis

4.1 Constraints

To keep things simple we will make the following assumptions. Dagaare words have an initial trochaic foot; feet are binary under syllabic or moraic analysis; and degenerate feet, e.g., *(*ba*), and ternary feet, e.g., *(*ba.rʊ.ʊ*), are excluded. At most one syllable may be extrametrical: (*baa.ʊ*)*ʊ* is possible, but *(*baa*)*ʊ.ʊ* is not. Candidates that violate these high-ranking constraints will not be mentioned.

Four phonological constraints are needed to express the generalizations informally outlined in earlier sections. These constraints are given in Table ??.

Table 14: Four constraints

Weight-to-Stress Principle	'No unstressed heavy syllables'
Max(V)	'No vowel deletion'
Dep(V)	'No vowel insertion'
Align(Suffix, L, Foot, R)	'The left edge of a suffix coincides with the right edge of a foot'

The Weight-to-Stress Principle (WSP, **Prince1990**) punishes unstressed heavy syllables. It is satisfied in (*báá*)*ɔ́* where the suffix vowel has shortened and surfaces as the light extrametrical syllable *ɔ́* that lacks an onset. It is also satisfied in (*bár.rɔ́*)*ɔ́* where the long suffix vowel has been parsed into two light syllables: the tail of the foot *rɔ́* and the light extrametrical syllable *ɔ́* that lacks an onset. The latter is **Kennedy1966** "secondary syllable." The WSP is violated in *(*báá*)*ɔ́ɔ́*, *(*bár*)*rɔ́ɔ́* and *(*bár.rɔ́ɔ́*) where the long suffix vowel is parsed as a single heavy syllable.[8]

[8] An anonymous reviewer notes that the word /dàgáárì/ 'the Dagaare language' violates the WSP given a left-aligned trochee, i.e., (*dà.gáá*)*rì* and wonders why the vowel does not shorten. Two explanations seem possible. First, this could be an instance of nonderived environment blocking (**Kiparsky1993**). Second, the intuitively strong syllable is the penult, suggesting the foot structure *dà*(*gáárì*). It should be pointed out that trisyllabic and longer words in Dagaare are often right-headed compounds with the morphological structure σ+$\sigma\sigma$, e.g., *lábírì* 'small axe' from *lárì* + *bírì* 'axe-sg + seed-sg'. It is possible that /dágáárì/ is etymologically a compound, i.e., /dá+gáárì/, although synchronically opaque.

4.2 Deriving vowel length

The four constraints in Table ?? allow us to derive the vowel length alternations in action nominals. We start with CV stems. Tableau (??) establishes the crucial rankings. To simplify presentation, we have omitted tone and simply assume the correct vowel harmony (ATR, rounding). Candidates with ternary feet, degenerate feet, and multiple extrametrical syllables are systematically omitted.

(3) Vowel length with CV roots

/ba-ʊʊ/		WSP	ALIGN	DEP(V)	MAX(V)
(a) ☞ (baa)ʊ				1	1
(b) (ba.ʊ)ʊ			1!		
(c) (ba.ʊʊ)		1	1		
(d) (baa)ʊʊ		1!		1	
(e) (baa.ʊʊ)		1!	1	1	
(f) (ba.ʊ)			1		1

The winner (a) exhibits both suffix vowel shortening and root vowel lengthening. The faithful candidate (b) is perfect in every way except that it fatally misaligns the suffix and foot boundaries. Since ALIGN dominates both faithfulness constraints, MAX(V) and DEP(V), the result is a double adjustment of vowel shortening and vowel lengthening. Candidates (c), (e), and (f) are grayed out to show that they are harmonically bounded: they can never win no matter how the constraints are ranked.

We now turn to CVV roots illustrated in Tableau (4). In this case, only suffix vowel shortening is needed in order to satisfy the WSP:

(4) Vowel length with CVV roots

/baa-ʊʊ/		WSP	ALIGN	DEP(V)	MAX(V)
(a) ☞ (baa)ʊ					1
(b) (ba.ʊ)ʊ			1		1
(c) (ba.ʊʊ)		1	1		1
(d) (baa)ʊʊ		1!			
(e) (baa.ʊʊ)		1!	1		
(f) (ba.ʊ)			1		2

Consonant-final roots behave differently. What sets them apart from vowel-final roots is that they inevitably violate ALIGN when combined with a vowel-initial suffix. Given the input /CVC-VV/ the best-aligned candidate is (*CVC*)*VV*

where the suffix boundary is crisply aligned with the foot boundary. But this foot structure entails the syllabification **CVC.VV* which is illegal in Dagaare.[9] We need a better syllabification, but that will inevitably violate Align. This makes alignment irrelevant with consonant-final roots because it will have to be violated no matter what. We illustrate this for CVC roots in Tableau (**??**). The winner (*ba.rʊ*)*ʊ* has the syllable structure CV.CV.V which is legal in Dagaare.

(5) Vowel length with CVC roots

/bar-ʊʊ/		WSP	Align	Dep(V)	Max(V)
(a) ☞	(ba.rʊ)ʊ		1		
(b)	(ba.rʊʊ)	1	1		
(c)	(baa.rʊ)ʊ		1	1	
(d)	(baa)rʊʊ	1	1	1	
(e)	(ba.rʊ)		1		1

The following question raised by a reviewer is best quoted verbatim:

> I see a potential inconsistency between the analyses of /ba-ʊʊ/ and /bar-ʊʊ/. If foot structure can make the suffix split across foot edges, why does /ba-ʊʊ/ need vowel lengthening? The structure (*baʊ*)*ʊ* has no degenerate foot and no unstressed VV. It doesn't have -*ʊʊ* attaching to a foot, but then neither does (*ba.rʊ*)*ʊ*.

The answer is characteristically optimality-theoretic: grammaticality is determined by competition. In the case of /ba-ʊʊ/, the candidate *(*baʊ*)*ʊ* loses because there is a better candidate available: the winner (*baa*)*ʊ* that satisfies Align. In the case of /bar-ʊʊ/ we have no such luxury: all candidates violate Align and therefore we must settle for the suffix-splitting (*ba.rʊ*)*ʊ*.

We conclude by showing the tableaux for CVVC and CVCC roots. They behave analogously and present no additional complications.

(6) Vowel length with CVCC roots

[9] A full analysis of Dagaare syllable structure cannot be undertaken here. Here we simply assume an undominated locally conjoined constraint Onset & $_{L}$*Coda that is violated by the syllabification C.V where the first syllable has a coda and the second syllable has no onset. Other analyses are no doubt possible.

/barr-ʊʊ/		WSP	Align	Dep(V)	Max(V)
(a) ☞	(bar.rʊ)ʊ		1		
(b)	(bar.rʊʊ)	1	1		
(c)	(baar.rʊ)ʊ		1	1	
(d)	(bar.rʊ)		1		1

(7) Vowel length with CVVC roots

/baar-ʊʊ/		WSP	Align	Dep(V)	Max(V)
(a) ☞	(baa.rʊ)ʊ		1		
(b)	(ba.rʊ)ʊ		1		1
(c)	(baa)rʊʊ	1	1		
(d)	(baa.rʊ)		1		1

4.3 Lexically conditioned length

Our metrical analysis of Dagaare action nominals is relatively straightforward. Much more intriguing are the number and imperfective paradigms. Table ?? below illustrates lexically conditioned length alternations with the imperfective suffix /-rV́/.

Table 15: Lexical conditioning in the imperfective

	Underlying	Imperfective	Alternation	
(a)	/da-rV́/	dàà-rá	lengthening	‘buy’
	/tá-rV́/	tá-rà	–	‘reach’
(b)	/fáà-rV́/	fáá-ꜜrá	–	‘seize’
	/gaa-rV́/	gɛ̀-rɛ́	shortening	‘go’
(c)	/bɔŋ-rV́/	bɔ̀n-nɔ́	–	‘know’
	/woŋ-rV́/	wò-nó	C-deletion	‘understand’
	/bal-rV́/	bàl-lá ~ bàl-á	variation	‘be tired’

In CV-roots the vowel lengthens or stays short; in CVV-roots the vowel stays long or shortens; in CVC-roots the suffix creates a CC cluster /CVC-rV́/ which either survives or shortens, sometimes variably within a single lexical item. Why are length alternations so uniform in the action nominal paradigm, but riddled with lexical exceptions in the number and imperfective paradigms? To answer this question with any degree of confidence would require a deeper understanding of Dagaare morphophonology than we have at the moment. However, one is immediately struck by the observation that it is the *vowel-initial* suffixes that

tend to have uniform paradigms. In addition to the action nominal /-ÚÚ/, the perfective /-ÈÉ / and the plural /-Ṿ / seem fairly regular. It is the *consonant-initial* suffixes that permit exceptions, in particular the number /-rÍ/ and the imperfective /-rṾ/.[10] Trying to explain these apparent suffix-related regularities is an interesting project, but must be left for future work.

5 Summary

We have provided new evidence for metrical structure in Dagaare based on vowel length alternations in action nominals. If the root is CV the root lengthens and the suffix shortens; if the root is CVV the suffix shortens; if the root ends in C nothing happens. Similar length alternations appear more idiosyncratically with number and aspect suffixes. We have proposed a metrical analysis that explains the length alternations in action nominals and lends further support to the metrical analysis of vowel length proposed in **Anttila&Bodomo2009** for Dagaare nouns.

Acknowledgements

This paper has benefited from presentations at the UC Berkeley Phonetics and Phonology Forum (April 30, 2012), the Stanford Phonology Workshop (May 18, 2012), and the 47th Annual Conference on African Linguistics at UC Berkeley (March 26, 2016). We thank Luca Iacoponi, David Odden, and two anonymous reviewers for helpful comments. We are responsible for any errors.

Abbreviations

DIM	diminutive	PL	plural
IMPF	imperfective aspect	SG	singular
PERF	perfective aspect		

References

Akumbu, Pius W. 2011. Tone in Kejom (Babanki) associative constructions. *Journal of West African Languages* 38(1). 69–88.

[10] Space does not permit a discussion of the perfective /-ÈÉ/ and the plural /-Ṿ/ here. We hope to return to the topic in a more complete exposition in the future.

Akumbu, Pius W. 2015. Babanki verb tone. *Studies in African Linguistics* 44(1). 1–26.

Akumbu, Pius W. 2016. Babanki coda consonant deletion and vowel raising: A case of allomorphy. In Emily Clem, Virginia Dawson, Alice Shen, Amalia Horan Skilton, Geoff Bacon, Andrew Cheng & Erik Hans Maier (eds.), *Proceedings of the 42nd Annual Meeting of the Berkeley Linguistics Society*, 3–20. Berkeley, CA: Berkeley Linguistics Society.

Boersma, Paul & David Weenink. 2016. *Praat: Doing phonetics by computer*. Amsterdam: University of Amsterdam. Version 6.0.14.

Clements, George N. 1983. The hierarchical representation of tone features. In Ivan R. Dihoff (ed.), *Current approaches to African linguistics*, vol. 1, 1–17. Dordrecht: Foris Publications.

Clements, George N. & Kevin C. Ford. 1979. Kikuyu tone shift and its synchronic consequences. *Linguistic Inquiry* 10. 179–210.

Connell, Bruce. 2014. *Downdrift, downstep, and declination*. (Paper presented at the Typology of African Prosodic Systems Workshop. Bielefeld University, Germany, May 18-20, 2001.)

Grebe, Karl & Winnifred Grebe. 1975. Verb tone patterns in Lamnsok. *Linguistics* 149. 5–23.

Hyman, Larry M. 1979. Tonology of the Babanki noun. *Studies in African Linguistics* 10. 159–178.

Hyman, Larry M. 2005. Initial vowel and prefix tone in Kom: Related to the Bantu augment? In Koen Bostoen & Jacky Maniacky (eds.), *Studies in African comparative linguistics with special focus on Bantu and Mande: Essays in honour of Y. Bastin and C. Grégoire*, 313–341. Köln: Rüdiger Köppe Verlag.

Hyman, Larry M. 2010. *Do tones have features?* (Paper presented at Tones and Features: A Symposium in Honor of G. Nick Clements, Paris, June 18-19, 2009).

Hyman, Larry M. 2011. The representation of tone. In Marc van Oostendorp, Colin Y. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*, vol. II, 1078–1102. Malden, MA: Wiley-Blackwell.

Mutaka, Ngessimo M. & Esther P. Chie. 2006. Vowel raising in Babanki. *Journal of West African Languages* 33(1). 71–88.

Odden, David. 1982. Tonal phenomena in KiShambaa. *Studies in African Linguistics* 13(2). 177–208.

Odden, David. 1995. Tone: African languages. In John A. Goldsmith (ed.), *The handbook of phonological theory*, 444–475. Cambridge: Blackwell.

Pulleyblank, Douglas. 1986. *Tone in lexical phonology*. Dordrecht: D. Reidel.

Snider, Keith. 1990. Tonal upstep in Krachi: Evidence for a register tier. *Language* 66. 453–74.
Snider, Keith. 1998. Phonetic realisation of downstep in Bimoba. *Phonology* 15(1). 77–101.
Snider, Keith. 1999. *The geometry and features of tone*. Dallas: The Summer Institute of Linguistics & The University of Texas at Arlington.
Snider, Keith & Harry van der Hulst. 1993. Issues in the representation of tonal register. In Harry van der Hulst & Keith Snider (eds.), *The phonology of tone: The representation of tonal register*, 1–27. Berlin: Mouton de Gruyter.
Stewart, John M. 1965. The typology of the Twi tone system. *Bulletin of the Institute of African Studies, Legon* 1. 1–27.
Yip, Moira. 1980. *The tonal phonology of Chinese*. Massachusetts Institute of Technology dissertation.
Yip, Moira. 1989. Contour tones. *Phonology* 6. 149–174.

Chapter 2

Reconsidering tone and melodies in Kikamba

Patrick Jones
University of South Florida

Jake Freyer
Brandeis University

The melodic tone system of Kikamba, as described by **Roberts-Kohno2000**; **Roberts-Kohno2014**, stands out as particularly complex within the context of recent crosslinguistic work on melodic tone in Bantu (**Bickmore2014**; **Bickmore2015**). It is unique, for example, in possessing a melody that assigns four distinct tones to three stem-internal positions simultaneously. The apparent existence of such complex melodies raises doubts as to whether there are any substantive restrictions on the possible form of a tonal melody. We argue, however, that these doubts are premature. We propose a new analysis of Kikamba in which (a) melodies refer to no more than two target positions at a time and (b) melodies target only two possible stem-internal positions, each of which occurs commonly within Bantu melodic tone systems. This simplification is achieved by (a) rejecting the existence of a melodic L tone assigned to the penult, and re-attributing its putative effects to interactions among other, more basic tones, and (b) distinguishing between melodic tones assigned early in the phonological derivation and other suffixal tones added later. In general, we argue that since core properties of melodic tone are often obscured in surface forms due to interactions with language-particular rules, the crosslinguistic comparison of melodic tone should proceed on the basis of a (more) underlying level in which these rules are controlled for. Once this is done, the exceptional properties of Kikamba melodic tone largely disappear.

1 Melodic tone in Bantu and Kikamba

In all Bantu languages that make distinctive use of tone, tonal alternations within the verb stem help to signify various aspects of verbal inflection, including tense, aspect, mood, polarity, clause type, and focus (**Bickmore2014**). In (??) below, we see a clear example of this from Kihunde (**Mateene1992**).

(1) Melodic tone in Kihunde (**Mateene1992**)[1]

a. Infinitive (p. 17)
i-[king-ul-aɲ-a]
NC.5-[close-REV-RECP-FV][2]
'to open each other'

b. Recent Past (p. 22)
tw-a-[king-úl-aɲ-a-a]
1PL.SBJ-PST-[close-REV-RECP-ASP-FV]
'we opened each other (recently)'

c. Negative Hypothetical (p. 38)
tú-ta-[king-úl-aɲ-ir-é]
1PL.SBJ-NEG-[close-REV-RECP-ASP-FV]
'if we do not open each other'

In the infinitive form in (??), the verbal stem is the straightforward sum of its parts: neither the root nor any suffix bears an underlying H tone, so the fact that the stem as a whole surfaces as toneless is unsurprising. However, when the same stem (modulo the inflectional suffixes ASP and FV) appears in the Recent Past form in (??) or the Negative Hypothetical form in (??), H tones appear on the stem's second and final vowels (V2 and FV). Logically, since the non-inflectional content of the stem is constant between these forms, the tonal differences between them must somehow arise from differences in inflection. Thus, the tones that appear within the stem in (??) and (??) are *grammatical* tones.

Two key questions that arise in the analysis of grammatical tones concern (a) where they come from and (b) how they come to be assigned to their surface positions. Here, for the sake of explicitness, we wish to lay out our own assumptions on these matters clearly at the outset. First, we assume that the stem tone

[1] The forms here differ from those cited by Mateene in that they contain the reciprocal suffix *–aɲ*; its presence obviates a process of local tone plateauing that would otherwise obscure the basic facts of melodic tone assignment in (??).

[2] Square brackets in examples and glosses mark verb stem boundaries.

alternations in (??) arise primarily from differences in underlying representation: the URs of (??) and (??), but not (??), contain tonal *melodies* that are exponents of inflection. These melodies consist of one or more *melodic tones*, each of which is labeled with a desired *target*, i.e. a stem-internal position to which it wishes to be assigned. Thus, the Recent Past form in (??) contains the melody $\{H_{V2}\}$, consisting of a single melodic H tone whose target is V2. The Negative Hypothetical form in (??) contains the melody $\{H_{V2}+H_{FV}\}$, containing one H that targets V2 and another that targets FV. Finally, we assume that melodic tones are matched with their targets in an early process of *Initial Mapping*, before other tone rules apply. This process may require a negotiation between tones targeting the same vowel (e.g. H_{V2} and L_{FV} in a disyllabic stem), so that perfect mapping of tones to targets is not guaranteed.[3]

In Kihunde, a language with no tone shift and only limited spreading, the target of a melodic tone is generally identical to its surface location. In other languages, operations like shift and spread, applying after initial mapping, can obscure a target's identity. Consider, for example, the Kinande form in (??). This corresponds exactly both in meaning and in segmental makeup with the Kihunde form in (??), and, like it, its melody $\{H_{V2}+L_{FV}\}$ contains a melodic H that targets V2 (**Hyman1985**; **Jones2014**). However, due to general rules of leftward shift and leftward spread that apply after initial mapping (and which affect underlying tones as well as grammatically-assigned tones) this H surfaces not on V2 but on the first vowel of the stem (V1) and on the first vowel before it (V0).

(2) Recent Past (Kinande)
tw-á-[*king-ul-an-a-à*]
1PL.SBJ-PST-[close-REV-RECP-ASP-FV]
'we opened each other (recently)'

[3] These assumptions are broadly similar to those adopted, for example, by **Bickmore2007**; **Ebarb2016**, **Marlo2008** (**Marlo2008**; **Marlo2009**), **Marlo2015**, and **Odden2009**. One important conceptual difference between our approach and that of the works just cited, however, is our avoidance of construction-specific tone assignment rules. In our view, the task of associating particular tones to particular stem-positions in a tense-dependent way belongs solely to morphology, which associates different tenses with different melodies. The task of the phonology is only to associate the component tones of these morphologically-assigned melodies with their desired targets. One consequence of this is that under our approach, the melody is a single coherent entity at the level of underlying representation, and not simply the sum of all tones assigned by melodic assignment rules.

There is thus a critical distinction between a melodic tone's *surface location* and its *target*: while the former may be directly observed, the latter reveals itself only in the context of analysis.[4]

This issue bears directly on questions of typology. Recent work collected in **Bickmore2014**, as well as antecedent work by **Kisseberth&Odden2003** and **Marlo2013**, has considerably extended our knowledge of melodic tone patterns throughout Bantu, to the point that we can now begin to make informed generalizations about (a) what tones may appear in tonal melodies, (b) how many tones a single melody may contain, and (c) what stem-internal positions may serve as targets for melodic assignment. These generalizations, drawn from **Bickmore2014** and **Bickmore2015**, are presented in Table **??**.

Table 1: Typological generalizations for melodic tone in Bantu (**Bickmore2014**; **Bickmore2015**)

	Common	Exceptional
Melodic tones	H and L	H, L, SH, SL (Kikamba) H, L, HL, LH (Bakweri)
Max # of tones per melody	1 or 2	3 (Simakonde: **Manus2014**) 4 (H-L-H-SL in Kikamba)
Targets for melodic tones	V1, V2 Pen, FV	V0 (i.e. pre-stem) V3, V4
# of targets per melody	1 or 2	3 (Kikamba)

In the context of the generalizations summarized in Table **??**, the melodic tone system reported for Kikamba stands out as uniquely complex. Of all languages surveyed in **Bickmore2014**, it ties with Bakweri (**Marlo2014**) in having the largest melodic tone inventory (H, L, SH, and SL), it has the largest number of tones per melody (four), and its melodies target the greatest number of stem positions at a time (three). In addition, it is one of just two languages that are reported to assign a melodic L tone to the penult.

[4] This point is clearly articulated by **Bickmore2014**: "Ultimately, stem tones will be shaped by the general rules of the language. An in-depth synchronic analysis is thus necessary to strip away these rules, revealing what the specific content of each pattern is, where these tones are associated, and what happens to tones once they are initially associated, not to mention saying when a particular pattern is found".

What are we to make of this? One possibility is that melodic tone in Kikamba is simply an extreme instantiation of a phonological subsystem that has no principled bounds. It is possible, in other words, that any arbitrary combination of melodic tones associated with any arbitrary set of stem positions may constitute a legitimate tonal melody, so we should not be particularly surprised to find complex melodies that assign four distinct tones at once, and to three distinct positions. Indeed, the very existence of such apparently complex melodic patterns seems to suggest that there are few substantive constraints on what a tonal melody can look like.

On the other hand, it is also possible that the considerable (and typologically unusual) degree of complexity reported for Kikamba might give way to a simpler system upon reanalysis. This possibility is especially worth exploring due to the highly indirect relationship between surface tone patterns and underlying melodies discussed above, since this indirect relationship allows the same set of surface facts to submit to a wide range of analytical interpretations.

Here, we pursue this latter possibility and develop a reanalysis of the Kikamba melodic tone system. In this effort, we are relying entirely upon data previously reported by **Roberts-Kohno2000** and **Roberts-Kohno2014**. As we will see, upon reanalysis, the melodic system of Kikamba actually deviates very little from the "standard" Bantu melodic tone systems described in Table **??**. This finding offers hope that, contrary to what the surface facts of Kikamba might suggest at first, melodic tone is not a purely arbitrary system that can vary without limit. Instead, it is one whose variation is constrained by general principles that careful language-internal and crosslinguistic analysis can reveal.

2 The standard analysis of Kikamba melodies (Roberts-Kohno2014)

The exceptional properties of the Kikamba tone system reported in §?? emerge from the analysis of Kikamba melodic tone developed by **Roberts-Kohno2000** (**Roberts-Kohno2000**; **Roberts-Kohno2014**), briefly summarized in Table **??**.[5] This

[5] In all examples from Kikamba, tone is transcribed as follows: high tone is indicated with a single acute accent (e.g. [á]), low tone is indicated with a single grave accent (e.g. [à]), super-high tone is indicated with a doubled acute accent (e.g. [a̋]), super-low tone is indicated with a doubled grave accent (e.g. [ȁ]), and falling tone (which always results from separate H and L tones assigned to the same vowel) is indicated with a circumflex (e.g. [â]). Vowels that are not marked with any diacritic are phonologically toneless, and are generally pronounced with L tone.

Table 2: Kikamba tone melodies posited by **Roberts-Kohno2000** (**Roberts-Kohno2000**; **Roberts-Kohno2014**)

Melody	Example Form
{∅}	o-kaa-[kon-aang-a] '(person) who will hit'
{H_{V2}}	tw-aa-[kon-ááng-í-ɛ́] 'we hit (long ago)'
{H_{FV}}	to-ǐ-kaa-[kon-aang-á] 'we will not hit'
{H_{V2}+L_{FV}}	to-[kon-ááng-í-ɛ̀] 'we hit (earlier today)'
{H_{V2}+L_{Pen}}	o-[kon-ááng-éèt-ɛ] '(person) who's been hitting (today)'
{H_{V2}+L_{Pen}+H_{FV}}	tó-[kon-ááng-ì-ɛ́] '(person) whom we hit (today)'
{SL_{FV}}	ko-[kon-aa̰ng-a̰] 'to hit'
{H_{V2}+H_{FV}+SL_{FV}}	to-í-[kon-ááng-á-â] 'we do not usually hit'
{H_{V2}+L_{Pen}+H_{FV}+SL_{FV}}	to-í-[kon-ááng-éèt-ɛ̂] 'we had not hit (long ago)'
{H_{V2}+SH_{FV}}	tw-áa-[kon-ááng-ɛ́̌] 'if/when we hit'

analysis posits ten distinct patterns of melodic tone assignment, with melodies containing anywhere from zero to four melodic tones.[6]

[6]To facilitate comparison between stems, the iterative morpheme *–aang* (not consistently present in forms provided by **Roberts-Kohno2014**) is included in all forms in Table **??**. Here and elsewhere, its meaning of 'here and there/a little bit/randomly' is omitted from glosses to save space.

In this analysis, the relationship between underlying tone melodies and surface tone patterns is entirely straightforward: melodic tones surface on their specified targets, with the minimal complication that H_{V2} spreads rightwards onto all following toneless vowels. This straightforward relationship arises for a simple reason: the analysis posits a distinct underlying melodic tone for every tonal turning point within the stem.

In this paper, we develop a new analysis in which some turning points derive not from the presence of an underlying melodic tone, but rather from *interactions* between a more limited set of tones. Most importantly, we will reject L_{Pen} as a melodic tone, and re-analyze the melodic SL_{FV} tone proposed by Roberts-Kohno as a *non-melodic* floating tone. The end result is an analysis which is somewhat more abstract, but which (a) finds both crosslinguistic and language-internal support and (b) results in a underlying melodic system that is both more internally coherent and more in line with what we should expect in light of the crosslinguistic generalizations about Bantu melodies established in §??.

3 Primary melodies of Kikamba

3.1 Overview

In this section, we consider the melodies described by **Roberts-Kohno2014** that do not involve SL or SH tones. (We discuss those that do involve SL and SH tones in §??.) We show that what **Roberts-Kohno2014** analyzes as 6 arbitrary melodies can be reduced to 5 melodies that form a logically coherent set: three single-tone melodies $\{H_{V2}\}$, $\{H_{FV}\}$ and $\{L_{FV}\}$ and two two-tone melodies representing all the logically possible ways of combining them $\{H_{V2}+H_{FV}\}$ and $\{H_{V2}+L_{FV}\}$. This simplification is made possible primarily by the elimination of L_{Pen} as a possible melodic tone, with its effects attributed instead to general rules and constraints of the language.

3.2 $\{H_{FV}\}$ melody

The most straightforward melody of Kikamba causes a single H tone to surface on the stem's final vowel. This melody is present, for example, in Habitual forms in "Assertive" clauses (i.e. declarative main clauses without object focus). In (??) below, we see such a form in nonfinal position, where it is not affected by the presence of phrasal L tones to be discussed in §??. Following **Roberts-Kohno2014**, we analyze this melody as $\{H_{FV}\}$.

(3) {H_{FV}} melody in Habitual (Assertive, nonfinal)
né-tó-[kon-aang-a-á] …
ASSERT-1PL.SUBJ-[hit-ITER-ASP-FV]
'we always hit'

3.3 {H_{V2}} melody

Another straightforward melody causes a H tone span from V2 to FV. This melody is present, for example, in Remote Perfective forms in Assertive clauses, as in (**??**) below. Again following **Roberts-Kohno2014**, we analyze this melody as {H_{V2}}, consisting of a single melodic H tone attracted to V2. This H is subsequently targeted by a rule of Rightward Spreading, which extends it until the end of the word. (This rule of unbounded spreading targets only grammatical tones; see **Bickmore1997** (**Bickmore1997**; **Bickmore1999**) for discussion of a similar situation in Ekegusii, with accompanying theoretical analysis.)

(4) {H_{V2}} melody in Remote Perfective (Assertive, nonfinal)
né-tw-áa-[kon-ááng-í-ɛ́] …
ASSERT-1PL.SUBJ-PST-[hit-ITER-ASP-FV]
'we hit long ago'

3.4 {H_{V2}+H_{FV}}

In some forms, such as the Assertive Hodiernal Perfective form in (**??**), H tones are assigned to both V2 and FV. In this case, H_{V2} still spreads to the right, but it stops at the antepenultimate vowel, leaving one L-toned vowel in between it and H_{FV}. **Roberts-Kohno2014** analyzes this L-toned vowel as the result of L_{Pen}, a melodic L tone assigned to the penult. By contrast, we propose that it results from the OCP: the rightward spread of H_{V2} is blocked just in case it would cause two distinct H tones to be associated to adjacent syllables.

OCP undefined

(5) {H_{V2}+H_{FV}} melody in Hodiernal Perfective (Assertive, nonfinal)
né-tó-[kon-ááng-i-ɛ́] …
ASSERT-1PL.SUBJ-[hit-ITER-ASP-FV]
'we hit (earlier today)'

Considerations which favor the OCP-based analysis are (a) the well-documented role of the OCP in stopping tone spread in other Bantu languages (**Myers1997**; **Odden2014**) and (b) language-internal symmetry. Since Kikamba melodies independently allow for H_{V2} and H_{FV}, and since Kikamba melodies allow for multiple

tones, it is natural to expect a melody that combines them. {H_{V2}+H_{FV}} is just this melody. On the other hand, a {H_{V2}+L_{Pen}+H_{FV}} is unexpected from the perspective of inventory symmetry and compositionality, since there is no melody in which putative {L_{Pen}} is assigned by itself.

3.5 [H_{V2}+L_{FV}]

As shown in (??), Kikamba imperatives surface with a H tone on V2 that spreads rightwards only up to the penult, leaving the ultima L-toned. Following **Roberts-Kohno2014** we assume that H cannot spread further onto the ultima because it is blocked by a final melodic L tone. The imperative's melody, therefore, is {H_{V2}+L_{FV}}.

(6) {H_{V2}+L_{FV}} in Imperative forms
[kon-ááng-éð-í-à] …
[hit-ITER-CAUS-CAUS-FV]
'make (someone) hit!'

However, departing from Roberts-Kohno, we propose that not *all* surface forms that show a H span from V2 to the penult result from a {H_{V2}+L_{FV}} melody. In fact, most instances of this pattern have another origin: a {H_{V2}+H_{FV}} pattern that is subjected to a rule of *Final Lowering*. We see this, for example, in Hodiernal Perfective forms. When they appear in Assertive or Relative clauses and lack 3rd singular personal agreement morphology, their stems clearly show a {H_{V2}+H_{FV}} pattern, as we have already seen in (??) above. However, when the same stems appear in a clause with *object focus*, or with a 3rd singular personal subject marker, the final H tone is lowered to L. These facts are shown in Table ??, where melodies derived from Final Lowering are given in bold.

Table 3: Final H Lowering in the Hodiernal Perfective

	Assertive (nonfinal)	Relative	Object-Focus
Hodiernal Pfv 'we hit (today)'	[H_{V2}+H_{FV}] né-tó-[kon-ááng-i-é]	[H_{V2}+H_{FV}] tó-[kon-ááng-i-é]	**[H_{V2}+L_{FV}]** to-[kon-ááng-í-è]
… w/ 3SG subj. 'he hit (today)'	**[H_{V2}+L_{FV}]** n-óo-[kon-ááng-í-è]	**[H_{V2}+L_{FV}]** o-[kon-ááng-í-è]	**[H_{V2}+L_{FV}]** á-[kon-ááng-í-è]

As an alternative to final lowering, we might instead propose that forms with 3rd singular personal agreement and forms with object focus are simply assigned

a variant tone pattern by the morphology.[7] In our view, however, this solution is unsatisfactory because it fails to provide the semantically uniform class of "Hodiernal Perfective" forms with a uniform tone pattern, and also because it fails to explain why the two tone patterns shown by Hodiernal Perfective forms are so similar. Moreover, as we will shortly see, Final Lowering has effects that extend beyond the Hodiernal Perfective forms. We therefore posit the rule of Final Lowering in (**??**).

(7) Final Lowering: $H_{FV} \longrightarrow L_{FV}$

a. in object-focus clauses

b. in forms with 3rd singular personal subject agreement

This rule is admittedly stipulative at the moment. It is not presently clear whether lowering should be induced directly by reference to morphosyntactic features, or indirectly by interactions with tones that these features introduce. (It is tempting, for example, to relate the lowering of H_{FV} in forms with 3rd singular personal subject agreement markers to the fact that these markers systematically differ from others in tone.) More study of this question is needed.

Closely related to the Hodiernal Perfective forms just analyzed are Hodiernal Stative forms that show a H tone span from V2 to the *antepenult*. **Roberts-Kohno2014** analyzes these forms as possessing a distinct $\{H_{V2}+L_{Pen}\}$ melody, where the presence of a melodic L on the *penult* limits the rightward spread of H to the *antepenult*. However, there are two crucial observations to make of such forms. First, this tone pattern appears to result from Final Lowering, since it occurs in exactly the same contexts where the $\{H_{V2}+L_{FV}\}$ pattern emerges in the Hodiernal Perfective forms in Table **??**. Second, this pattern occurs only in forms with penultimate long vowels introduced by the final suffix sequence *–eet-ɛ*. Both of these points are illustrated in Table **??**. (As in Table **??**, melodies affected by Final Lowering are given in bold.)

We account for both of these facts by proposing that forms with H spans from V2 to the antepenult underlyingly possess a $\{H_{V2}+H_{FV}\}$ melody, where (a) H_{FV} is lowered to L_{FV} via Final Lowering (**??**) and (b) derived L_{FV} spreads to the second mora of a long penult due to a rule of *Long Retraction*, which applies before Rightward Spreading extends H_{V2} to the right. Long Retraction is formulated in Figure **??**.

[7] This is the solution adopted by **Roberts-Kohno2014**, who posits a $\{H_{V2}+L_{Pen}+H_{FV}\}$ pattern for most Hodiernal Perfective forms (as seen in §**??**), but posits a $\{H_{V2}+L_{FV}\}$ pattern for Hodiernal Perfective forms with 3rd singular personal agreement.

Table 4: Tonal variation in Hodiernal Stative Forms

	Assertive (nonfinal)	Relative	Object-Focus
Hod. Stative	[H_{V2} + H_{FV}]	[H_{V2} + H_{FV}]	**[H_{V2} + L_{FV}]**
'we have hit'	né-tó-[kon-ááng-éet-é]	tó-[kon-ááng-éet-é]	to-[kon-ááng-éèt-è]
... w/ 3SG subj.	**[H_{V2} + L_{FV}]**	**[H_{V2} + L_{FV}]**	**[H_{V2} + L_{FV}]**
'he has hit'	n-óo-[kon-ááng-éèt-è]	o-[kon-ááng-éèt-è]	á-[kon-ááng-éèt-è]

Figure 1: Long Retraction

Note that Long Retraction is independently motivated within Kikamba. **Roberts-Kohno2014** observes that final *super-low* (SL) tones spread onto the second mora of a long penult, exactly as predicted by Long Retraction. Thus, for example, in forms that have a final SL tone, such as infinitives, we see surface contrasts such as *ko-*[*kon-ǎ*] 'to hit' vs. *ko-*[*kon-aǎng-ǎ*] 'to hit repeatedly.' As discussed in §**??**, we view SL tones as L tones that are downstepped by a following floating L (**Clements1981**). This allows for a straightforward analysis of final "SL spreading": a final L spreads to the penult via Long Retraction, and this spread L is then downstepped by a following floating L.[8]

Under this analysis, all Hodiernal Stative and Hodiernal Perfective stems share the same underlying melody – {H_{V2}+H_{FV}} – but surface with different tone patterns due the varying applicability of Final Lowering and Long Retraction. This analysis is illustrated in the derivations in Table **??**. Note that in these derivations, only the stems of verbal forms are shown, so that all forms may be seen side by side.

spell out abbr.

3.6 {L_{FV}}

The final set of forms to consider in this section are those that realize no H tones at all within the stem. The central question here is whether the final vow-

[8] As a reviewer notes, a similar lowering happens in Kuria: phrase-final L becomes SL (i.e. downgliding L) after another L (**Mwita2008**; **Marlo2014**).

Table 5: Derivations of forms with underlying {H_{V2} + H_{FV}} melodies

	Hod. Perf	*Hod. Perf. 3*SG	*Hod. Stat.*	*Hod. Stat. 3*SG
UR	{H_{V2} + H_{FV}}	{H_{V2} + H_{FV}}	{H_{V2} + H_{FV}}	{H_{V2} + H_{FV}}
	[kon-aang-i-ɛ]	[kon-aang-i-ɛ]	[kon-aang-eet-ɛ]	[kon-aang-eet-ɛ]
Initial Map.	[kon-áang-i-ɛ́]	[kon-áang-i-ɛ́]	[kon-áang-eet-ɛ́]	[kon-áang-eet-ɛ́]
H_{FV} Lowering	—	[kon-áang-i-ɛ̀]	–	[kon-áang-eet-ɛ̀]
Long V Retract	—	—	–	[kon-áang-eɛ̀t-ɛ̀]
R. Spread	[kon-ááng-i-ɛ́]	[kon-ááng-í-ɛ̀]	[kon-ááng-éet-ɛ́]	[kon-ááng-éɛ̀t-ɛ̀]

els of these verbs should be analyzed as underlyingly toneless, as proposed by **Roberts-Kohno2014**, or as bearing a final L tone. We opt for the latter analysis, by a chain of reasoning that is somewhat indirect.

First, some forms that surface without any H tones in the stem are clearly derived, via Final Lowering, from forms with an underlying {H_{FV}} melody. In Table **??**, we see that these forms occupy the exact same positions within morphological paradigms as previous forms affected by Final Lowering: object-focus forms, and forms with 3rd singular personal subject agreement.

Table 6: Final Lowering in Habitual forms

	Assertive (nonfinal)	Relative	Object-Focus
Habitual	[H_{FV}]	[H_{FV}]	**[L_{FV}]**
'we always hit'	né-tó-[kon-aang-a-á]	to-[kon-aang-a-á]	tó-[kon-aang-a-à]
... w/ 3SG subject	**[L_{FV}]**	**[L_{FV}]**	**[L_{FV}]**
'he always hits'	n-óo-[kon-aang-a-à]	o-[kon-aang-a-à]	á-[kon-aang-a-à]

When Final Lowering occurs in forms with a preceding H_{V2} tone, it is clear that the rule must produce a final L tone, rather than a final toneless vowel. This is crucial, for example, in explaining the extent of spreading in Hodiernal Perfective forms with third person personal subject agreement (cf. Table **??**): the fact that lowering of H_{FV} produces L_{FV} is what ensures that H_{V2} is able to spread to the penult, but no further. We can reasonably assume that Final Lowering produces the same results in Table **??**, where no confirming evidence from tone spread is available. Thus, at least some forms in the language without any Hs must be analyzed as having a final L. We assume that learners simply generalize this result, positing final L in forms with no H tones even when Final Lowering is not involved. One such form is the Hesternal Perfective, which shows a final L even

in the absence of object focus or a 3rd singular personal subject marker (??).

(8) Hesternal Perfective (Object Relative clause)
to-náa-[kon-aang-i-è]
'(thing that) we cut (yesterday)'

One final reason for positing final L rather than ∅ has to do with the realization of forms like the Hesternal Perfective when they occur before pause in an Assertive phrase. In these contexts, as we will see in §??, these forms surface with a final SL tone. This is just what we expect if, as we will propose, the ends of Assertive phrases are marked by a final floating L tone. (Note that has been independently proposed for closely-related Kikuyu by **Gjersoe2016**.) In this case, we can regard the final SL tone as simply a downstepped final L, derived from the general lowering of L to SL before floating L tones discussed in §??. On the other hand, this simple explanation is not available if we regard the final vowel of (??) as toneless. In that case, the final floating L tone at the end of the Assertive phrase will have no preceding L tone to downstep.

assertive phrase

3.7 Summary

In this section, we have achieved a modest reduction (from six to five) in the number of tonal melodies needed to account for the forms which Roberts-Kohno analyzes without any final SL or SH tones. A more impressive result has been a considerable increase in the internal coherence of the proposed melody set: while the melodies posited by **Roberts-Kohno2014** constitute arbitrary combinations of H_{V2}, L_{Pen}, L_{FV} and H_{FV}, our proposed melodies are simply all combinations of $\{H_{V2}\}$, $\{H_{FV}\}$ and $\{L_{FV}\}$ that assign no more than one tone to one vowel. Finally, we have identified two important synchronic processes, Final Lowering and Long Retraction, that are needed to account for intraparadigmatic alternations in stem tones, and well as the crucial role played by the OCP in blocking tone spread. In §4, we complete our analysis of verbal tone in Kikamba by analyzing forms in which additional tones are added beyond this basic melody set.

4 Floating L tones

4.1 Overview

So far, we have not yet considered any forms that **Roberts-Kohno2014** analyzes as possessing a final melodic super-low (SL) or super-high (SH) tone. In this section, we argue that these forms are best accounted for not by positing a new

melodic tone, but by recognizing a distinct class of floating tones that are introduced into the derivation only after all melodic tones have been assigned. In §??, we begin with a discussion of phrasal tone, in which the facts concerning floating L tones are somewhat more clear. In §??, we then proceed to a discussion of verb-bound floating L tones which Roberts-Kohno analyzes as melodic. Finally, in §??, we briefly discuss a form that appears to warrant a final floating H.

4.2 Phrasal tones

So far, all verbs in Assertive clauses have been presented as they would appear in non-final position. The reason for this is that at the end of an Assertive clause, verbs systematically show the effects of a phrase-final boundary tone. These effects vary depending on whether the phrase-final verb ends in a H tone or a L tone. If the verb ends in a high tone in non-final position, then it appears with a final *falling* tone phrase-finally (cf. ??,b,c). If the verb ends in a low tone in non-final position, then it ends with a *super-low* tone phrase-f?).

check tones

(9) Position-based alternations in stem-final tone

a. {H_{FV}}: Habitual 'we always hit'
   Non-final né-tó-[kon-aang-a-á] …
   Final né-tó-[kon-aang-a-â]

b. {H_{V2}+H_{FV}}: Hodiernal Perfective 'we hit (today)'
   Non-final né-tó-[kon-ááng-i-ɛ́] …
   Final né-tó-[kon-ááng-i-ɛ̂]

c. {H_{V2}}: Remote Perfective 'we hit (long ago)'
   Non-final né-tw-áa-[kon-ááng-í-ɛ́] …
   Final né-tw-áa-[kon-ááng-í-ɛ̂]

d. {L_{FV}}: Hesternal Perfective 'we hit (yesterday)'
   Non-final né-tó-náa-[kon-aang-i-ɛ̀] …
   Final né-tó-náa-[kon-aang-i-ɛ̀]

Roberts-Kohno2000 (**Roberts-Kohno2000**; **Roberts-Kohno2014**) proposes that these alternations are the result of a phrasal SL tone. In a similar spirit, we propose that these alternations are caused by a floating L_{φ} tone which marks the right edge of an Assertive phrase. When L_{φ} follows a word-final L tone, it causes it to *downstep* and surface as SL. However, when L_{φ} follows a word-final H tone, it docks onto the word-final vowel to form a final fall. Crucially, this docking of L_{φ} must take place rather late in the derivation. The reason for this concerns the

interaction of L_{φ} with H_{V2}. As shown in (??), when a verb with a $\{H_{V2}\}$ melody is assigned L_{φ} at the end of the assertive phrase, the result is simply a falling tone at the end of the H tone span from V2 to FV. L_{φ} thus interacts with H_{V2} very differently than L_{FV}, which occupies the FV by itself and limits the spread of H_{V2} to the penult (cf. ??). The reason for this, we propose, is ordering: L_{FV} is a *melodic* tone that is assigned at the same time as H_{FV}, and is thus present early in the derivation when H_{V2} spreads to the right. By contrast, L_{φ} is a *phrasal* tone introduced only after all word-level phonology is complete. It is therefore not able to block the rightward spreading of H_{V2} simply because it is not present when that spreading takes place.

Two additional notes on phrasal tone are in order. First, though we have focused above on the effects of phrasal tone on a phrase-final *verb*, L_{φ} is always assigned to the last word of an Assertive verb phrase. Thus, if an Assertive verb is followed by a L-final noun, that noun will surface with a final SL tone due to L_{φ}-induced downstep (cf. ??). Similarly, if an Assertive verb is followed by a H-final noun, that noun will generally surface with a final fall (cf. ??). (Note that in the examples to follow, parentheses are used to mark the edges of the *Assertive* phrase, i.e. the minimal phonological phrase in which an Assertive verb appears.)

(10) L_{φ} manifests on the final vowel of the Assertive phrase

a. e-i.ò
   'a banana'

b. (né-tó-[kon-aang-a-á] e-i.ò)$_{\varphi}$
   'we usually hit a banana'

c. n-da.á
   'a louse'

d. (né-tó-[kon-aang-a-á] n-da.â)$_{\varphi}$
   'we usually hit a louse'

The second point concerns the final fall observed in (??). A pervasive generalization in Kikamba is that falling tones are only permitted before pause. Thus, if a H-toned noun like *n-da.á* 'louse' or *cháí* 'tea' stands at the end of an Assertive phrase but is not utterance-final, we do not see a phrase-final falling tone. Nonetheless, L_{φ} does not simply disappear without a trace: instead, the vowel that *would* have realized a falling tone (had it been prepausal) surfaces as *super-high* (cf. ??). In this way, the presence of L_{φ} can be detected even in the absence of any L-toned surface vowel. This will prove crucial to the discussion of putatively melodic super-low tones in §??.

(11) HL permitted only pre-pausally (**Roberts-Kohno2000**)

a. kemiiná
'Kemiina (a name)'

b. (né-né-ké-[nɛɛngiɛ] kemiinâ)$_{\varphi}$
'I gave it to Kemiina'

c. (né-né-[nɛɛngiɛ] kemiiná́)$_{\varphi}$ cháí
'I gave tea to Kemiina'

4.3 "Melodic" SL tones

A number of non-assertive verb forms show alternations very similar to those observed at the ends of assertive phrases. For instance, verbs that show final SL in phrase-final position surface with final L phrase-medially (cf. **??**,b), while verbs that surface with phrase-final falls surface with phrase-medial SH (cf. **??**,d).

(12) Contextual stem alternations of non-assertive verbs

a. ko-[konǎ]
'to hit'

b. ko-[konà] ma-i.ò
'to hit bananas'

c. to-í-[kon-ááng-éet-ê]
'we had not hit (long ago)'

d. to-í-[kon-ááng-éet-ế] ma-i.ò
'we had not hit bananas (long ago)'

Roberts-Kohno2000 (**Roberts-Kohno2000**; **Roberts-Kohno2014**), recognizing the clear similarities between these alternations and the phrasal alternations in (**??**) and (**??**) above, argues that both should be analyzed as the result of an assigned SL tone. Similarly, we propose that all the alternations in (**??**–**??**) derive from the variable presence of a floating L tone.

However, as Roberts-Kohno discusses at length, there is a crucial difference between the alternations observed in (**??**) and those involving Assertive clauses in (**??**) and (**??**). While the floating L$_{\varphi}$ tone assigned in Assertive phrases surfaces on whatever element stands last within the Assertive phrase, the floating L responsible for downstep in (**??**) and for the final falling tone in (**??**) is closely bound to the verb. Thus, when it fails to downstep the final L of nonfinal *ko-konà* 'to hit'

in (??), it does not then instead cause a final downstep in final *ma-i.ò* 'bananas'. Similarly, when the floating L tone is unable to form a final falling tone on the verb in (??), it does not trigger downstep of following *ma-i.ò*, but is instead realized indirectly through in the verb's SH tone. Unlike the phrasal L_{φ} tone, then, the floating L tone in (??) must be realized on the verb itself, or not at all. We propose that this is because the floating L tone in these forms is a tonal *suffix* to the verb, rather than a boundary tone to the entire phrase.

The ultimate fate of suffixal L depends both upon the final tone of its verb and on its phrasal context. If suffixal L is assigned to a verb with a final L tone, then it will manifest by downstepping that L so long as the verb appears in phrase-final position, as in (??). In phrase-medial position, as in (??), the floating L simply deletes, with no effect on the preceding tone. If the suffixal L belongs to a verb with a final H tone, then it will manifest as part of a final falling tone in utterance-final position, as in (??), but as part of a final super-high tone utterance-medially, as in (??). These options are summarized in Table ??.

Table 7: The fate of floating L tones in Kikamba (Ⓛ = floating L)

phrase-medial	phrase-final, utterance-medial	utterance-final
Ⓛ deletes	$\text{L}\textcircled{\text{L}} \rightarrow {}^{\downarrow}\text{L}$ $\text{H}\textcircled{\text{L}} \rightarrow {}^{\uparrow}\text{H}$	$\text{L}\textcircled{\text{L}} \rightarrow {}^{\downarrow}\text{L}$ $\text{H}\textcircled{\text{L}} \rightarrow \text{HL}$

The fact that suffixal L is found only in verb forms, and the fact that it is closely bound to individual verbs rather than phrases that contain them, makes it appear much like a melodic tone like H_{FV} or L_{FV}. However, just as with L_{φ}, the fact that suffixal L is *not* a melodic tone is shown through its interaction with H_{V2}: while melodic L_{FV} limits the spread of H_{V2} to the penult (cf. ??), suffixal L simply adds on to a long H tone span from V2 to FV. This may be seen clearly in the Negative Habitual forms in (??), where suffixal L added to a form with a $\{H_{V2}\}$ melody creates either a falling tone in utterance-final position (cf. ??) or a final super-high tone in phrase-medial position (cf. ??). In both forms, rightward spreading of H_{V2} is totally unimpeded by the presence of the suffixal L on FV. This suggests that suffixal L, like L_{φ}, is added only after all other tones have associated and (in the case of H_{V2}) spread.

(13) Combination of suffixal L with a $\{H_{V2}\}$ melody

a. to-í-[kon-ááng-á-â]
'we do not usually hit'

b. to-í-[kon-ááng-á-ǎ] ma-i.ò
'we do not usually hit bananas'

The general conclusion, then, is that while suffixal Ls are more closely linked to the verb than L_{φ}, they must nevertheless be distinguished from melodic tones originating from a single melody because they are assigned at different points in the phonological derivation. This limits the true melodies of Kikamba to those established in §3.

4.4 Melodic SH

A final tone pattern described by Roberts-Kohno involves a H tone span from V2 to FV which is raised to SH on the final vowel (e.g. *tw-áá-*[*kon-ááng-ǎ*] 'if/when we hit'). We tentatively propose that this form results from a suffixal floating H tone which *upsteps* the preceding word-final H. More investigation into these forms is required, however.

5 Conclusion

Under the reanalysis of Kikamba melodic tone proposed here, the melodic inventory of Kikamba can be reduced from the ten melodies in (??) to the five melodies in (??–b), the latter of which may combine with the suffixal floating L tone (and, much more rarely, the suffixal floating H tone) in (??).

(14) Melodic inventory of **Roberts-Kohno2014**

a. 0 melodic tones
{∅}

b. 1 melodic tone
{H_{FV}} {H_{V2}} {SL_{FV}}

c. 2 melodic tones
{H_{V2}+L_{FV}} {H_{V2}+SL_{FV}} {H_{V2}+SH_{FV}}

d. 3 melodic tones
{H_{V2}+L_{Pen}+H_{FV}} {H_{V2}+H_{FV}+SL_{FV}}

e. 4 melodic tones
{H_{V2}+L_{Pen}+H_{FV}+SL_{FV}}

(15) Our proposed melodic inventory

a. 1 melodic tone
   {H_{V2}} {H_{FV}} {L_{FV}}
b. 2 melodic tones
   {H_{V2}+H_{FV}} {H_{V2}+L_{FV}}
c. Suffixal floating tones
   {L_{Suf}} {H_{Suf}}

This reanalysis produces a tonal inventory that is internally coherent, consisting of a few basic melodic tones whose logical combination yields the full range of attested melodies. More importantly, under this reanalysis, the melodic system of Kikamba is no longer a typological outlier whose relation to other Bantu systems is mysterious. On the contrary, the melodic system instantiates a near-canonical Bantu melody system (cf. Table **??**): H and L melodic tones assigned to V2 and FV combine in melodies that target no more than 2 positions at a time. It is important to note, however, that the advantages of (**??**) are not only aesthetic or even only typological. Arriving at this inventory, and in the process eliminating aspects of (**??**) such as L_{Pen}, we have been able to provide unified tonal analyses of semantically coherent sub-paradigms (e.g. those of the Hodiernal Perfective and Stative) that were not possible using the less constrained melodic inventory. Thus, the current proposal is supported by both typological and language-internal considerations.

If this analysis is on the right track, it strongly confirms the crucial importance of synchronic analysis in the typological study of melodic tone. Because the relationship between surface tone patterns and underlying melodies is often highly indirect, we can only meaningfully compare the melodies of Bantu languages after detailed and, we would argue, theoretically consistent, analyses of them have been developed.

Finally, we end on what is to us, at least, an optimistic note. Looking at the incredible *surface* diversity of melodic tone patterns in Bantu, it can be tempting to conclude that melodic assignment is an inherently unconstrained system, where essentially anything is possible, and where the melodic inventory of a given language is limited only by what its idiosyncratic history makes possible. In the course of our analysis of Kikamba, however, we hope to have shown that the considerable surface diversity observed in Bantu melodic tone patterns is often misleading. With synchronic analysis that carefully distinguishes surface stem tone patterns from underlying melodies, it is possible to find deep similarities between superficially distinct melodic systems. This opens up the possibility that perhaps melodic tone in Bantu is more constrained than it initially appears, so

that it may ultimately be possible to state strong restrictions on what constitutes a possible melodic system.

Abbreviations

Glosses are abbreviated as follows:

1PL	first person singular	NEG	negation
ASP	aspect	PFV	perfective
ASSERT	assertive	PST	past tense
CAUS	causative	RECP	reciprocal
FV	final vowel	REV	reversive
ITER	iterative	SBJ	subject marker
NC.5	class 5 nominal concord prefix	UR	Underlying representation

Tonal abbreviations are:

H	high	SH	super-high
L	low	SL	super-low

Stem position abbreviations are:

V1	stem-initial vowel	FV	stem-final vowel
V0	pre-stem vowel	Pen	penultimate vowel
V2	second stem vowel		

References

Aboh, Enoch O. & Maria Dyakonova. 2009. Predicate doubling and parallel chains. *Lingua* 119(7). 1035–1065.

Agyeman, Nana Ama. 2002. *Serial verb constructions in Akan*. Norwegian University of Science & Technology MA thesis.

Aikhenvald, Alexandra Y. & R. M. W. Dixon. 2006. *Serial verb constructions: A cross-linguistic typology*. New York: Oxford University Press.

Appah, Clement K.I. 2003. *Nominal derivation in akan: a descriptive analysis*. Norwegian University of Science & Technology MPhil Thesis.

Bannerman, J. Y., D. E. K. Krampah, G. F. K. Arthur & K. A. Dickson. 2011. *Mfantse nkasafua na kasambirenyi nkyerɛase: Dictionary of Mfantse words and idioms*. Tema: Center for Indigenous Knowledge Systems.

Barkema, Henk. 1996. Idiomaticity and terminology: A multi-dimensional descriptive model. *Studia Linguistica* 50(2). 125–160.

Boadi, Lawrence A. 2005. *Twi kasa mmara ne kasɛsoɔ*. Kumasi: Katawuri.

Bodomo, Adams. 2004. The syntax of nominalized complex verbal predicates in Dagaare. *Studia Linguistica* 58(1). 1–22.

Bodomo, Adams. 2006. On nominalizing the verbal complex in Dagaare and English. In no editor (ed.), *11th biennial symposium on linguistics: Inter-theoretical approaches to complex verb constructions*, 1–17. Houston: Rice University.

Bodomo, Adams & Marc van Oostendorp. 1994. *Serial verb nominalisations in Dagaare*. Washington, DC: ERIC Clearinghouse.

Booij, Geert. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th Decembrettes: Morphology in Toulouse*. University of Toulouse - le Mirail: Cascadilla Proceedings Project.

Christaller, Johannes Gottlieb. 1933. *A dictionary of the Asante and Fante language called Tshi (Twi)*. Basel: Basel Evangelical Missionary Society.

Department of Education, Ghana. 1971. *Twi Nsɛm Nkorɛnkorɛ Kyerɛwbea*. Accra: Waterville Publishing House.

Duah, Reginald A. 2013. *Force dynamics and causation in Akan*. Legon: University of Ghana dissertation.

Hiraiwa, Ken & Bodomo Adams. 2008. Object-sharing as symmetric sharing: Predicate clefting and serial verbs in Dagaare. *Natural Language Linguistic Theory* 26. 795–832.

Kambon, Obadele. 2012. *Serial verb nominalization in Akan*. Legon: University of Ghana dissertation.

Kambon, Obadele, E. Kweku Osam & Nana A. Amfo. 2015. A case for revisiting definitions of serial verb constructions – evidence from Akan serial verb nominalization. *Studies in African Linguistics* 44(2). 75–99.

Koptjevskaja-Tamm, Maria. 1993. *Nominalizations*. Oxford: Routledge.

Obeng, Samuel Gyasi. 2001. *African anthroponymy: An ethnopragmatic and morphophonological study of personal names in Akan and some African societies*. München: Lincom Europa.

Osam, E. Kweku. 1993. The loss of the noun class system in Akan. *Acta Linguistica Hafniensia* 26. 81–106.

Osam, E. Kweku. 1994. *Aspects of Akan grammar: A functional perspective*. Eugene, OR: University of Oregon dissertation.

Osam, E. Kweku. 2004. *The trondheim lectures, an introduction to the structure of akan: its verbal and multiverbal systems*. Legon: Department of Linguistics.
Patton, Michael Quinn. 2002. *Qualitative research and evaluation methods*. New Delhi: SAGE Publications.
Saah, Kofi K. 1994. *Studies in Akan syntax, acquisition, and sentence processing*. University of Ottawa dissertation.
Vendler, Zeno. 1967. *Linguistics in philosophy*. New York: Cornell University Press.

Part II

Syntax and semantics

Part III

Areal features and linguistic reconstruction

a community proofreader or typesetter at http://www.langsci-press.org/register.

./langsci/gr