

Features and Rules in the Logoori Tone Melody System*

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1. Background

Bantu languages have long presented a theoretical and analytic puzzle in tonal analysis, which is that verb inflections are signalled not only with segmental affixes, they also involve abstract tone melodies aligned to the verb stem, as exemplified by the Shona data in (1).

verbs stems: *pa* ‘give’, *tor-es-er-an-a* ‘(make) take (for (each other))’, *ti* ‘say’, *bik-is-ir-an-a* ‘(make) cook (for (each other))’, *shamwarizis-ir-an-a* ‘make befriend for (each other)’, *bhururukis-ir-an-a* ‘make fly for (each other)’, inflections *ku-* ‘infinitive’, *ha-* ‘negative’, *t(i)-a* ‘1pl.subj’+recent past’, *va-* ‘class 2 subj’, *-i* ‘non-past final vowel’, *-a* ‘general final vowel’

(1)	<i>H root</i>	<i>L root</i>	
	ku[pá	ku[ti	Infinitive
	ku[tórá	ku[bika	(pattern 1)
	ku[tóresá	ku[bikisa	
	ku[tóresána	ku[bikisana	
	ku[tóresérana	ku[bikisirana	
	hatá[pa		Recent past negative
	hatá[tóra	hatá[biká	(pattern 2)
	hatá[tóresá	hatá[bikísa	
	hatá[tóreserá	hatá[bikísíra	
	hatá[tóreséraná	hatá[bikísírana	
	hatá[shámwáridzisirá	hatá[bhurúrukisira	
	hatá[shámwáridzisiraná	hatá[bhurúrukisirana	
	hatá[tóresá	hatá[bikísa	
	havá[pí		Present negative
	havá[tórí	havá[bikí	(pattern 3)
	havá[tóresí	havá[bikírí	
	havá[tóreséri	havá[bikísírí	
	havá[tóresérani	havá[bikísírání	

These systems having been studied for many years, and a decade ago they were the subject of an issue of *Africana Linguistica*. The analysis of melodies breaks down into two main parts: representation, and computation. In Shona there are three patterns. The first, seen in the infinitive, only reflects general phonological rules. In the other two cases, tones are added to the stem as an aspect of inflection, and the primary analytic questions are, how are these tones represented in connection with inflectional material, and how are they lined up with stem vowels? The representation of the melody could be two

* A caveat to the reader: this is a work in progress. I have changed the notation for identifying tones in the course of writing the paper, and *hope* that I have implemented those changes consistently, but it is possible that I have fouled up the symbols for sub-features somewhere.

floating Hs as suffixes which mark certain tenses, and paired with those tones there would be rules saying where the Hs initially go and how they are modified. Such systems of rules (see Odden 1981) would be responsible for explaining why there is no added H in disyllabic H roots and no final H in trisyllabic L verbs, in the second pattern.

The problem is that the required rules are, to a considerable extent, specific to a particular melody. We have to be able to also account for the fact that there *can* be a final H in a disyllabic H verb under a *different* melodic pattern. For the most part, work on Bantu melodic tone inflection has glossed over the precise mechanisms for deriving these patterns, and research on the topic has strongly tended to be atheoretically descriptive. There is nothing wrong with providing a clear description of the facts, but hopefully by the end of this paper, the reader will see how the present change in perspective can benefit such descriptions of phonology, by putting primary analytic emphasis on the patterns of data alternation. Simply put, the approach advocated here holds that when tones behave the same, it is because they have something in common, and when they behave differently it is because they have a distinguishing feature. Shared and distinguishing features are not determined by the physical realization of segments, they are determined by what the segments do, phonologically. Under the perspective advocated here, it is the overall system of phonological alternations that determine the featural analysis of tones in a language, it is not just the phonetic output.

In this paper, I return to a specific case which I treated in a previous paper (Odden 2018) – unsatisfactorily in hindsight – the system of Logoori, a Luhya language of Western Kenya. In that paper, I discussed a half-dozen inflectional patterns, and concluded that a purely representational approach is insufficient, noting that the concept of melody must also encode the melodic system into the rules which map the tones.

these patterns have evaded analysis in purely representational terms—it is not enough to say that a certain tense adds an H, or two Hs, one must say what happens when these tones are added. Not only must one specify a particular target of initial association, a fact that has been well known throughout the history of autosegmental analysis of Bantu tone, one must say what that melodic tone does to other tones [p.93].

For instance, in Logoori the subjunctive has one melodic H, as does the indefinite future, but the surface behavior of these two Hs is very different. How then do we encode that difference in the grammar? At the time, I had no clue, but I now understand that the problem comes from the representational premise that we only have H and zero or L, because that is what you have in pronunciations.

To the extent that papers give an analysis with explicit mapping rules rather than descriptive statements, the usual approach is to impose the burden on the mapping rules, by having one group of tone rules be triggered by the syntactic and semantic properties which characterize, for instance, the indefinite future, versus a different group of tone rules triggered by the grammatical properties defining the subjunctive. This approach is very problematic on theoretical grounds, because it blatantly rejects the important theoretical premise that a grammar is a set of independent computational modules, where phonology only accesses phonological properties, syntax only accesses syntactic properties, and semantics only accesses semantic properties. This purely rule-based phonetically-defined approach says that phonology has access to everything. The approach which puts the entire burden on the rule system fails quasi-empirically because multiple rules would also have to be

redundantly burdened with exactly the same list of inflectional categories.¹ The pattern found in the indefinite future is shared by a number of other inflections such as the conditional, consecutive, persistive and so on, so we would end up requiring about a half-dozen rules, each of which would need to recite the particular list of inflections following the M2 pattern. Furthermore, it is not sufficient to just say “subjunctive” to identify the forms with the M3 pattern, because only a subset of subjunctives follow this pattern, namely the ones with no tense inflection between the subject prefix and the M-stem. We need to somehow set up the underlying forms to correctly encode information as to what tenses trigger which rule patterns. The problem is that with just H and L to work with, we can’t come up with reasonable relations between rule behavior and representations. The problematic representational assumption comes from a view of phonology, one increasingly called into question, that objects in phonology are phonetic descriptions of pronunciation, and not descriptions of phonological behavior.

My solution to the melody quandry starts from a different view of phonology, that of the radical substance-free approach to grammar, where phonological features for tone are not phonetic descriptions of pitch, they are descriptions of phonological class behavior. When two tones do the same thing, that is because they have a common feature. See Odden (2022, 2021, 2020), Chabot (2021), Danesi (2022) for applications of this approach. Under this approach, rule-based behavior is what defines and allows a language-learner to discover features. If one melody has a tone that maps to the second syllable and a different melody puts tone on the final syllable, we would not say that the two melodic tones are the same object, we would naturally say that they are representationally *different* things, and the rule system refers to that difference. The rules then directly refer to that distinction as represented with distinct features, and the two mapping rules call out different tonal objects, despite any tendency for the tones to be pronounced the same. The burden of accounting for melodic patterns falls equally on computation and representation. The primary culprit in being unable to devise a theory of tone melodies is the premise that tone features are articulatory instructions rather than indicators of phonological behavior. That theoretical error has been corrected.

2. First steps in identifying tonal distinctions

A preliminary note is necessary, regarding the data and tonal analysis of Logoori. There is a high degree of variation in the language, both between speakers and within speakers. The results of my work over the years are being disseminated on <https://languagedescriptions.github.io/Logoori/>, which is a work in continual progress. It includes a chapter on the verbal tone system which gives vastly more data and details. This paper constitutes an “executive summary” focusing on the broadest generalizations, hopefully valid for most speakers. My data comes from slightly over a dozen speakers, which constitutes a miniscule fraction of the roughly 600,000 speakers of the language. Because the central question of rules and features is a cognitive question about an internalized grammar, it is important that the generalizations be representative of at least one speaker of the language.

The generalizations presented here are valid for EM, who has provided the majority of my data over the past decade. As noted in the grammar, some speakers have slightly (or substantially) different tonal systems compared to the facts presented here. Such variations do not play a role in the present paper, and any mention of optionality or variation means that EM produces (indeed volunteers) both

¹ Quasi-empirically, in the sense that one might take the required complications to be a factual refutation of the theory, but a staunch advocate of phonetically-determined phonological representations would simply declare that such complexity is necessitated by the axiom that features are phonetic descriptions.

variants. In other words, the system described here is not based on the false premise that speakers have full access to all outputs of all speakers of the language. Like any language, Logoori has dialects.

A current lacuna is that there is no complete description of the facts of Logoori verbal-inflectional tone. Although I have been working on Logoori full-time for a decade, I discovered two new verb tenses just within the 4 months that I have been writing this paper. For that reason, this should be considered to be a progress report outlining some of the basic phonological patterns of verb tone and an analytic framework for coping with tone. I point to and do not analyse the substantial complication contributed by object prefixes, I do not even mention the quirk of unprefixed subject relative forms which can have yet a different melodic pattern from verbs in other clause types.

Pak (2021) addresses one of the central concerns of this paper, namely how can the apparent need for massive reference to morphological properties – specifically in Logoori verbal tone – be accommodated in a modular theory of grammar. Her solution differs from mine in important ways, mainly stemming from apparent differences in underlying theory. The most important, it seems to me, lies in the question of the substance of phonological features, where her analysis employs just H and L tonal objects plus metrical structures as a substitute for some of the abstract features posited here, whereas my analysis is strictly based on distinctive i.e. phonological feature differences, and requires no exceptions to modularity in the form of re-write rules, which additionally have a kind of computational power (disjunctive rule blocks) not employed here. We agree in the basic idea that the behavior divergence between melodies comes from something in the morphology, we differ in what that thing is. Specifically, I claim, it is what tone is affixed. While Pak argues for readjustment rules as a limited version of process-based morphology in a primarily piece-based theory, the present analysis has no process-based morphology at all, that is, readjustment simply is not necessary for Logoori, if one has the right theory of features.² There are substantial empirical differences in these analyses, in that Pak analyses only the M1 / M2 distinction. Later versions of this paper may include explicit comparison of these two analyses.

2.1. Tones in lieu of melodies

In the *phonological* theory of tones advocated here, we start with the most basic fact, that some vowels have tones and some do not. This can be seen in any random sample of words in the language.

(2)	ndaaké ¹ dééka	‘I cooked it’	kwaakáva ¹ hómóóra	‘we massaged them’
	yíígoraa	‘he used to open’	isige	‘locust’
	omosháani	‘son’	vátakoráanga	‘if they don’t call you’
	kótúuza	‘to spit’	ekégótu	‘lost’
	varakavoroganyi	‘they will mix’	tareetá	‘don’t marry!’
	ndakíhaandiika	‘I will write it’	vaangóó ¹ jáa	‘they are helping me’

² Pak argues for the necessity of readjustment rules because they seem to be necessary as long as we assume that the tonal inventory contains only H, Ø and always-derived L – of course, denying that assumption is the essence of the present analysis. Pak seeks to strengthen the case against increasing the range of non-phonetic tone distinctions, by finding that this move “opens up a number of questions about the distribution of L and H in Logoori that would demand explanation”, however, free random distribution of tones vastly overgenerates representations in Logoori anyhow, and the present theoretical framework rejects the traditional premise that grammars should state all observed non-random distributions, many of which remain unexplained even in an account with readjustment – for example, why do no tense-aspect prefixes bear tone, why do no verbal segmental suffixes bear tone?

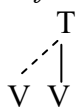
Three aspects of Logoori tonal pronunciation must be notated in any observationally adequate record of the language. First, every syllable either has raised pitch or else non-raised pitch. In the word *tareetá*, the first two syllables have non-raised pitch (indicated by lack of an accent), the last has raised pitch (indicated by the acute accent). In *ekégótu*, the raised pitches are on the second and third syllables and the non-raised pitches are on the first and last syllables. It is a non-phonological matter of phonetic implements to say how much a particular syllable is (non-)raised, in fact the raised pitch of *tareetá* is noticeably lower than the raised pitch of *yíigóra*. This level of detail is accounted for by the phonetic component, not the phonology.

Second, there is a distinctive lowering of all pitches, notated in the above transcriptions with a tick mark, standing for ‘downstep’. In [kwaakává'hómóóra] all but the first and last syllables have raised pitch, but the sequence [kává] is raised relative to a higher baseline than in [hómóó], that is, pitch drops a bit between [kává] and [hómóó]. The location / presence of downstep is a fundamentally distinctive surface phonological fact of the language. Finally, long vowels can have two distinctive types of raised pitch, a falling raised pitch as in the second syllable of [kótúuza], and a level raised pitch as in [yíigóraa]. Somewhat foreshadowing the analysis, we will simply say that [tá] in [tareetá] “has tone”, because this fact is directly observed in pronunciations and is necessary to say how the phonetics works. A basic limit on reliance on pronunciation alone for determining the phonological analysis is that we cannot conclude that [ta] and initial [ta] and [ree] are toneless, just because they *don't* have raised pitch. It is possible (indeed it will be demonstrated here) that [ree] does have a phonological tone, but that it has a *different* tone from the tone on the final syllable – it is a third kind of tone, one realized physically the same as a total lack of phonological tone. The literature on Bantu tone has frequently yet sporadically admitted a three-way distinction between H, unspecified L, and specified L, which is exactly what is proposed for [tareetá], that [ree] has a “specified L” that is a specified tone that is not physically raised, whereas [ta] has no tone at all. Logoori is indeed a language with such a phonological distinction.

Certain regular properties of these surface representations are the result of phonological rules. The two most important and ubiquitous in the language are that (a) a tone spreads to the left via a rule Leftward Spreading and (b) when two physically-realized tones come together on adjacent vowels, there is always reduction in the baseline pitch, i.e. downstep. The operation of Leftward Spreading is seen in (3). Notice how addition of a word with a tone causes raising of otherwise toneless syllables.

(3)	omũondo	‘person’
	móritu	‘heavy’
	móráhi	‘good’
	omũondo móritu	‘heavy person’
	ómóóndó móritú móráhi	‘good, heavy person’
	maheengere	‘bean-maize food’
	maheengere maangu	‘light mahengere’
	maheengere maangu mourojo	‘light mahengere in a saucer’
	máhééngéré máángó mórójú mónéne	‘light mahengere in a big saucer’

(4) *Leftward Spread*



(Optionality and word-initial exclusion require further study)

When a toned syllable is followed by another toned syllable, the tone spreads leftward up to the preceding tone, and a downstep appears to separate the two tones.

(5)	mbéére	‘milk’
	mbéé ¹ ré mára ¹ hɪ	‘good milk’
	mwí ¹ dako	‘Idakho person’
	mwí ¹ dákó mórá ¹ hɪ	‘good Idakho’
	mkó ¹ ónzakari	‘widow’
	mkó ¹ ónzáká ¹ rí m ¹ táámbrɪ	‘tall widow’
	matíginyu	‘heels’
	matíginyu malla	‘some heels’
	matí ¹ gín ¹ yú mállá mánéne	‘some big heels’
	ková ¹ choolla	‘to draw for them’
	ková ¹ chóóllá éng ¹ ’érengani	‘to draw a star for them’
	ková ¹ chóóllá éng ¹ ’é ¹ régání índá ¹ hɪ	‘to draw a good star for them’

Downstep also arises directly from phrasal concatenation of toned syllables without Leftward Spreading, though word-initial syllables are usually not toned. There are a number of CV particles such as *gú* ‘certainly’ (conveying assurance) or *ndí* ‘in that way’, which cause insertion of downstep when preceded by a word with a final (realized) tone.

(6)	varádeeka	‘they will cook’
	varádeé ¹ ká gó	‘they will certainly cook’
	varádeé ¹ ká ndí	‘they will cook in that way’
	varánwá	‘they will drink’
	varánwá ¹ gó	‘they will certainly cook’
	varánwá ¹ ndí	‘they will cook in that way’

Outputs like [varádeé¹ká ndí], which derives from /varadéeka ndí/, illustrate a disconnect between standard segmental transcriptions and their analysis. Transcriptionally, we have 4 tone marks and a downstep operator, but this is a segmental shorthand for a more structured representation with fewer tonal objects.

(7)	
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“T” simply stands for “tone”, with no implication of how this tone is pronounced. What seems to be a sequence of H tones on adjacent vowels, seen at the level of transcriptions, is actually one tone with a multi-syllable domain. “Downstep” is not a phonological object in Logoori, it is simply a way of noting the phonetic lowering of pitch register between two tones – as a general fact of tonal phonetics, the baseline for each tone (irrespective of number of associations between the tone and segments) is lower than that of its predecessor.

With no further phonological facts to justify subdivisions of tone in this language, we would posit a familiar H / Ø analysis of tone as is typical of most Bantu languages. We can now give an account of one of the verbal tone patterns, the M1 pattern, which has no inflectional melodic tones. As is typical of Bantu, there is a lexical root contrast between toned and toneless roots. This is directly revealed in the M1 tenses which do not add any melodic tone, see infinitives in (8).

toneless (L) verbs *haanzuukizaang* ‘be causing to yell’, *ganaganaang* ‘be thinking’, *haanzuukiz* ‘cause to yell’, *rakuuriz* ‘cause to release’, *veezeger* ‘belch’, *ganaganir* ‘think for’, *ganagan* ‘think’, *rakuur* ‘release’, *taandur* ‘tear’, *guriz* ‘sell’, *gurizaang* ‘be selling’, *biim* ‘measure’, *rag* ‘promise’, *sh* ‘grind’; **(H) toned verbs**, *taangaaziraang* ‘be announcing for’, *vodong’anaang* ‘be going around’, *taangaazir* ‘announce for’, *karaangiz* ‘cause to fry’, *suundurany* ‘over-pour’, *vodong’anir* ‘go around for’, *vodong’an* ‘go around’, *karaang* ‘fry’, *cheeriz* ‘greet’, *karag* ‘judge’, *karagaang* ‘be judging’, *deek* ‘cook’, *veg* ‘shave’, *ty* ‘fear’.

(8) <i>Toneless</i>	<i>Toned</i>
ku[haanzuukizaanga	ku[táangaaziraanga
ku[ganaganaanga	ku[vódong’anaanga
ku[haanzuukiza	ku[táangaazira
ku[rakuuriza	ku[káraangiza
ku[veezegera	ku[súónduranya
ku[ganaganira	ku[vódong’anira
ku[ganagana	ku[vódong’ana
ku[rakuura	ku[káraanga
ku[taandora	ku[chéériza
ku[goriza	ku[káraga
ku[gorizaanga	ku[káragaanga
ku[biima	ku[déeka
ku[raga	ku[véga
ku[sha	ku[tyá

We observe one alternation in these data, in toned roots, between falling and level tone. Falling tone has a very limited distribution. First, it arises in certain phrasal combinations, when a tone from one “word” (syntactic position) phonologically moves to the beginning of another word via syllable fusion, for example /vaakaryá ínama/ → [vaakar-ínama] ‘they ate meat’, /aváána varideeká ínama/ → [aváána varideek-ínama] ‘the children who will cook meat’. Falling tone also arises when preverbal tonal particles such as the completive-focus marker “E” realized as a tone on a long subject prefix syllable – /E kwaakagura/ → [kwáakagura] ‘we have now bought’ (recent). Strictly within the word, falling pitch is also a feature of any prepausal raised pitch from a phonological tone, thus in [varánwá] from /varanwá/, F₀ in the syllable [nwa] falls to some degree, however this is not part of phonology, and is not part of the transcriptions. Apart from the previously-mentioned phrasal derivations of falling tone, phonologically relevant falling tone only appears on a long penultimate syllable, elsewhere a long syllable with tone is level high pitched. The distinction between falling versus level-H long penults is not phonetically predictable and is lexically unpredictable in nouns, see for example *umósáaza* ‘husband’, *irigóondi* ‘sheep’, *ekéroori* ‘heifer’ vs. *irigáánda* ‘bean’, *orobááng’a* ‘panga’, *umokáána* ‘girl’. In verbs, the distinction is predictable primarily based on the melodic pattern, see for example *arichóora* ‘he will draw’ (indefinite future, M2) versus *arákóona* ‘he will help’ (immediate future, M1), a distinction discussed below. The alternation between level versus falling long syllables is seen above in *kotáangaaziraanga*, *kotáangaazira*, *kosóónduranya*, *kochéériza* versus *kodéeka*. At this point, one might either posit a tonal sub-feature “falling” which is assigned to the tone in *kodéeka* but not *kochéériza*, or the difference might be encoded as a difference in the association domain of the tone, to the two moras of the long vowel in *kochéériza* but only the first half of the vowel in

kochéeriza. Given *kodééka za* ‘to just cook’, we can also see that the penult position to which the rule is sensitive is utterance-penult.

The M1 pattern is found in a number of other tenses, summarized in (9) with the toneless stem *-rakooriz-* ‘make release’ and *-káraangiz-* ‘make fry’, forms from which most melodic patterns can be inferred.

(9)	vara[rakooriza	vara[káraangiza	immediate future
	vaaku[rakooriza	vaaku[káraangiza	immediate past
	váaka[rakooriza	váaka[káraangiza	completive-focus recent past
	vaa[rakoorizi	vaa[káraangizi	completive-focus hodiernal perfective
	váá[rakoorizi	váá[káraangizi	completive-focus hesternal perfective
	vátaa[rakooriza	vátaa[káraangiza	before
	varika[rakoorizi	varika[káraangizi	future rika-e
	vari[rakoorizi	vari[káraangizi	future ri-e
	omo[rakoorizi	omo[káraangizi	i-nominalization

In the case of verbs inflected in one of the 9 M1 categories, there is just concatenation of transparent segmental morphemes including roots some of which have a tone and others of which do not, plus affixes – there are no melodic tones. In M1, toned roots manifest that tone on the first syllable, and there are indicators that this tone is on the first stem syllable (obvious in (9), indirect evidence exists under other patterns). Leftward Spreading and a general rule about long penults derives the rest of the tonal facts. The interesting case is everything else, the other dozen or so patterns which also add an inflectional tone.

2.2. Melodic patterns

There are about³ a dozen other patterns where the lexical tone of the root is supplemented with a floating tone of some sort, plus other segmental morphemes. The table in (10) includes the proposed tonal features, the justification of which is the purpose of this paper.

(10)	M ⁴	Toneless	Toned	exemplar tense	melody
	2	vari[rákóóriza	vara[karáángizá	indefinite future	T _{β,F}
	3	ni va[rákóórizi	ni va[karáángizi	crastinal future	T ₂
	4	váá[rákooriza	váá[káraangiza	remote past	T ₁
	5	rakooriza	karáángizá	imperative	T _{β,F}
	6	ta[rákóóriza	ta[karaanga	negative imperative	T _{β,F} ~ T _β
			~ta[karáángá		
	7a	ka[rakóó'rízí	ka[karáá'ngízí	immediate imperative	T ₂ + T _F
	7b	vaaka[rá'kóórizá	vaaka[ká'ráángizá	explanatory past	T ₁ + T _F
	8	váá[rakooriza	váá[karaangiza	stative	T ₁
	9	vaa[rákóórízí	vaa[karáángízí	hesternal perfective	T _F
	10	va[rákóórizi	va[karaangizi	hodiernal perfective	T _β

³ “About” indicates that individual melodies are not easily-enumerable entities, they are epiphenomena arising from the intersection of individual features. A dozen is a ballpark figure, a count of obvious distinctions.

⁴ The number refers to conventional melody number, which approximates the historical order of their identification.

11 vara[rakooriza vara[karaangiza counterfactual T_{F,L}

The first fact which should be obvious from these examples is that something generally happens to the lexical tone of toned roots, and another tone is usually added. In parsing these examples, it is important to recall the effect of Leftward Spreading, which spreads tone to the left. We can undo the effect of that rule in the first row, the representatives of M2, and arrive at the more remote representations *varirakóóriza* and *varakaraangizá*. Factoring out the effect of LS, we observe that there is an added tone towards the left edge of the stem in toneless stems, and in toned stems the lexical tone is gone but the final vowel has the added tone. Our analytic goal is to understand how pre-surface representations derive by combination of melodic tones plus whatever lexical tones may exist in a given root.

Given the understanding that lexical tones are suppressed or deleted in the presence of a melodic tone, we turn to the primary questions about melodic tones: how many tones are there in a melody, where do these tones go, and how many patterns are there? In order to answer these questions, we also need an analytic framework – how would we *know* the answer? In this framework, there is a close (but not infinitesimal) relation between observation (data) and rules. We look to see how underlying forms are changes, when two or more instances of what is superficially the same thing (“a tone”) act the same, we attribute that to the fact of being the same, and when two things act different despite being superficially the same, we conclude that they have some different property. This program of seeking “same in this respect, different in that respect” is driven by particular rules, thus there is a rule that links a melodic tone to the second stem syllable, and a different rule that links a tone to the final syllable. This fact motivates positing different features that the rules refer to. Then the goal of analysis is to discover the simplest system of rules in the grammar that generates this system of alternations.

To anticipate the analysis, sometimes lexical tone is completely deleted, and sometimes it is phonetically suppressed but remains phonologically. Based just on the fact that lexical tone is not surface co-present with a melodic tone, we need (a) a rule to eliminate lexical tone which implies (b) a way to distinguish melodic from lexical tones. Distinction (b) can be encoded in the classical autosegmental way, that melodic tones are floating, and lexical tones are (at the pertinent point in the derivation) associated to a vowel, the stem-initial. Thus we have (11), a rule eliminating lexical tone before a (floating) melodic tone.

$$(11) \quad \textit{Tone Deletion}$$

$$\begin{array}{c} T \rightarrow \emptyset \quad T' \\ | \\ V \end{array}$$

We will refine this analysis below, in light of evidence for a distinction between phonological deletion versus phonetic suppression, insofar as sometimes there is a trace of an apparently-deleted tone.

A melody can have one or two tone elements. The location of those elements depends on the melody, possibly interacting with other tones in the representation. The melodic content column in (10) mnemonically classifies these tones in terms of where they go, which is the fact that is most-directly accessible from this table.⁵ Specifically, there is a tone assigned to the final syllable (T_F), one assigned to the second syllable (T₂), one assigned to the stem-initial syllable (T₁), one to the word-initial syllable (T_I) not to mention a variably-positioned tone T_{β,F}; there are also two combinations, namely

⁵ The pairing of CVCVCVVCV toned and toneless stems completely identifies which melodic pattern a particular tense follows.

final H plus stem-initial or final plus second syllable. Once we understand the properties of the 4 elementary melodic tone features, we turn to the properties of bitonal patterns, which combine the final-targetted tone with one of the two other stem-internal tones.

Most of these tones are positioned with respect to the beginning of the stem. This raises the question how “stem” is represented in phonology. One possibility is to invoke a representational entity “[” which is part of the phonological string and is a thing to which the rule may refer. Alternatively we might assume a cyclic derivational reconstruction of “stem”, where just the stem is submitted to the phonology in an early derivational phase, then later, more parts of the verb are re-submitted to the phonology in a manner familiar from Lexical Phonology. At this point there aren’t clear and strong arguments for a particular solution, so I adopt the linearized boundary account since that makes it easier to follow how the rules apply, and immunizes the analysis from irrelevant changes in syntactic theory. To be clear, a reasonably viable alternative is that the rule in question simply links the tone to the leftmost vowel. But in standard rule formulation, “leftmost” or “rightmost” are not primitive rule relations, they are reconstructed by explicit reference to a domain-defining bracket – thus even in conventional rule theory, “specifically-leftmost” requires a left-boundary indicator in the rule.

(12) *Stem-initial mapping*

$$\begin{array}{c} T_1 \\ \vdots \\ [\sigma \end{array}$$

The derivation of M4 verbs is rather simple. Because of the addition of a melodic tone, the lexical tone deletes in /vaa[káraangiza T₁/. The melodic tone is then mapped to the vowel following the stem-initial bracket. This does not cover all of the details of the M4 pattern which we will return to, but it covers the majority of the data.

The stative tense attests the M8 pattern, where tone is on the word-initial syllable. The only difference between M4 and M8 is that M8 refers to word-initial position rather than stem-initial position, indeed these two could be reduced to a single melody instantiated by one rule (initial association) and one tone (initial tone), distinguished in terms of different cyclic level of application (stem-level vs. word-level). Reducing M8 to a level-ordering difference from M4 is not a cost-free analysis – the phonological account may be simplified, but the overall grammatical analysis is possibly made more complex, therefore in lieu of a stronger argument that level-ordering is the correct device for distinguishing these tone patterns, I assume that the distinction is solely in terms of the phonological rules and representations – the kind of boundary which the M8 tone aligns to.

(13) *Word-initial mapping*

$$\begin{array}{c} T_1 \\ \vdots \\ [\# \sigma \end{array}$$

The M3 tone is a different tone from T₁ and T₁, and it is subject to a different rule, specifically one mapping the tone to the second syllable after the stem boundary. As expected, T₂ causes deletion of lexical H in /nɪ va[káraangizi T₂/, and second-syllable mapping (14) applies to both nɪ va[rakʊʊrɪzi T₂/ and /nɪ va[karaangizi T₂/.

(14) *Second-syllable mapping*

$$\begin{array}{c} T_2 \\ \vdots \\ \vdots \end{array}$$

[σ σ

In a moment, I explain more of the details of the second-syllable tone, but first we will scrutinize the logic of abstract features versus bare H tones.

The difference between the remote past and stative verb forms – remote *yáárákoora* versus stative *yáarakoora* – is hard to account for if one only has a distinction between H and Ø (or even H and L, or H, L and Ø). The verb root in this case is toneless, so what would we add to the underlying segmental structure to derive these different surface tones? On the face of it, we just add one H in both cases, so why do the Hs go to different positions? Given just H and Ø, only a two-way melodic system would be possible, yet we have a much richer system than that in Logoori. Plainly, we *are* required to add a substantial element of abstractness to the rule and representation system, if we are to generate multiple phonological patterns.

A common approach to this problem is to incorporate morphological features into the phonological analysis, so that the rule which stands as the alternative to (12) is triggered by a feature [remote] and the alternative to (13) is triggered by a feature [stative], these being language-specific morphological features encoding the morpho-syntactic and semantic properties of these tenses.

(15) *Stem-initial mapping*

T[remote]
⋮
[σ

(16) *Word-initial mapping*

T[stative]
⋮
[# σ

In doing this, we must abandon the premise that phonological features are phonetic (which *is* the conclusion drawn here). Once we abandon that assumption, there is no reason to only admit non-phonological features into the phonology, and no argument against admitting purely phonological features which regulate how particular tones behave. Indeed, we can alternatively say that only purely phonological features enter into the phonology, a rather obvious conclusion to draw, yet one which has escaped substance-dependent theories of phonology. Moreover, the particular morpho-syntacto-semantic feature [remote] is inadequate, since the stem-initial pattern is found in other tenses which are not ‘remote’, for example the past habitual and future consecutive tenses also have this melodic pattern (thus a three-way disjunction of trigger-features over three morphological categories would be necessary).

(17)	má kó[káraangiza	‘then we make fry’
	má kó[rákooriza	‘then we make release’
	kwáá[káraangizaa	‘we usually make fry’
	kwáá[rákoorizaa	‘we usually make release’

This exposes the fundamental flaw in invoking morphosyntactic features in tone mapping. Whenever a melody as attested in multiple grammatical contexts, we end up multiplying the number of rules required to perform the linking. The various “possessive” suffixes of English -s as in ‘Bill’s’ do not always signal ownership of property (‘the theorem’s proof’), instead, numerous morphosyntactic configurations converge on this underlying suffix.

An alternative abstract and purely phonological analysis might call on a count of a single object, H tone, to distinguish different behavioral patterns. Under this approach, we could posit a single H in the stative and two Hs in the remote, then devise a system of rules which translates the count of floating Hs into a specific surface pattern. As it happens, there is a relation between “two Hs” and “stem-initial”, “one H” and “word initial”, which can be encoded in a computation, and one could encode the relation between “two Hs” and “word initial”, “one H” and “stem-initial” just as efficiently. The M3 pattern of second-syllable assignment could then be encoded via a sequence of three Hs plus a rule mapping one of those tones to the second stem syllable, and the most logical next step would be to encode the M2 pattern as 4 H tones. A sketch of such an analysis starts as in (18).

(18)	M8	M4	M3	M2	
	H	HH	HHH	HHHH	Representation
	#H#	#HH#	#HHH#	#HHHH#	Rule
	⋮	⋮	⋮	⋮	
	#V	[V	[σ σ	[V V	

The double word-boundary fence is necessary in each rule to encode the exact number of tones in a melody which undergo a particular mapping rule, otherwise a rule that applies to a shorter string of tones would overapply to any longer tone string. Alternatively it could be stipulated that these rule must be ordered so that the longest applies first (in fact, this is the SPE algorithm for rule abbreviations, though the rules are not abbreviable by any proposed notational convention). This approach simply encodes each behavioral package as a number, linguistically represented as that many instances of H, effectively reifying the numeric aspect of table (10).

At least two problems face this approach. First, the higher the numeric index of the melodic pattern (recall that melody numbers are conventional and reflect order of discovery), the more complex the rule – a rule applying to melody-index 7 therefore applies in the presence of exactly 7 H tones. This would guide the assignment of numbers so that any patterns requiring more than one rule would have to be assigned low numeric indices (thus avoiding the cost of specifying exactly 7 tones in 4 rules). Second, some patterns involve multiple melodic tones, which is a potentially fatal problem for the theory that melodies are unstructured sequences of a single object (H tone). If stem-initial tone is encoded as 2 Hs, final tone is encoded as 7 Hs, and (for example) the imperative pattern is 9 Hs, concatenation of initial and final melodic tones would be identical to the imperative pattern (which is not the case). Instead, the two-H patterns would have to be encoded as a distinct number of H marks, and in particular the final H of bi-melodic patterns would have nothing in common with other melodic patterns having a final H – but in fact, they do, as we discuss below.

The point being made here is that some degree of abstractness and non-phoneticness is required, in order to account for the richness of Logoori’s verb inflection system. No advantage accrues to positing that these distinctions should be based on a count of a single representational object, as opposed admitting a richer but simpler set of representational objects.

In the case of word-initial mapping for M8 and stem-initial mapping for M4, there is relatively little else to say at this point. All that happens is that lexical tones are eliminated and a melodic tone goes to the appropriate position. The second-syllable M3 does pose further complications, discussed in 2.3, beyond the primary question of where the melodic tone goes in the first place (the complication is that this tone sometimes spread once to the right). We now turn to the fourth pattern, M2 i.e. $T_{\beta,F}$, which manifests a pattern of conditional mapping, where the tone may be on the second mora or on the final syllable, a pattern that arises under most of the melodic patterns. This is a rather complex tone, involving two features (because it has two behaviors), and it is also the most widely-attested pattern. It

will be helpful in understanding the analysis to know that “T_β” refers to a tone which can link to the second mora, and “T_F” refers to a tone that can link to the final syllable – a distinction which is exploited in the rule system. The split behavior of the M2 tone means that this tone has both of these tonal sub-features.

The first step in analyzing M2 is to show that left-edge positioning (in toneless roots) is to the second *vowel* rather than second *syllable*, the latter being the target for the M3 tone. Therefore we compare a fuller paradigm of M3 and M2 in (19). Looking only at the relatively-longer stems, focusing on the bolded targets, it is clear that with toneless stems, the M2 tone goes to the second *vowel* of the stem, but the M3 tone goes to the second *syllable*, the difference hinging on what happens with root-initial long versus short vowels.⁶

toneless verbs *haanzuukizaang* ‘be causing to yell’, *ganaganaang* ‘be thinking’, *haanzuukiz* ‘cause to yell’, *rakuuriz* ‘cause to release’, *veezeger* ‘belch’, *ganaganir* ‘think for’, *ganagan* ‘think’, *rakuur* ‘release’, *taandur* ‘tear’, *guriz* ‘sell’, *gurizaang* ‘be selling’, *biim* ‘measure’, *rag* ‘promise’, *sh* ‘grind’; **toned verbs**, *taangaaziraang* ‘be announcing for’, *vodong’anaang* ‘be going around’, *taangaazir* ‘announce for’, *karaangiz* ‘cause to fry’, *suundurany* ‘over-pour’, *vodong’anir* ‘go around for’, *vodong’an* ‘go around’, *karaang* ‘fry’, *cheeriz* ‘greet’, *karag* ‘judge’, *karagaang* ‘be judging’, *deek* ‘cook’, *veg* ‘shave’, *ty* ‘fear’.

(19)	M3 toneless	M2 toneless	M3 toned	M2 toned
	ni va[háanzóókizaange	vari[háanzóokizaanga	ni va[táangááziraange	vari[taangááziráangá
	ni va[gánágánaange	vari[gánáganaanga	ni va[vódóng’ánaange	vari[vodóng’ánaangá
	ni va[háanzóókizi	vari[háanzóokiza	ni va[táangááziri	vari[taangáázirá
	ni va[rákóórizi	vari[rákóóriza	ni va[karáángizi	vari[karáángízá
	ni va[véézégére	vari[véezegera	ni va[sóóndórányi	vari[suundórányá
	ni va[gánágániri	vari[gánáganira	ni va[vódóng’ániri	vari[vodóng’ánirá
	ni va[gánágáne	vari[gánágana	ni va[vódóng’áne	vari[vodóng’ána
	ni va[rákóóri	vari[rákóóra	ni va[karáange	vari[karáangá
	ni va[táándórí	vari[táándora	ni va[chéerízí	vari[cheerízá
	ni va[górízi	vari[góríza	ni va[karágé	vari[karágá
	ni va[górízáange	vari[górízaanga	ni va[karágáange	vari[karágáangé
	ni va[bíímí	vari[bííma	ni va[dééké	vari[deeká
	ni va[rágé	vari[rágá	ni va[végé	vari[vega
	ni va[shí	vari[shá	ni va[tyí	vari[tya

These data diagnose the difference between a second syllable and a second vowel target. The second *syllable* target is consistently “second syllable” for toned and toneless stems, whereas the second *vowel* target is an alternative to the final vowel target: V₂ is what you get with toneless stems. Added to a toneless root, the tone is on the first syllable if the syllable is long, and on the second syllable if the first syllable is short.

The dependence of the M2 docking site on lexical tone hints at a number of analysis paths, such as final assignment plus leftward movement, or leftward assignment being contextually blocked by lexical tone with final assignment being an elsewhere case. To decide which analysis is better, we have to construct and explicitly compare analyses. Explicit comparison is necessary because the substance-free framework does not appeal to extra-phonological filters preferring “natural” rules, it depends on

⁶ We return to this table, especially the M3 columns, where sometime there is tone to the right of the second syllable.

net grammatical simplicity. To account for the most significant difference of assignment under M2, we focus first on the toneless vs. toned stem distinction. Some of the possible analyses are that:

- (20) V2 is targetted irrespective of stem tone
 Tone shifts from V2 to final if there is a preceding tone
 Final V is targetted irrespective of stem tone
 Tone shifts from final to V2 if there is no preceding tone
 V2 is targetted if there is no preceding tone in the stem
 Otherwise the final is targetted
 Final is targetted if there is a preceding tone
 Otherwise V2 is targetted

However, this descriptive skeleton is not quite right since CV and CVCV H stems have no tone on any vowel. Although the above formulae predict [**varinwá*, **varivegá*], we actually get [*varinwa*, *varivega*]. This can be attributed to the fact that the final vowel either has a lexical tone, or it is immediately preceded by the lexical tone, which suggests a familiar form of tone-after-tone blockage. Therefore we could restrict final-association so that it only links to a toneless vowel immediately after a toneless vowel. But furthermore, this would mean that in the case of [*varivega*], the lexical root-initial tone still exists, so either final association precedes lexical-tone erasure, or lexical-tone erasure is not always full deletion, it may be ‘suppression’.

The comparison of M2 and M3 allows us to strongly argue for suppression as opposed to full deletion. In M3, we have full deletion, in M2, we have phonetic suppression. The quandry of [*varivega*] from /*varivéga* + $T_{\beta,F}$ / is that the lexical tone is deleted because of the melodic tone, but the melodic tone is deleted because of the lexical tone. The solution is that both behaviors (suppression and deletion) exist in Logoori – deletion is actual removal, but suppression is acquisition of a feature. Moreover, there may be a difference between suppression-by-feature and suppression-by-non-association. First we consider the evidence for suppression-by-feature. Observe in (19) that toned and toneless roots are exactly the same in M3: H spreads to the initial syllable by Leftward Spreading (ni *vagánágáne*, ni *vavódóng’áne*). In this respect, toned and toneless roots differ in M2, because toneless roots allow spreading to stem-initial position in toneless stems, but toned stems do not (*varigánágana*, *varivodóng’áná*). That is, the expected initial lexical tone still has a phonological effect, in blocking LS, even though the initial syllable is not *pronounced* with that lexical tone. In other works on Bantu (Kenstowicz, Jones, Marlo, others) this kind of blocking behavior has been accounted for by positing a three-way representational distinction between H, L and \emptyset , where specified L is the trace of a deleted H. The difference between those accounts and the present account is just theoretical interpretation, that the present analysis does not directly impute a phonetic property of specifically “lowered pitch” to this blocking tone, it simply says that there is a phonological tone which is distinguished from phonetic H by not being physically realized as raised pitch, as specified in the phonetic component.⁷ Notationally, it is arbitrary what we call that property, but mnemonically it can be called “L”, which carries no phonetic implications. In addition to absolute deletion (11) which eliminates the lexical tonal specification in M3 (and other patterns), Logoori also has Tone Suppression, preliminarily formalized as (21), as a category-adding operation.

⁷ Specifically, in the interface to phonetics, T_L maps to the same input target as a TBU without T.

$$(21) \quad \textit{Tone Suppression}$$

$$\begin{array}{c} T \rightarrow T_L \quad T_\beta' \\ | \\ V \end{array}$$

It is a pertinent matter to determine which tones trigger Tone Suppression and which trigger Tone Deletion (11), which we take up below. A good first approximation is that T_β causes suppression, as indicated in (21). The data in (19) also tells us that the M3 tone T_2 triggers absolute deletion.

2.2.1. EXCURSUS ON DATA

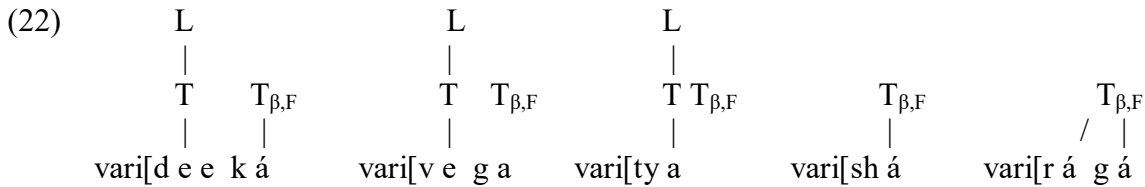
It is important to be clear about the factual nature of this blockage and the regularity of LS, since the phonological distinction between nullification coming from an underlying tone versus suppression as L coming from an underlying tone is a strong argument for basing phonological features on phonological behavior rather than just physical realization. LS is optional and in some cases there are questions of data interpretation. The grammar (ch. 2) discusses many details of phonetic pitch-realization underlying transcriptions, one being that in a sequence H^*H or H^*L , the final syllable in the H^* span usually has a pitch boost when that syllable precedes the penult, for example the final syllable [ré] in [cháá'mégéré] ‘mushroom’ tend to be noticeably higher than preceding [mé] in [icháá'mégéré'táyári] ‘ready mushroom’, to the point that the output could be transcribed as [icháamegeré'táyári].

Additionally, the phonetic transition from a toneless to toned syllable is attenuated in the first syllable of the tone’s domain. Presumed phonological [varikákáre] ‘they will slice’ is more narrowly transcribed as [varikākáre]. The same form can also be physically realized as [varīkákáre], in general the first syllable that a tone is associated is often somewhere between toneless and fully-toned in pronunciation. Given only the phonologically-justified two-way distinction of levels, a transcription like [varikákáre] carries with it a level of uncertainty as to what the phonological output is. At the boundary between toneless and toned syllables, it is always necessary to make a judgment whether that boundary syllable is raised sufficiently to be deemed to be phonologically toned. Because of the possibility of phonetic raised pitch-target anticipation in [ri] of [varikákáre] as well as delays in pitch-raising in [varīkákáre], we cannot always be sure what the phonological output is.

In M3 examples such as [ni vagánágánaange], [ni vavódóng'ánaange], the final tone-marked syllable always has the highest pitch. The most frequent transcription-types for such examples are [ni vagánágánaange] and forms like [ni vaganágánaange], and [ni vaganagánaange, ni vágánágánaange] are very infrequent. This is a consequence of the fact that LS usually applies at least once, but also tends not to apply across the stem boundary as one would find in [ni vágánágánaange]. As discussed in the grammar, there are numerous complications in the tendency to spread H to the left whereby phrasally-contributed contexts for the rule’s application tends to override purely word-internal application. Even though there is usually no spreading to the first two syllables of [izibárásí], we also usually encounter [varikáváriz-izibárásí] or [várīkáváriz-izibárásí], that is, when a context for LS is created at the phrasal level, the usual resistances to spreading found in word- and stem-initial position are overcome.

The phonological distinction between *varigánágana* vs. *varivodóng'ána*, or *varirákóóriza* versus *varikarángizá* hinges on the fact that the syllable after [ri] is most-frequently noticeably higher in *varigánágana* and *varirákóóriza*, and almost never that high in *varivodóng'ána* and *varikarángizá*. Minimal pair between mandatory LS vs. forbidden LS cannot exist at least in citation forms, because toned roots have their tones at the right end of the stem and toneless stems have their tones at the left end, and in CV(CV) stems where there is the potential for overlap of patterns, toned stems do not have tone at all. We will see below phrasal minimal pairs illustrating strict blockage vs. non-blockage.

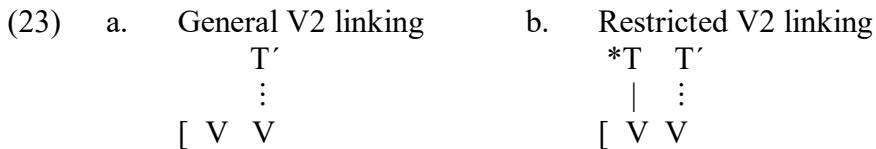
Proposed surface representations of *varideeká*, *varivega*, *varitya*, *varishá* and *varirágá* follow.



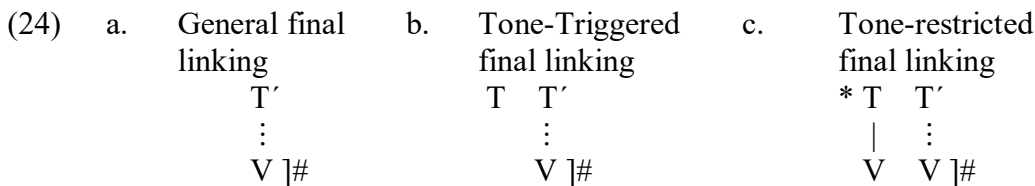
One way in which a tone might be apparently deleted if it is actually removed from the representation, as in M3 verbs. The second is that it may bear a distinctive property distinguish it from an ordinary tone – it is T_L , as in *varideeká*. The third is that the tone may be blocked from association because of a tone on the immediately-preceding vowel (*varivega*). Of course, we do not know from the data whether the missing final tone in *varivega* is associated, or whether it too is T_L , that is a detail that has to emerge from the formal analysis.

2.2.2. DECIDING ON THE ANALYSIS

Given the pattern of facts seen in the outputs, we now consider competing rule formalizations for computing those outputs. A prerequisite for doing this is a theory of phonological computations, for this I will rely on the stripped-down version of classical autosegmental notation embodied in Simple Phonology as represented in *Phonological ontology*: rules simply add or remove a specified entity (node or relation) in a rule-specified context. In terms of stating contexts, we require a theory of and notation for stating a contextual blocking condition, which is something that been ignored in formal rule theory for a long time in favor of UG stipulations such as the OCP. This paper eschews substantive UG stipulations and only attributes to UG statements of what mechanisms exist for formalized rules. A blocking condition is such a mechanism, it says “If X is the case, the rule does not apply”, thus blocking conditions are conceptually viable. In formulating the rule to map the melodic tone to the second stem vowel, the rule can either be stated as context free (not referring to anything about preceding tone), or it can be context-sensitive applying only when “there is no preceding tone”, i.e. a preceding tone is expressed as a blocking condition. In (23b), “*” indicates the blocking condition, if there is a tone in that position, the rule is blocked.⁸



Obviously, (23a) is simpler than (23b). Final linking can be formalized in multiple ways, either with explicit triggering by a preceding tone or not; or by explicit blockage by a preceding toned vowel.



⁸ The features triggering the rule are temporarily omitted: we focus on how many rules there are and what they do.

(24a) is the simplest of these rules, (24c) is the least simple, yet it turns out to give the simplest grammar. The simplicity of an individual rule is not the deciding factor between analyses, what decisively selects the analysis from equally-accurate sets of rules is the net simplicity of the system.

There are three main approaches to generating the M2 pattern. One is to directly map the melodic tone to the correct position and put the burden on each individual rule to decide where and whether a tone. There being two loci of association, there are two rules each of which shoulders some burden of directly positioning tone in the correct position. Alternatively, there may be a primary locus of initial association and a conditional locus of reassociation, which leads to options to assign tone to V2 then reassigning to the final, or initial association to the final and reassociation to V2. The evaluation of analyses thus reduces to a simple matter of stating the analyses, and comparing them for simplicity. Off the table in this formal and explicit approach is the common practice of selectively disfavoring certain aspects of rule statement such as declaring that “H blockage” is a universal free option encoded in UG (because attempts to predict when such blockage – known as the OCP – is enforced and what exact mechanism is invoked have spectacularly failed to even reach the level of observational adequacy).

Under approach 1, we state that tone maps to V_2 when that vowel is not immediately preceded by a toned vowel as stated in (25a). Subsequently, H maps to the final vowel, provided that the target does not bear a tone, as stated in (25b).

- | | |
|----------------------|-----------------------|
| (25) a. V2 linking | b. Final linking |
| *T T' _β | * T T' _F |
| ∴ | ∴ |
| [V V | V V]# |

Notice that the two rules also refer to different features on the final vowel, notated as T_β versus T_F . The reason for this is that M2 instantiates two phonologically-required differences of representation, which as we will see are independently required. First, some patterns have just the V_2 pattern without the final H; second, other patterns have just the final H without the V_2 variant. We might initially hypothesize that the rules given in (25) refer to a single kind of melodic tone feature such as “F”, but ultimately this tone has to be bifurcated into two behavior patterns, and it is better to start with a correct analysis that to start with an incorrect analysis based on incomplete analysis.

Approach 2 would assume unconditioned mapping of tone to V_2 followed by shift-to-final when a tone immediately precedes, whereas approach 3 would assume unconditioned final mapping of followed by shift-to- V_2 when V_2 is toneless. The initial linking rules are respectively (26a) for approach 2 and (26b) for approach 2.

- | | |
|-----------------------------|---------------------------|
| (26) a. Absolute V2 linking | b. Absolute final linking |
| T T' _β | T T' _F |
| ∴ | ∴ |
| [V V | V]# |

Then the repair rules shift tone to the opposite end either in the case of a blocking tone under approach 2, or in lieu of a blocking tone under approach 3.

- (27) a. Forward shift
- $$\begin{array}{c} T_{\beta} \\ \swarrow \downarrow \\ [V \ V \ \dots \ V] \end{array}$$
- b. Backward shift
- $$\begin{array}{c} *T \quad T_F \\ | \quad \swarrow \downarrow \\ V \ V \ \dots \ V]\# \end{array}$$

Finally, both approach 2 and 3 require some repair for the case of CV and CVCV toned stems, where the melodic tone is lost. This being the case where the lexical tone stands immediately before the final tone, (28) can be posited to convert *varivegá* to [varivega].

- (28) Final Deletion
- $$\begin{array}{c} T \quad T \rightarrow \emptyset \\ | \quad | \\ V \quad V]\# \end{array}$$

It is not hard to see that the two-rule combination (25a,b) is simpler than either (27), (26a), (27a) or (27), (26b), (27b). In a fully-formalized account, these rules are graphic representations of different sets of propositions which constitute the specific rules (an appendix will eventually be provided to give those propositions). What is counted is the set of elementary representational propositions abbreviated by these specific notations. There is a fairly straightforward relation between standard minimalist autosegmental notation and propositional content, e.g. order of elements represents precedence, lines represent dominance.

This provides the bulk of the rules required for initial tone association, we next consider rightward spreading as a case of other things that melodic tones do, after which we consider combinations of melodic tones and sub-variations of “final tone”.

2.3. Other melodic effects

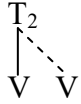
There is more to the melodic system than just initial tone mapping. One example of such behavior is found in the M3 pattern, examples repeated below.

- | (29) M3 toneless | M3 toned |
|-----------------------|-----------------------|
| ni va[háanzóókizaange | ni va[táangááziraange |
| ni va[gánágánaange | ni va[vódóng'ánaange |
| ni va[háanzóókizi | ni va[táangááziri |
| ni va[rákóorizi | ni va[karáángizi |
| ni va[véézégere | ni va[sóondóranyi |
| ni va[gánágániri | ni va[vódóng'ániri |
| ni va[gánágáne | ni va[vódóng'áne |
| ni va[rákóori | ni va[karáange |
| ni va[táándóri | ni va[chéerízi |
| ni va[górizi | ni va[karágé |
| ni va[górizáange | ni va[karágáange |
| ni va[bíimí | ni va[dééké |
| ni va[rágé | ni va[végé |
| ni va[shí | ni va[tyí |

Based just on assignment to the second syllable, we predict incorrect *ni va[gánágánaange, *ni va[véézégere, *ni va[gánágániri, *ni va[gánágáne, *ni va[táándóri, *ni va[górizi, *ni va[górizáange.

The remedy is quite simple: this H spreads one vowel to the right, therefore the third syllable might end up having tone. This is surface-evident whenever the second syllable is short, as in the case in these stems.

(30) Rightward Doubling



Application of (30) is obvious in n_1 va[gánáánaange, n_1 va[véézégére, n_1 va[gánágániri, n_1 va[gánágáne, n_1 va[táándóri, * n_1 va[górízi and n_1 va[górízáange. When the second syllable is long, it is unclear whether Rightward Doubling applies, see n_1 va[háánzóókizaange, n_1 va[háánzóókizi, n_1 va[rákúúrizi versus n_1 va[rákúúri. If the tone is initially on the first mora of a long vowel, we would start from n_1 va[háánzóókizaange, then Doubling would directly derive the correct surface form. However, we would also expect * n_1 va[rákúúri: but, we independently know that there are rules in the language realizing long toned penults with falling tone. The form n_1 va[rákúúri can be explained on the basis of more general Fall/ Level phonotactics, or this could be evidence for a restriction that Doubling does not apply within a syllable, only across syllables. Insofar as any restriction on a rule is a formal complication, the simplest grammar is one that uses already-necessary resources, thus we adopt the prosodically unrestricted doubling rule (30).

The point of greater significance for the analysis of Logoori melodic tone behind Rightward Doubling is that this rule only applies to the second-syllable tone, not to *every* tone. See for example M8 stative *yáarakuora*, not **yáarakuora*, M4 remote past *yáarakuora* not **yáarakúora*. M2 indefinite future *varigánaganira*, not **varigánágánira*. The only tone which spread rightward is the second syllable tone, as specified in the rule of tone doubling. The T_2 property of this tone has two phonological functions, one being to trigger the appropriate initial-association rule, the other being to trigger Rightward Doubling. The T_2 property has a third phonological function which needs further analysis, in that penult Fall versus Level tone is also a function of melodic pattern. Fall exists on a long penult in M1 and M3, and level tone is found in M2, M4 (in other patterns, penult tone comes from leftward spreading of final tone).

2.4. Further patterns of final tones

In the realm of “other complications” leading to further tonal subclassification, final melodic tones have realizations other than those of the V2/final pattern seen in M2. M10 is similar to M2 in that toneless stems have tone to the second vowel, but lexically toned verbs have no tone at all, neither the lexical tone nor the expected final tone.

(31)	M10 toneless	M10 toned
	va[gánágani	va[vodong’ani
	va[rákúúri	va[karaanji
	va[táándori	va[cheerizi
	va[górízi	va[karaji
	va[bíími	va[deechi
	va[rájí	va[veji
	va[shíi	va[tyii

How can this be harmonized with the analysis of assumed final tone in M2? The crucial rule difference between M2 and M10 is that Final Linking (25b) does not apply to the M10 tone. M2 and M10 are similar up to a point – they share application of V2 Linking (25a) – but they diverge in that the M10 tone does not undergo the rule that the M2 tone undergoes, namely Final Linking (25b). This was anticipated in the analysis of M2, where the sub-tonal feature F is required to trigger that rule, and the M2 tone does bear F. By contrast, the M10 tone is bare T_β , meaning that it can be assigned to the second mora by V2 Linking, but since it is not $T_{F,\beta}$, the tone remain unassociated when V2 linking fails, which happens when the stem is lexically toned. The contrastive derivations of *varákóórizi*, *vakaraangizi*, *varirákóóriza* and *varikaráángizá* then proceed as follows.

(32) a.	T_β	$T_L T_\beta$	$T_{F,\beta}$	$T_L T_{F,\beta}$
	va[rakooorizi	va[karaangizi	vari[rakoooriza	vari[karaangiza
b.	T_β	$T_L T_\beta$	$T_{F,\beta}$	$T_L T_{F,\beta}$
	⋮		⋮	
	va[rakooorizi	va[karaangizi	vari[rakoooriza	vari[karaangiza
c.	T_β	$T_L T_\beta$	$T_{F,\beta}$	$T_L T_{F,\beta}$
	va[rakooorizi	va[karaangizi	vari[rakoooriza	vari[karaangiza
d.	va[rákóórizi	va[karaangizi	vari[rákóóriza	vari[karáángizá

The underlying form is step (32a). In (32b), V2 Linking (25a) applies as expected in both forms of the toneless stem, leaving only LS to apply. In step (32c), Final Linking (25b) links the tone to the final vowel in *varikaraangiza* but not in *vakaraangizi*, since the M10 tone lacks F, therefore it is simply not associated. The phonological output (32d), then includes the effect of LS. A failure of H to be realized at all in toned stems, where toneless stems have the melodic tone on V2 as expected, follows from this sub-distinction between T_β and $T_{\beta,F}$.

The difference between M6 and M10 rests in the optionality of F-marking in M6. As we see in the fuller table of M6, toned stems are always toneless if the stem is so short that the preceding-tone condition blocks Final Linking. Longer toned stems attest both final H and no final H.

(33)	M6 toneless	M6 toned (no F)	M6 toned (F-marked)
	ta[gánáganaanga	ta[vodong'anaanga	ta[vodóng'ánáángá
	ta[rákóóriza	ta[karaangiza	ta[karáángizá
	ta[véézegeera	ta[suundoranya	ta[suundórányá
	ta[gánáganira	ta[vodong'anira	ta[vodóng'ánirá
	ta[gánágana	ta[vodong'ana	ta[vodóng'áná
	ta[rákóóra	ta[karaanga	ta[karáángá
	ta[táándora	ta[cheeriza	ta[cheerizá
	ta[górizá	ta[karaga	ta[karágá
	ta[górizanga	ta[karagaanga	ta[karágáángá
	ta[bííma	ta[deeka	ta[deeká
	ta[rágá	ta[vega	ta[vega
	ta[shá	ta[tya	ta[tya

The first column of toned stem data is parallel to the M10 hodiernal perfective, and the competing forms like *tavodóng'ánáángá* are parallel to various M2-inflected toned verbs. Thus we have representational competition between T_β and $T_{\beta,F}$. Toneless stems are uniform in having tone on the second vowel, because V2 mapping is blind to the presence of F, it only requires #. Focusing on the variation between T_β versus $T_{\beta,F}$, the question can be reduced to stating the possible analyses of such variation. The allomorphy solution says that there is a free choice in word-formation between T_β and $T_{\beta,F}$ for these tenses. The phonological rule approach says that there is optional rule within the phonology, where T_β becomes $T_{\beta,F}$ or $T_{\beta,F}$ becomes T_β . On the face of it there is no simplicity advantage to the phonological rule approach, in fact there is a clear disadvantage that this variation is limited to the negative subjunctive and the M6 pattern, therefore some additional feature Z would still be required to limit the tenses that manifest this purported phonological F-deletion rule. This additional complexity tilts the scales in favor of free allomorphic selection.

Two remaining cases of final tone require explanation. The first is the imperative, which has the peculiarity that L verbs do not manifest the melodic tone at all.

(34)	M5 toneless	M5 toned
	[haanzookizaanga	[taangááziráángá
	[ganaganaanga	[vodóng'ánáángá
	[haanzookiza	[taangáázirá
	[rakooriza	[karáángízá
	[veezegera	[suundórányá
	[ganaganira	[vodóng'ánirá
	[ganagana	[vodóng'ána
	[rakoora	[karáángá
	[taandora	[cheerízá
	[goriza	[karágá
	[gorizaanga	[karágáángé
	[bɪɪma	[deeká
	[raga	[vega
	[sha	[tya

This could be handled by a further representational property, a special mark which prevents this tone from being associated if the stem does *not* have a tone, in fact it suggests that the imperative might be T_F (hence toneless verbs do not not have H on V2). The problem with that analysis is that what *would* happen, and does in other tenses, is that toneless verbs receive a final tone – but toneless verbs in the imperative actually receive no tone.

A better way of looking at the matter is to see how the imperative is phonologically unique, in that unlike other verb forms, stem-initial position is also word-initial. With no modifications of the grammar, we would predict that /rakoora $T_{\beta,F}$ / would undergo V2 linking (23b), which it does not. The simplest remedy is to restrict that rule, requiring that *something* – at least a subject prefix – precede the stem. In the imperative, nothing precedes the stem within the word, therefore no rule assigns melodic tone in toneless verbs to the stem.

(35)	Restricted V2 linking
	*T T_β
	\vdots
	X [V V

Another subset of final-tone cases needing to be dealt with is M11 in the counterfactual tense, examples in (36).

(36) <i>Toneless</i>	<i>Toned</i>
vara[haanzookizaanga	vara[taangaaziraanga
vara[ganaganaanga	vara[vodong'anaanga
vara[haanzookiza	vara[taangaazira
vara[rakuoriza	vara[karaangiza
vara[veezegera	vara[suunduranya
vara[ganaganira	vara[vodong'anira
vara[ganagana	vara[vodong'ana
vara[rakuora	vara[karaanga
vara[taandora	vara[cheeriza
vara[goriza	vara[karaga
vara[gorizaanga	vara[karagaanga
vara[biima	vara[deeka
vara[raga	vara[vega
vara[sha	vara[tya

In this verb form, the simple surface generalization is that all verbs are toneless. Why then would we say that there is a final tone here? The answer derives from two facts about this tense. First, positing a melodic tone at all explains why there is deletion of the lexical tone. Now we could just give up the goal of giving a representational account for these various tenses, and might just say that in this tense, tones are deleted from the verb, by reference to a ubiquitous morphological property. Apart from theoretical reasons to reject the morphological solution, there are facts indicating that this tone deletion is the result of a phonological rule.

The underlying mechanism, Tone Deletion (11), is independently justified throughout the melodic system. Second, deletion by an abstract tone (one not surface manifested as raised pitch) is found with the final melodic tone of toned short verb stems such as *varivega* 'they will shave', where floating $T_{\beta,F}$ triggers suppression of lexical tone. The same kind of abstractly-conditioned tone deletion exists in at least two other syntactic constructions, the towards-construction and the what-construction. In the former construction (37a), *má-* stands in the position of the nominal augment, and all tones in the noun are deleted. In (37b), *kí* follows the noun which loses all of its tones (and usually the augment). In both cases, we may assume additional of a floating tone after the noun, which causes deletion or suppression of tones in the noun.

(37) a.	ibárasi	'horse'
	mábarasi	'towards the horse'
	ikí'fóoyó	'rabbit'
	mákífooyo	'towards the rabbit'
	ikí'rímbooto	'flea'
	mákirimbooto	'towards the flea'
b,	barasi kí	'what horse?'
	kífooyo kí	'what rabbit?'
	kirimbooto kí	'what flea?'

A modifier with tone can follow a noun which has lost its tones because of *ma-*, but spreading of tone into that noun is always blocked.

- | | | |
|------|--|---------------------|
| (38) | <i>mázingoko ziné</i> | ‘4 chickens-wards’ |
| | <i>mákífooyo kúra</i> | ‘that rabbit-wards’ |
| | <i>mázing’oombe zivaga^o</i> | ‘3 cows-wards’ |
| | <i>inánguruve enéne</i> | ‘big pig-wards’ |

The mere fact of lexical tone deletion does not definitively diagnose what kind of tone triggers the rule, however (38), where spreading is blocked, shows that there is an associated final tone which is not realized with raised pitch – T_L . If the M11 tone is $T_{F,L}$, we predict that lexical tones in the verb are lost, and tones from the right do not spread into the verb, as is the case. The specification T_F reflects the fact that the final vowel blocks spreading, therefore we need the specified T_L to go to the final vowel.

- | | | |
|------|--------------------------------------|-----------------------------------|
| (39) | <i>varavariza dáave</i> | ‘if they had not counted’ |
| | <i>varakooŋa máama</i> | ‘if they had helped mother’ |
| | <i>korasimugokiza váno</i> | ‘if we had revived these’ |
| | <i>orasúuvír-óó¹ físa</i> | ‘if you had believed the officer’ |
| | <i>areeya karóono</i> | ‘if he had swept now’ |
| | <i>koravoholla vaangá</i> | ‘if we had untied how many?’ |

Compare blockage by the posited final $T_{F,L}$ above with expected spreading into the verb with the segmentally homophonous future forms in (40).

- | | | |
|------|---|--------------------------------|
| (40) | <i>varávárizá dáave</i> | ‘they will not count’ |
| | <i>varákóó¹ ná máama</i> | ‘they will help mother’ |
| | <i>korási¹ mógókízá váno</i> | ‘we will revive these’ |
| | <i>orasúúvír-óó¹ físa</i> | ‘you will believe the officer’ |
| | <i>arééyá ká¹ róono</i> | ‘he will sweep now’ |
| | <i>korávó¹ hóllá vá¹ angá</i> | ‘we will untie how many?’ |

At this point, we have covered all of the known single-tone melodic patterns of Logoori, at least in their basic manifestation, except for M9, which is found in the hesternal perfective.

- | | | |
|------|------------------------|------------------------|
| (41) | M9 toneless | M9 toned |
| | <i>vaa[háánzóókízí</i> | <i>vaa[táangáázírí</i> |
| | <i>vaa[rákúúrízí</i> | <i>vaa[karáángízí</i> |
| | <i>vaa[véézégérí</i> | <i>vaa[súóndórányí</i> |
| | <i>vaa[gánágání</i> | <i>vaa[vódóng’ání</i> |
| | <i>vaa[rákúúrí</i> | <i>vaa[karáánjí</i> |
| | <i>vaa[táándórí</i> | <i>vaa[chéérízí</i> |
| | <i>vaa[górizí</i> | <i>vaa[karájí</i> |
| | <i>vaa[bíímí</i> | <i>vaa[dééchí</i> |
| | <i>vaa[rájí</i> | <i>vaa[véjé</i> |
| | <i>vaa[shíí</i> | <i>vaa[tyíí</i> |

We observe that toned and toneless stems have tone throughout the stem, suggesting a final tone which spreads left. However, this tone must be different from the final tone of M2 first because that tone is

assigned to V2 in toneless stems, and second because M2 tone is not assigned in toned CV and CVCV stems because of the moraicly-adjacent tone which blocks assignment of $T_{\beta,F}$, but the M9 tone is assigned after lexical H. The (final) tone of M9, then, is distinct from that of M2, being assigned to the final syllable regardless of preceding tones.

Of those tones that may be assigned to the final syllable, T_{β} identifies tones which can associate to V2 when no lexical H precedes, and combination with F is what triggers final association. Bare T_F has not been identified so far, but we would suspect the existence of such a tone by seeing a melody that does not link to V2, and instead always links to the final vowel, which is what we have in M9. The only problem with simply deeming the M9 tone to be bare T_F is that Final Linking would apparently not associate the melodic tone to /vaavéji T_F /, since the target is preceded by an underlying toned vowel. In previous example of short-stem blockage of association, loss of lexical tone is via suppression – conversion to T_L , triggered by T_{β} . In this case, we posit complete deletion, which is triggered by T_F . T_{β} and $T_{\beta,F}$ trigger suppression (conversion to T_L), but T_F triggers absolute deletion. This explains why toned and toneless stems behave the same in M9 – they *are* the same, lexical tone is deleted – and we allow Leftward Spreading to the stem initial vowel. Therefore, we can posit that the tone for M9 is T_F , and that bare T_F causes lexical deletion, not just suppression (conversion to T_L).⁹

2.5. Double-H patterns

Some melodic patterns have combinations of tones. The most transparent of these is the M7a pattern of the immediate imperative, which have a final tone and a second-syllable tone.

(42)	M7a toneless	M7a toned
	ka[haanzóó'kízí	ka[taangáá'zírí
	ka[rakóó'rízí	ka[karáá'ngízí
	ka[veezé'géré	ka[suundó'rányí
	ka[ganá'gánírí	ka[vodó'ng'ánírí
	ka[ganá'gáné	ka[vodó'ng'áné
	ka[rakó'óri	ka[kará'ángé
	ka[taandóri	ka[cheerízí
	ka[gorízí	ka[karáge
	ka[bíimí	ka[deeké
	ka[ragé	ka[vegé
	ka[shí	ka[tyí

We see that the first tone is always on the second stem syllable (not vowel) except in CV roots where there is no second syllable, and there is a final H in all forms except trisyllables with a short penult. The obvious inference to draw from the data is that this pattern contains both T_2 and $T_{\beta,F}$. In the case of relatively long stems such as *kahaanzóó'kízí*, both of the tones can be associated to the appropriate syllable (second-syllable and last) giving *kahaanzóókízí*, and the final tone spreads left to give the output. The difference between trisyllabic long-penult *karakó'óri* and short-penult *kataandóri* is already predicted by the preceding analysis, because of the moraic location of the first tone relative to the final tone. In *karakó'óri* the second tone can associate to the final vowel because the preceding

⁹ It also follows from this that T_L is not subject to deletion, an important detail that bears on the question of how tones group together in classes. Ultimately, there will be a subclassification into higher-order tones recapitulating the traditional H, L, Ø distinction.

mora is not toned, whereas in *kataandórí* the final vowel is on the mora right after the one which bears the first tone in the sequence. In the shortest stems *kabumí*, *karagé* only the initial tone associates (to the second syllable), and in *kashí*, there is no second syllable therefore T_2 cannot associate (therefore only T_β associates). There is a bit of a puzzle under this analysis that LS tends not to spread T_2 to stem-initial position, which might be evidence for an additional non-realized tone, a specified stem-initial non-raised tone $T_{1,L}$. This pattern is selected by two related inflectional constructions, the immediate imperative and the object-imperative, an example of the latter being *komoró'méré* 'speak to us!', *nzambá'káná* 'refuse me!'. A morphological characteristic of these tenses is that they have no subject prefix, and select the final vowel /e/ except when the prefix domain has no vowel (as in *nzambá'káná*).

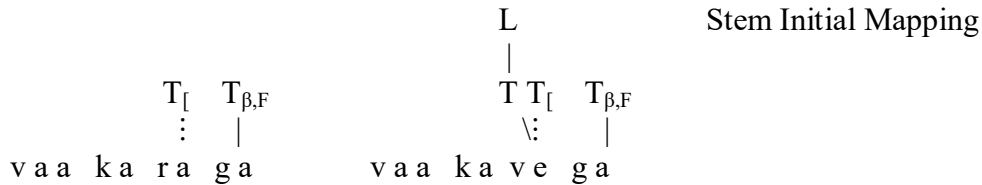
A different double-H pattern, M7b, is found in the 'explanatory recent past' with the tense prefix *-aka-*.

(43)	M7b toneless	M7b toned
	vaaká[háá'nzóókízá	vaaká[táá'ngáázírá
	vaaká[rá'kóórízá	vaaká[ká'ráángízá
	vaaká[véé'zégérá	vaaká[súú'ndórányá
	vaaká[gá'nágáná	vaaká[vó'dóng'áná
	vaaká[rá'kóóra	vaaká[ká'ráángá
	vaaká[táá'ndórá	vaaká[chéé'rízá
	vaaká[gó'rízá	vaaká[ká'rágá
	vaaká[bíí'má	vaaká[déé'ká
	vaaká[rá'gá	vaaká[vé'gá
	vaaká[shá	vaaká[tyá

This pattern clearly combines the stem-initial tone T_1 and final $T_{\beta,F}$.

A puzzle is posed by CVCV stems like *vaakará'gá*, *vaakávé'gá*, in that the final H is moraicallly preceded by a melodic tone, which should block Final Linking analogous to *kakaráge*. In fact, blockage in *kakaráge* is only optional, *kakará'gé* is also possible (albeit most frequent), whereas blockage is obligatory in the various patterns which add $T_{\beta,F}$ alone. In other words, the blocking condition on Final Linking is connected to the nature of the preceding tone, where lexical tone always blocks but T_2 only optionally blocks. Then, *vaakará'gá* is explained by fine-tuning blockage so that T_1 does not block. There is a simple way to implement that generalization in the grammar, namely rule-ordering. In order to block Final Linking, the preceding tone must be associated to the penultimate mora – as stated in the rule. If T_1 is not linked at the stage when Final Linking applies, it does not block the rule.

(44)		L	Tone Suppression
	T_1 $T_{\beta,F}$		
		T T_1 $T_{\beta,F}$	
	v a a k a r a g a	\	
		v a a k a v e g a	
		L	Final Linking
	T_1 $T_{\beta,F}$		
	∴	T T_1 $T_{\beta,F}$	
	v a a k a r a g a	\	
		v a a k a v e g a	



As one can see in the final line of the derivation above, a bi-tonal short vowel is generated in [vaakavé¹gá], distinct from the mono-tonal stem-initial vowel in [vaakará¹gá]. Phonological T_L is only phonologically distinct from Ø, phonetically there is no difference between a toneless syllable and a syllable with T_L.

3. Further sub-patterns: The OP

There are yet other complications to the melodic system, which we will touch on but not presently give much analysis of. First, when an object prefix is present, there is a substantial change on the surface tone pattern – that is the topic of this section. Second, there is a phrasal interaction (treated extensively in the following section) between a verb and the next word which further supports the abstract phonological approach taken here. Some verbal tones delete when followed by a modifier and some do not; and furthermore, modifiers provide additional evidence for distinguishing absolutely-deleted melodic tones from suppressed tones.

Many of the pattern distinctions are eliminated when an object prefix combines with other melodic tones. The overall tendency is that toned stems have tone on the stem-initial syllable, and toneless stems have tone on the second stem vowel. Another tendency is that both lexical tone classes have an overall H¹H* pattern, when the stem is trisyllabic or longer. This is summarized in (45).

(45)	m1	kokétema kokíkaraanga	kokívariza kovárakoura
	m2	variketéma varikíkáraanga~varikíká ¹ ráángá	varikigóra varikirakóóra~varikirá ¹ kóóra
	m3	ni vaketéme ni vakíkáraangi	ni vakigóri~ni vakigóri ni vakirákoura~vakirákouri
	m4	vaakétema~(vaaké ¹ téma) (vaakédeeka)~vaakédeeka	vaakí ¹ góra vaakí ¹ chóóra
	m6	otaketéma otakíkáraanga	otakigóra otakirakóóra
	m7a	kaketéme kakíká ¹ ráángé	kakigóri kakirá ¹ kóóri
	m7b	vaakaké ¹ téma vaakakí ¹ karáángá	vaakakí ¹ góra vaakakí ¹ rákóóra
	m8	vááketema~(vááketéma) váákikaraanga~(váákikáraanga)	váákigóra~(váákigóra) váákirakoura ~ (váákirákoura)
	m9	vaaketémi~vaaketé ¹ mí vaakikaraanji~vaakiká ¹ ráánjí	vaakigóri~vaakigóri vaakirákouri~vaakirá ¹ kóóri
	m10	vaketémi vakikaraanji	vakigóri vaakirákóóri

An OP in the imperative is morphologically barred, hence the gap for M5. In the case of M1, there is no stem melodic tone, and the surface OP tone may reflect plain deletion of tone immediately after

tone where /kɔ-kí-káraanga/ → [kukíkaraanga]. Since there is substantial neutralization in toneless verbs to a second-vowel pattern, the analysis would start from the premise that there is a broad change of the melodic tone to T_β after an OP tone, also to T_1 in the combination of OP tone plus a melodic stem tone. The toned / toneless neutralization is asymmetric in that toned roots rarely have the same pattern as in OPless forms, but toneless verbs with a second-vowel tone have “same as no OP” as an option, indeed the only option for shorter stems. There are substantial questions of optionality that require further research before proposing an analysis, the point of this section is simply to point to another large-scale complexity of the language, which stands in need of a simple analysis.

4. Further sub-patterns: Phrasal sandhi

Another domain providing evidence for the purely-phonological approach to tonal melodies is the behavior of verb+modifier sequences. The two phenomena relevant here are deletion of tone in the verb, and deletion of tone at the beginning of the modifier (alternatively, assignment of H in a complementary environment). In the case of verb tone deletion, only melodic tones delete, but not all melodic tones delete. Melody deletion subclassifies melodic tones just as the citation-pattern rules have subclassified those tones. As for post-verbal tone change, the post-verbal presence vs. absence of initial tone is condition by both the tone classification of the target word itself, and the presence versus absence of melodic tones in the verb, bearing in mind that some melodic tones remain phonologically present but phonetically suppressed – they are T_L – while other melodic tones are entirely eliminated.

4.1. Ordinary modifiers: M1

The analysis of phrasal sandhi starts with a consideration of M1 verb forms followed by various ordinary postverbal words. This gives us a baseline for understanding V+X interactions. The first behavioral division required is, descriptively, between “ordinary” words versus “special” words. In ordinary words, the only significant tonal interaction between verbs and following modifier is application of LS. With that matter squared away, we turn to what happens to the inflectional melodies followed by tonally-ordinary words. Finally, we contemplate the properties of “special” words, and how that interacts with the various melodies.

Various nouns, adverbs and demonstratives are toneless, causing no change in the verb’s tone (though as in the case of *varaty-éeng’oombe*, vowel fusion can result in a long falling tone coming from / $\check{V}\#V/$). The tone of the verb in V+X is the same as the tone of the citation form of the verb, factoring in general phonological adjustments.

(46)	varagora	varagor-eeng’oombe	‘they will buy a cow’
	varáréga	varárég-eeng’oombe	‘they will defeat a cow’
	arákísha	arákísha vwaangu	‘he will grind it quickly’
	kovóha	kovóha vwaangu	‘to tie quickly’
	varávódong’ana	varávódong’ana voza	‘they will go around only’
		varávódong’ana llara	‘they will go around once’
	varátyá	varaty-éeng’oombe	‘they will fear the cow’
	yaakógúóta	yaakógúóta yava	‘he defeated these’

LS applies when the following modifier has a tone. If the verb is toneless, the modifier’s tone generally spreads throughout the verb, usually but not always stopping before the word-initial syllable.

(47)	vararakoora	varárakóór-áváana	‘they will release the children’
	aragavoranya	árágávórányá gáráha	‘he will divide quickly’
	korarima	korárimá vóráhi	‘we will plow well’
	ndaakorora	ndaakórá éditoni	‘I saw Editon’
	korikagwi	korikágwí vódínyú	‘we will fall hard’

When a tone is present in the verb (either a root tone, that of an OP, or the prefix tone in complete-focused forms), modifier tone spreads from the post-verbal word up to the verb’s tone, the two being separated by a downstep.

(48)	varikadééke	‘they will cook’
	varikadéé ¹ ké vóráhi	‘they will cook well’
	ndáakageenda	‘I have walked’
	ndá ¹ ákágééndá mkíváánda	‘I have walked in the valley’
	várikánpágori	‘they will run’
	várikánpá ¹ góri vódínyú	‘they will run hard’
	varávódong’ana	‘they will go around’
	varávó ¹ dóng’ána gáráha	‘they will go around slowly’
	varatyá	‘they will fear’
	varatyá ¹ gáráha	‘they will fear slowly’
	yaakóónzita	‘he killed me’
	yaakóó ¹ nzítá n-írigina	‘he killed me with a rock’
	kováta	‘to bury them’
	ková ¹ tá híidáára	‘to bury them by the village’
	waakókékora	‘you did it’
	waakóké ¹ kórá n-í ¹ zísóni	‘you did it with shame’

4.2. Ordinary modifiers: other melodies

Looking first at M3 in the crastinal future, a following modifier has no effect on the M3 melody. The second syllable has tone as expected, also the third syllable does if the second syllable is short, as predicted by the analysis above. If the following word is vowel initial (has an augment), V+V fusion results in the verb’s final tone being reassigned to the augment (*na kodéék-ijnama*). Penult fall in prepausal position predictably becomes level (*na kokaráange*, *na kokarááng-ijnama*) when followed by other words.

(49)	ni varyí ¹ m’gáamba	‘they will eat tomorrow’
	na vavegé marova	‘they will shave Marova’
	na viit-ámago	‘they will kill carpenter beetles’
	na kodééké vvaangu	‘we will cook quickly’
	n-aachéérízí ¹ sána	‘he will greet lots’
	na kokóómbéére yava	‘we will hug these’
	na vakaráá ¹ ngírí máama	‘they will fry for mother’
	na vásáámbórógányi yava	‘they will dismantle these ones’
	na kokarááng-ijnama	‘we will fry meat’
	ma vakaráángir-omkóó ¹ nzákárí	‘they will fry for the widow’

The M4 remote past tone is also unaffected by a following ordinary modifier.

- (50) yáá róra uyó 'he saw this one'
 vaavó roga yivwo 'they mixed porridge that one'
 waatí mbulla yiki 'you unsewed this one'
 yáá vó dong'ana yiki 'he went around this one'
 yáá gá vorana llara 'he divided once'
 ndáásáá mborogana gáraha 'I dismantled slowly'
 váasha má' dóoma 'they ground maize'
 wáá réé' t-írj jáambi 'you brought a mat'
 kwáá chéé' ríz-íchóógo 'we greeted Choogo'
 ndáá góó' tá gáraha 'I defeated slowly'
 wáámó' rómá gáraha 'you spoke slowly'

The stative, M8, also only shows the effect of LS spreading tone into the verb.

- (51) yáám ana marova 'he knows Marova'
 yáá' yáánz-ímbwá 'yáá 'he likes my dog'
 yáásuur-ímbwá 'yáa 'he rejects my dog'
 ndáá' mápá máróvá dáave 'I don't know Marova'
 ndáá' méj-íchá' nzéywe 'mbá 'I don't live in Chanzeywe'

4.3. Tone Erasure

Things are different with final melodic tones, starting with M2. Sometimes a verb loses its tone before another word. Under the M2 pattern, toneless verbs have tone on the second stem mora and toned verbs have final tone, unless the stem is shorter than two moras. The following data from the indefinite future (M2) show that all such verbs become toneless when something follows. The crucial examples are toneless verbs (where the tone would be on V2) or longer toned verbs, but not CV or CVCV toned stems which do not realize the melodic tone anyway. In the examples below, the following word is toneless, therefore the utterance is toneless.

- (52) *Toned verbs* (3μ+)
- | | |
|-----------------------|--------------------------|
| arikooŋa kúrima | 'he will help to plow' |
| arideek-iŋama | 'he will cook meat' |
| arivohool-izing'oombe | 'he will untie the cows' |
| arisinikiza vwaangu | 'he will annoy quickly' |
| aricheeriza marova | 'he will greet Marova' |
| aricheeriza vwaangu | 'he will greet quickly' |
- Toneless verbs*
- | | |
|------------------------|----------------------------------|
| kúriŋa vwaangu | 'we will grind quickly' |
| varisha yivo | 'they will grind these' |
| oriror-evogono | 'they will see into the bedroom' |
| varirakoor-izing'oombe | 'they will release the cows' |
| aridoya marova | 'he will hit Marova' |
| arihaandiika amarago | 'they will write laws' |

Examples where the following word contains a tone are seen below, with tone spreading into the verb.

- (53) *Toned verbs*
- | | |
|----------------------------|------------------------------------|
| varivohóóllá mónico llara | ‘they will untie in here once’ |
| arívódóng’án-íkííndi | ‘he will go around another’ |
| arívohóóllá gáraha | ‘he will untie slowly’ |
| aricheerizá vóráhi | ‘he will greet well’ |
| varivogííllizáná ná gú’úgá | ‘they will agree with grandfather’ |
| arisíníkizá vájálwo | ‘he will annoy the Luos’ |
- Toneless verbs*
- | | |
|--------------------------|-------------------------------------|
| varígwá háánáánguruga | ‘they will fall by the ugali pot’ |
| arimájná máama | ‘he will know mother’ |
| ndígééndá mkíváánda | ‘I will walk in the valley’ |
| korígóriz-ícháá’yíró | ‘we will sell the pasture’ |
| várígánágáná vóráhi | ‘they will think well’ |
| varígánágányá ávárógoori | ‘they will make the Logooris think’ |

Similarly, verbs in the habitual / present lose their melodic tone, and tone can spread from the following word into the detoned verb.

- (54)
- | | |
|---|---------------------------------------|
| yeeṇa marova | ‘he wants Marova’ |
| yeeṇ-óró ¹ hí | ‘he wants a slap’ |
| kweeṇ-omurogoori koríma kiguuti | ‘we want a Logoori to plow the field’ |
| ng’eenda ní ¹ m’zyá m’só ¹ kóuru | ‘I walk to school’ |
| kunweez-ícháá ¹ í dáave | ‘we don’t drink tea’ |
| ámóromá s-ómwíisukuro | ‘He talks like grandchild’ |
| oyíinzír-ívíhí ¹ gá dáave | ‘you don’t work in Vihiga’ |
| ng’ééndá ní ¹ nzyá m’sókóó ¹ ró dáave | ‘I don’t walk to school’ |
| komórom-óródírí ¹ jí dáave | ‘we don’t speak Tiriki’ |
| kónwééz-ícháái | ‘we drink tea’ |
| agééndá náá ¹ zyá m’só ¹ kóuru | ‘he walks to school’ |

The perstitive likewise loses its tone.

- (55)
- | | |
|------------------------|-----------------------------------|
| kokeheenzá chíifu | ‘we are still watching the chief’ |
| akíbíímá ébéenzi | ‘he is still measuring the basin’ |
| kókṇagura vwaango | ‘we are still running quickly’ |
| kókívárizá gáraha | ‘we are still counting slowly’ |
| kokivariza vwaango | ‘we are still counting quickly’ |
| kókibadura voruru | ‘we are still whipping fiercely’ |
| kókitaandura voruru | ‘we are still tearing fiercely’ |
| kokirakoor-izing’oombe | ‘we are still releasing the cows’ |
| ákichéerizá vóráhi | ‘he is still greeting well’ |

Not all following words trigger deletion of the M2 tone: certain sentence-final adverbs do not. Toneless verbs retain their M2 tone before *dáave*, *mbá* ‘not’ and *sáana* ‘much, a lot’. Longer toned verbs retain their final melodic tone before these modifiers as well, though CV and CVCV toned stems would have no tone even in their citation form.

- (56) *Toned verbs*
 varinwa dáave ‘they will not drink’
 arya mbá ‘he will not eat’
 arivegá sáana ‘he will shave a lot’
 orivega dáave ‘you will not shave’

arikoopná¹ sáana ‘he will help a lot’
 arivohóóllá¹ dáave ‘he will not untie’
 arikoopná¹ dáave ‘he will not help’
 aricheerizá¹ mbá ‘he will not greet’

Toneless verbs
 korishá¹ dáave ‘we will not grind’
 varigorá¹ sáana ‘they will buy very much’
 origóra¹ dáave ‘you will not buy’
 aribíí¹ má dáave ‘he will not measure’
 variganá¹ gáná dáave ‘they will not think’

From examples in (54) such as *komórom-óródirí¹ jí dáave* where *dáave* is present after another modifier, we conclude that *dáave* itself does not block tone erasure, it simply fails to condition it by itself. The specific analysis of that exception relates to the domain of the rule, which is that stem tone erasure applies within the VP, whereas these adverb attach at a level higher than the VP.

Melody deletion also does not take place in certain clausal forms of verbs with M2. As we see in (57) relative clause forms of the indefinite future do not lose their melodic tones before a modifier.

- (57) *H verbs*
 aváána varikoopná korima ‘the children who will help to plow’
 rwá varikoopná¹ gáráha ‘when they will help slowly’
 rwá varideek-íṅnama ‘when they will cook meat’
 aváána varivohóóllá voza ‘the children who will only untie’
 rwá varivohóóll-izing’oombe ‘when they will untie the cows’
 vwahá varivohóóllá llara ‘who will untie once’
- L verbs*
 vwah-árigwá vwaango ‘who will fall quickly’
 avásóóréri varishá¹ há ófisa ‘the boys who will grind by the officer’
 rwa varimígá marova ‘when they will strangle Marova’
 vwah-átarigwá vwaango ‘who will not fall quickly’
 avasóóréri varigóra voza ‘the boys who will only buy’
 aváána varibííma gáráha ‘the children who will measure slowly’
 oríkochóó¹ rá vóráhi ‘the one who will draw us well’
 omúónd-ariganágana yavo ‘the person who will think of those’
 rwá varirakóór-izing’oombe ‘when they will release the cows’

These complications will be considered in detail (months) later.

The imperative, which we have analyzed as a special case of M2 where the melodic tone is deleted when it is both stem- and word-initial, also undergoes melody deletion. The crucial cases

showing this are toned verbs with stems longer than two moras which have a final tone in citation forms. As we see below, they lose their tone before a (toneless) modifier.

(58)	deek-iɪnɪma	‘cook the meat!’
	kooɲa yavo	‘help those!’
	karaga marova	‘judge Marova!’
	karaga yava	‘judge those ones!’
	vohooɬa vwaangu	‘untie quickly!’
	karaang-iɪnɪma	‘fry meat!’
	vodong’ana yava	‘go around these!’

Melody-loss plus LS is also found in toned verbs.

(59)	cheeriz-aam ¹ góní	‘greet Amguni!’
	fuungá gáráha	‘close slowly!’
	vegá gáráha	‘shave slowly!’
	karágá vóráhi	‘judge well!’
	karáángá mávóyu	‘fry eggs!’
	vohóóll-ízíí ¹ mbwá	‘untie the dogs!’

Toneless stems and short toned stems expectedly have no tone, insofar as they are toneless even in citation forms.

(60)	rya vwaangu	‘eat quickly!’
	vega marova	‘shave Marova!’
	sha vwaangu	‘grind quickly!’
	rɪma vwaangu	‘plow quickly!’
	choora vwaangu	‘draw quickly!’
	gavoranyira yavo	‘dole out for those!’
	rakooɾa marova	‘release Marova!’
	koroga yava	‘stir those ones!’

Another tense evincing melody deletion is the M9 hesternal perfective, which loses its final melodic tone before a modifier.

(61)	kwaar-iɪnɪma	‘we ate meat’
	kwaaveji marova	‘we shaved marova’
	zyaayayi ha kɪgʊʊtɪ	‘they grazed at the field’
	kwaadeechi vwaangu	‘we cooked quickly’
	waatyíí míháɖya	‘you feared Mihadya’
	kwaakor-ígáasi	‘we did the job’
	kwaakaraj-ómwáana	‘we judged the child’
	kwaarakooɾi ómwáana	‘we released the child’
	kwaacheerízi chóógo	‘we greeted Choogo’
	vaakwéésí gáráha	‘they pulled slowly’
	kwaang’óód-ívítábo	‘we wrote books’
	waamorómí gáráha	‘you spoke slowly’
	ndaasaambórógáɲí gáráha	‘I dismantled slowly’

A trace of the underlying melodic tone remains in these data, nevertheless. The lexical distinction between toned and toneless is fully eliminated. Lexically toned verbs are toneless before a modifier just as lexically toneless verbs are. This is in contrast to the M7b explanatory past below, where there is similar citation-form neutralization, but phrase-medially the underlying lexical distinction re-emerges. When the M9 tone deletes, this *does* not cause re-emergence of the lexical tone.

The M11 counterfactual has a uniform final tone, but it is one not realized as pitch raising: this melody is $T_{\beta,L}$. As seen previously, $T_{\beta,L}$ triggers deletion of lexical tones in the stem, and blocks spreading of a following tone, even allowing otherwise unattested rising tones under syllable-merger (*arayaan-z-ééditoni*). From that fact, we surmise that this final tone does *not* delete phrase-medially.

- | | | |
|------|---------------------------------------|---------------------------------|
| (62) | varavariza mááma | ‘if they had counted mother’ |
| | varakooṅa mááma | ‘if they had helped mother’ |
| | kurarya sáana | ‘if we had eaten much’ |
| | korasimogokiza váno | ‘if we had revived these’ |
| | koraveereriza váá ¹ sháára | ‘if we had mourned the cousins’ |
| | arayaan-z-ééditoni | ‘if he had loved Editon’ |

Even though the M10 hodiernal perfective pattern is very similar to the M2 pattern, it is distinct phrasally, in that the melodic tone is not deleted, though because lexically toned verbs are toneless in citation forms, this can only be clearly seen with lexically toneless verbs.

- | | | |
|------|-----------------------------------|-------------------------|
| (63) | ogwí vwaango | ‘you fell quickly’ |
| | kogoní ¹ vóráhi | ‘we slept well’ |
| | kugollíi marova | ‘we bought for Marova’ |
| | vachóóri garáha | ‘they drew slowly’ |
| | agórizi yaga | ‘he sold those ones’ |
| | ndovóri amagáanda | ‘I crushed the beans’ |
| | kotáándori yaga | ‘we tore up those ones’ |
| | vagávóranyi garáha | ‘they doled out slowly’ |
| | mburó ¹ gányí óvóchíma | ‘I stirred up ugali’ |
| | ndakóó ¹ rí ádébi | ‘I released Adebi’ |

The immediate imperative pattern M7a also has a final tone, which does not delete in the presence of a modifier. The general pattern for M7a is that the final tone is not assigned prepausally after a short penitential (toned) syllable because it is preceded by a σ_2 tone, thus any tone on the following vowel of such stems must derive from LS from a tone in the following word.

- | | | |
|------|-------------------------------|-------------------------------------|
| (64) | kam’hoomóll-íkikurori | ‘now massage the tailbone for him!’ |
| | kasoví ¹ r-áváandi | ‘now believe others!’ |
| | kavórog-ovosera | ‘now mix porridge!’ |
| | kavaríz-izing’oombe | ‘now count the cows!’ |
| | kaseembéllé llara | ‘now weed once!’ |
| | kagoríz-iviindu | ‘now sell the things!’ |

Otherwise, the final vowel has a tone in this tense, and as the following examples show, that tone is retained before a modifier.

(65)	kazyí vwaangu	‘now go quickly!’
	kary-á ¹ váandi	‘now eat others!’
	karagé ¹ mááma	‘now promise mother!’
	karogé llara	‘now bewitch once!’
	kadeek-íɲama	‘now cook meat!’
	kakará ¹ áng-íɲama	‘now fry meat!’
	kavodóng’ané yava	‘now go around these!’
	karɪndí ¹ íll-írikóó ¹ kóɲɔ	‘now wait on the ant!’
	kavodóng’an-áava	‘now go around those!’
	kavohóoll-ízing’oombe	‘now untie the cows!’

In contrast, the explanatory past M7b, which also has a citation bi-tonal melody with final tone, substantially changes its pattern when a modifier follows. When the stem and following word are toneless, the combination is toneless: the melodic tones are missing.

(66)	yaakazyia llara	‘he went once’
	yaakagwa vwaangu	‘he fell quickly’
	kwaakagur-izing’oombe	‘we bought cows’
	vaakasema marova	‘they insulted Marova’
	yaakagur-iviindu	‘he bought things’
	yaakaguriz-izing’oombe	‘he sold cows’
	yaakaminag-ovosera	‘he stirred porridge’
	vaakazazaam-ɪnyama	‘they tasted meat’
	vaakahaangarizana vwaangu	‘they argued quickly’

If the following word has a tone, it spreads into the verb.

(67)	kwaakásh-óóvóró	‘we ground millet’
	yaakárorá úm ¹ kó	‘he saw brother in law’
	kwaakáror-óvómáá ¹ nání	‘we saw extreme poverty’
	ndaakágórá vííndi	‘I bought others’
	ndaakásóná éditoni	‘I pointed at Editon’
	waakágérizá kódéeka	‘you tried to cook’
	kwaakárákóórá váandi	‘we released others’
	ndaakávééérízá káandí	‘I mourned again’
	ndáákágééndágáá mkíváánda	‘I was walking in the valley’

But toned verbs only lose the melodic tone, retaining their lexical tone.

(68)	vaakat-ó ¹ úndi	‘they buried another’
	kwaakanw-óvosera	‘we drank porridge’
	vaakar-íɲama	‘they ate meat’
	kwaakákér-izing’oombe	‘we milked cows’
	vaakáté ¹ g-ízí ¹ ngókó	‘they trapped chickens’
	ndaakákár-ɪɲama	‘I sliced meat’
	waakaréét-izing’oombe	‘you brought cows’
	yaakakámat-umogoye	‘he caught a rope’
	yaakávó ¹ dóng’an-í ¹ mbóró	‘he went around the monitor lizard’

In phrase-medial position tone pattern M7b is indistinguishable from M1, showing that this alternation is not melody-deletion, this is melody non-selection. There is no trace of melodic behavior phrase medially, in contrast to phrasal forms of M2 which lose the melodic tone while still showing the effect of melodic tone in the forms of lexical tone deletion. The issue for M7b is then purely a matter of morphosyntactic distribution.

In summary, there are a variety of effects on the tone of medial verbs whose behaviors are made more sensible given the understanding that not all phonetic H or L tones have the same phonological analyses. First, we see that final tones may delete phrase medially, but not *all* final tones delete. Those of M2, M5 and M9 are not realized, and yet the melodic tones still have their effect in causing deletion of lexical tones. M7a and M9 tones are fully realized; M7c tone is by hypothesis not even affixed in a non-final verb. Finally M11 $T_{\beta,L}$, which is a fully abstract tone identifiable only via its effect on surrounding tones, is not changed phrase-medially.

(69)	<i>behavior</i>	<i>which patterns</i>	<i>what tone features</i>
I	no melody, just LS	M1 (-aaku- past etc)	\emptyset
II	melody only in citation form, entire pattern radically different medially vs. finally	M7b (explanatory -aaka-)	$T_1 + T_F$ (right edge of VP only)
III	melodic tone deleted, internal effect of melody persists	M2 (subset: -ri- indefinite but not relative forms), M5 (imperative), M9 (hest. perf)	$T_{\beta,F}, T_F$
IV	no deletion of melody	M11 (counterfactual), M10 (hod. perf), M7a (immediate imperative), M3 (subjunctive), M4 (remote), M8 (stative)	$T_{F,L}, T_{\beta}, T_2 + T_F, T_2, T_1, T_l$

Given this distribution, the next step in analysis is to posit a rule targeting the appropriate melodic tone. From this table we see that it is T_F , with or without the feature β which figures into V2 association, suggesting a rule along the lines of (70)

$$(70) \quad T_F \rightarrow \emptyset$$

V

Important technical details still need to be worked out. One is the expression of the VP requirement between the deleted melodic tone and the following trigger – how is the syntactic-domain limit implemented in the grammar? A second is the fact that relative clause forms also do not undergo the rule. Third, why is the final specified-L final tone also not deleted: does the rule also say “and not L”? This questions will be taken up later.

4.4. Tonally Special Modifiers

Given this background on melody modification before ordinary modifiers, we now turn to the tonally-special words, which undergo left-edge tonal modifications as a function of the preceding word’s tone

(thus melody deletion is obviously relevant). There are three subtypes of tonally-special modifiers: CV particles, ‘guuga-words’ (similar to *guugá* ‘grandfather’), and non-prefixing demonstratives (*vára* ‘those yonder’, *váno* ‘these’ with an initial class morpheme, as opposed to ones with a phonologically and semantically empty vowel such as in *iki* ‘this’, *icho* ‘that’, *aga* ‘these’). Their behavior is summarized below with an M1 form of a toneless verb, a CV toned verb, and a longer toned verb.

(71)	ndaakórá gú'úgá	‘I saw grandfather’
	ndaakórá ku	‘I saw a bit’
	ndaakórá vára	‘I saw those’
	ndaakotyá 'gú'úgá	‘I feared a grandfather’
	ndaakotyá ku	‘I feared a bit’
	ndaakotyá vára	‘I feared those’
	ndaakóvó'há gú'úgá	‘I tied grandfather’
	ndaakóvó'há kó	‘I tied a bit’
	ndaakóvó'há vára	‘I tied those’

The phrasal alternation centers around presence or absence of initial tone. Citation *guugá* and *vára* present an apparently conflicting view, that demonstratives have an initial tone but *guugá* does not. The simplest analysis emerges from assuming that these modifiers all have a tone which is missing in some context (the tone is not inserted in the complementary context). That tone is a floating tone, which may remain floating or be deleted under certain conditions, and the representational fact identifying these modifiers as different from tonally ordinary words is that very floating tone.

Other facts support the conclusion that /gú'úgá/ has two underlying tones. In general the evidence indicates that all of these these modifiers have a tone subject to contextual deletion (or non-association), rather than the tone being a part of the verb which is then assigned to certain following words. Evidence for underlying initial tone in the case of /gú'úgá/ comes from analysis of nominal lexical tone. The extant noun tone patterns are to have no tone, initial tone or second-syllable tone, and the two double-tone patterns pre-stem and penult, or pre-stem and final.

(72)	<i>toneless</i>			
	omogera	‘river’	iri-davaangiro	‘badly-made pot’
	ikiharaato	‘famine’	epeengero	‘beer pot’
	<i>toned (default location)</i>			
	omókóro	‘initiate’	amágáraba	‘bean leaves’
	eké-kóómoori	‘plant sp.’	iví-táraazi	‘shelves’
	<i>second syllable</i>			
	omféréji	‘water tap’	ísúgúdi	‘conga drum’
	nasáaye	‘God’	amabárabaande	‘loquats’
	<i>two tones, second one final</i>			
	é'n-gókó	‘chicken’	ikí'-fwóoyó	‘rabbit’
	oro-séé'ng'ééngé	‘barbed wire’	eké-dó'vóngoryó	‘pool of water’
	<i>two tones, second one penultimate</i>			
	irí'-bwóoni	‘potato’	í'n-dógónyi	‘ant sp.’
	eké'-séégéra	‘eye swelling’	iri-dá'ráamu	‘drum’

Nouns like *guugá* (likewise *koozá* ‘uncle’ and *baabá* ‘father’) appear anomalous in having just a final tone, at least when they do not have a plural class prefix, but they are not truly anomalous since there are in the bitonal, final tone class. We directly see the first tone in citation forms in the plurals *vááguugá*, *váákoozá* and *váábaabá*. Nouns like *guugá* are morphologically special compared to *íkí-fwóóyó* in having no class prefix or augment in the singular, which gives rise to a unique morpho-phonological structure, a would-be word-initial stem with initial tone, something which only occurs on the surface under CV+V contraction, a syntactically-determined phrasal tone proclitic, or the present alternation. We conclude that the underlying stem of ‘grandfather’ is /gúugá/, though more precisely the first tone is not underlyingly associated, it associates conditionally.¹⁰

These would-be initial alternating tones are at least temporarily identified here with the property S, which furthermore is morphosyntactically predictable. The connection to morphosyntax is visible through a common word-formation fact of this word class, regarding the augment and the distinction between primary vs. secondary agreement forms. The *guuga* type of modifiers, which are nominals, divide into three subsets: the aforementioned CVVCV nouns which have no class prefix or augment; numerals with no augment but secondary class-agreement (-*viri* ‘2’, -*vaga* ‘3’, -*ne* ‘4’, -*taano* ‘5’); trisyllabic+ non-agreeing (Swahili-derived) modifiers such as *sarasíini* ‘30’, *tayáari* ‘ready’, *kabisa* ‘totally’ which have no prefixes at all. In light of the fact that the plural prefix of *vááguugá* is *vaa* and not *va* which is the normal cl. 2 prefix, we can relegate *vaa-* to the subcategory of non-primary class prefixes.

CV words are almost entirely restricted to the alternating CV particles to be discussed here. The exceptions are *mbá*, *dá°* ‘not’ which are tonally invariant, but also sentence-final and outside the syntactic domain (VP) where the tonal rule regarding particles can apply. Furthermore, *dá°* is the truncation of *dáave* ‘not’. The only toneless CV word is *za*, which is an optional truncation of *vuza* ‘only’. The particles have no citation form, and they only appear after a verb (within the VP).

The alternating demonstratives are formed with a secondary agreement morpheme marking class followed by -*no* ~ -*no* in proximal demonstratives and -*ra* in distal demonstratives. Samples of these demonstratives are in (73).

(73)	remote distal	further			cl.
	vára	váno	yava	yavo	2
	góra	góno	yigo	yigwo	3
	jíra	jínó	yiji	yijo	4
	ríra	rínó	yiri	yiryo	5
	gára	gáno	yaga	yago	6
	kíra	kínó	yiki	yicho	7
	víra	vínó	yivi	yivyo	8
	yíra	yínó	yiyi	yeyo	9
	zíra	zínó	yizi	yizyo	10

4.4.1. CV PARTICLES

The sandhi behavior of CV particles is relatively simple. As seen above in (71) with the M1 pattern, the particle has a tone which spread to the left, except if the preceding verb has a final tone (therefore the particle loses its tone), or the verb is toneless (the tone shifts from the particle to the end of the

¹⁰ The final tone could be associated, or it could be T_F which links to the final vowel by rule.

verb). In (74), the verb has a tone, lexical in (a), that of an OP before a toned root in (b), or an OP before a toneless root in (c).

- | | | | |
|------|----|---------------------------------|------------------------------|
| (74) | a. | varávo ¹ há kí | ‘they will tie what?’ |
| | | kwaakódéé ¹ ká kó | ‘we cooked a bit ’ |
| | | korávé ¹ gá rí | ‘we will shave when’ |
| | b. | varaké ¹ témá gó | ‘they will indeed chop it’ |
| | | arágá ¹ nwá rí | ‘he will drink it when’ |
| | | koravi ¹ karáángá rí | ‘we will fry then when’ |
| | c. | árakí ¹ shá rí | ‘he will grind it when?’ |
| | | arakó ¹ sémá gó | ‘he will indeed insult us’ |
| | | korakó ¹ sóovirá gó | ‘we will indeed believe you’ |

There are three complications affecting particles which obscure their behavior. One is that when a prepausal tone spreads to preceding syllables, it frequently splits into a final H¹H sequence, thus we also find (75).

- | | | |
|------|--|----------------------------|
| (75) | varávo ¹ há ¹ kí | ‘they will tie what?’ |
| | arávé ¹ gá ¹ rí | ‘he will shave when’ |
| | varávo ¹ dóng ¹ ’áná ¹ kí | ‘they will go around what’ |
| | aravá ¹ végá ¹ hó | ‘he will shave them by it’ |
| | várakí ¹ shá ¹ rí | ‘they will grind it when?’ |
| | oragó ¹ rímá ¹ kó | ‘you will plow it a bit’ |

Since tone-splitting only applies prepausally, a toneless modifier after the particle removes that complication, in which case we see tone just on the particle, which spreads to preceding vowels without intervening downstep.

- | | | |
|------|---|-------------------------------------|
| (76) | orákóó ¹ mbéérá gó voza | ‘you will certainly only hug ’ |
| | varáká ¹ rágá hó llara | ‘they will judge there once’ |
| | varáká ¹ rágá kí vwaangu | ‘they will judge what quickly’ |
| | arakó ¹ chéérízirá kó Marova | ‘he will greet for us a bit Marova’ |
| | ndágúú ¹ tá kó voza | ‘I will only defeat a bit ’ |
| | oráká ¹ ráángá kó llara | ‘you will fry a bit once’ |
| | kwaakótóó ¹ ngá ndí marova | ‘we paid Marova how’ |
| | orará ¹ sá ndí llara | ‘you will throw that way once’ |
| | korávé ¹ gá rí voza | ‘we will only shave when’ |

This pre-pausal tone splitting is a form of phonological noise which obscures the analysis.

If the verbs ends in a tone (thus is a CV stem, in M1), the particle may lose its tone.

- | | | |
|------|--------------|--------------------------|
| (77) | aratyá kí | ‘he will fear what’ |
| | yaakóryá hó | ‘he has eaten there’ |
| | voráchá rí | ‘it will dawn when?’ |
| | vaakónwá gó | ‘they have indeed drunk’ |
| | varikánwí rí | ‘they will drink when’ |
| | ndaakónwá kí | ‘I drank what’ |

Alternatively, the particle can retain its tone in which case downstep results from phrasal contonation of tones.

(78)	aránwá ¹ hó	‘he will drink by it’
	araryá ¹ m	‘he will eat in’
	arátyá ¹ kí	‘he will fear what’
	koránwá ¹ kó	‘we will drink a bit’
	oránwá ¹ hó	‘you will drink by it’
	vaakónwá ¹ kó	‘they drank a bit’
	voráchá ¹ rí	‘it will dawn when’
	waakónwá ¹ hó	‘you drank by it’

The two patterns in (77) and (78) indicate that the rule deleting particle tone immediately after a tone is optional. In the M1 pattern, this option only arises with monosyllabic toned stems.

There is an infrequent option that a tone, even a non-prepausal one, optionally shifts to a preceding toned verb, but only if there is at least one toneless syllable preceding the final.

(79)	arikáchí ¹ ring’áné gɔ vwaangu	‘he will certainly be quiet’
	arikáchí ¹ ring’áné gó vwaangu	‘I will be a bit late to study’
	ndikaché ¹ révé kɔ kusooma	
	ndikaché ¹ révé kó kusooma	‘they will whip what quickly’
	varábá ¹ dórá kɪ vwaangu	
	varábá ¹ dórá kí vwaangu	‘we have now believed the preacher when’
	kwáá ¹ súóvírí ri mogaambi	
	kwáá ¹ súóvírí ri mogaambi	
	korikávéga hó vuza	‘we will only shave by it’
	*korikávé ¹ gá ho vuza	
	aradée ¹ ká kí llara	‘he will cook what once?’
	*aradée ¹ ká kɪ llara	

The alternation of greatest interest for understanding tonal melodies is leftward shift of tone from a particle. If the preceding verb is toneless, the tone shifts leftward from the particle to the end of the verb.

(80)	korábíímá kɪ	‘we will measure what’
	varágávórányá ndi	‘they will divide this way’
	varikáshé ndi	‘they will grind how’
	yaakóvárízá ho	‘he has counted there’
	vaakóséémbéllá kɪ	‘they have weeded what’
	yaakógótá hó za	‘he only got lost at it’
	yaakóvárízá ho za	‘he has only counted there’
	korárimá kɪ vuza	‘we will only plow what?’
	varárovágá kɪ Marova	‘they will bewitch a bit Marova’
	arázyá ndi vwaangu	‘he will go how quickly’
	varágánágáná ri	‘they will think when?’
	oragórízá h-iviindu	‘you will sell things by it’
	arikárákóórízí kɪ kasaandi	‘he will make Kasaandi release what’
	ndikázáázáámé kw-ɪɲama	‘I will taste the meat a bit’

An important exception to the toneless generalization (w.r.t. obligatory shift) is that completive-focus forms have H on the subject prefix syllable, but this H does not block particle tone shift.

- (81) wáakavárízá ho kadív-avaando ‘you have now counted even people by it’
 váakakórorá ri ha mōgizi ‘they have now coughed at the homestead when’
 yáákarakóórá gu marova ‘he has now certainly released Marova’
 yáarásí kw-amagina ‘he has now thrown stones a bit’
 wáagávórí gw-iiɲama ‘you have now certainly divided meat’
 yáagwíí ri mō chiito ‘he has now fallen when in the market’

From this, we conclude that the toneless restriction is in terms of stem tones, not word tones.

Turning to predictions for other patterns involving melodic tone affixes, we do not generally expect tone to shift from a particle to a preceding toneless verb, because by nature tenses with tone melody inflection are not toneless. This is the case with M3 verb forms, which always have a melodic tone. That tone can appear on the first or second stem vowel which can be word-final, as well as on the third vowel when the penult is short, otherwise the stem has a non-final tone. This predicts the possibility of deletion of the particle’s tone after CV, CV(V)CV and CV(V)CVCV stems, but not elsewhere – this prediction is correct.

Longer stems retain tone on the particle, which spreads to the left.

- (82) naa ngóyáá¹ né kó ‘I will be disarranged a bit’
 n-ooḡóyáá¹ né kó llara ‘you will be disarranged a bit once’
 ni vahíírí¹ tí rí ‘they will snore when’
 na vakarááŋge kí hara ‘they will fry what yonder’
 n-oogoyááne kó llara ‘you will be disarranged a bit once’
 na vágánágá¹ né kó ‘they will think a bit’
 na vágánágá¹ né ndí ‘they will think this way’
 n-oovódóng¹’áne kí hara ‘you will go around what yonder’

When the tone is assigned to the last vowel, either the tone of the verb and that of the particle are separated by downstep (83a), or more commonly, particle tone deletion applies in (83b).

- (83) a. na varýí¹ kó ‘they will eat a bit’
 n-aaté¹ kí llara ‘he will bury what once’
 n-ootémé¹ rí ‘you will chop when’
 na kurímí¹ hó ‘we will plow by it’
 na korégé¹ ndí ‘we will win this way’
 na kurímí¹ hó karóono ‘we will plow by it now’
 na vagórí¹ kí llara ‘they will buy what once’
 naa mbégé¹ kó vwaangu ‘I will shave a bit quickly’
 na vagérízí¹ kó korima ‘they will try a bit to plow’
- b. na kuryí gu ‘we will certainly eat’
 naa nzí gu ‘I will go certainly’
 na vanwí ri ovosera ‘they will drink porridge when’
 n-aanwí ki ‘he will drink what’
 ni vagwí ri ‘they will fall when’

ni varyí ri	‘they will eat when’
na vagorí ki	‘they will buy what’
na ndémé ki llara	‘I will chop what once’
na varóré nd-orokeyo	‘they will see the banana farm thus’
n-aatégé ri	‘he will trap when’
ni vadééké ri	‘they will cook when’
n-uuháándé ho vwaangu	‘you will get stuck quickly by it’
naa ngóónyé r-iavaandu	‘I will help the people when’
n-aachérévé ko s-áá ¹ mgóní	‘he will be late like Amguni a bit’
na vávíimbóllí h-avageni	‘they will unroof for the guests by it’
ni vagórízí ri	‘they will sell when’

A further prediction is that a particle retains its tone after the M4 remote past, since that tone is always assigned to a non-final stem-initial vowel, thus conditions for shift are not satisfied (the verb always has a tone) nor are conditions for deletion satisfied (the tone is never word-final in this tense).

(84) váá ¹ nwá rí	‘they drank when’
váá ¹ gwá rí	‘they fell when’
vaaró ¹ má rí	‘they bit when’
vaanó ¹ gá rí	‘they plucked when’
kwáá ¹ tá kó	‘we buried a bit’
víí ¹ góra rí	‘they opened when’
vóó ¹ mbáká rí	‘they built when’
vaachéé ¹ rízá rí	‘they greeted when’
vaaséé ¹ mbéllá rí	‘they weeded when’
vaamó ¹ rómá rí	‘they spoke when’
vaavó ¹ dóng’áná rí	‘they went around when?’
vaayá ¹ vógóllá rí	‘they unburied when’

It is also correctly predicted that the particle retains its tone after the M8 stative form of the verb, since the only tone in the verb is word-initial, and because the verb is not toneless, there is no shift.

(85) wáá ¹ gwá kó	‘you are in the state of having fallen a bit’
yáá ¹ nwá ¹ kí	‘they are in the state of having drunk what’
yáárya ndí vwaangu	‘he is in the state of having eaten quickly how’
váá ¹ gwá rí hamogera	‘they are in the state of having fallen when at the river’
kwáá ¹ rímá kó	‘we are in the state of having dug some’
váá ¹ vóhá ¹ kí	‘they are in the state of having tied what?’
kwáá ¹ ríngá ¹ kí	‘we are in the state of having folded what’
ndáádeeká kó ¹ dáave	‘I have never cooked’
wáá ¹ kárágá kí llara	‘you are in the state of having judged what once’
váá ¹ goyáána kó	‘the guests are a bit confused’
ndáá ¹ séémbéllá kó ¹ dáave	‘I have never weeded’
váá ¹ vódóng’áná rí	‘they are in the state of having gone around when?’

Because M2 undergoes melodic tone deletion, we predict the possibility of particle tone shift to a verb with the M2 pattern. However, we find that tone remains on the particles, optionally spreading to the

left and optionally splitting into H¹H prepausally, but not shifting. This includes both toned and toneless verbs regardless of stem shape.

(86)	arinwa kó	‘he will drink a bit’
	arigwá hó	‘he will fall there’
	arigwá ¹ hó	‘he will fall there’
	varivega rí	‘they will shave when’
	orivegá ¹ kó	‘you will shave a bit’
	arimáná ¹ kí	‘he will know what’
	variyává ¹ rí	‘they will bury when’
	arideeká ¹ rí	‘he will cook when’
	varitaangazá ¹ rí	‘they will announce when’
	aricheerizá kó	‘he will greet a bit’
	arivohóóllá ¹ kó	‘he will untie a bit’

In phrase medial position, there are options for Leftward Spreading, but we do not find shift.

(87)	arirya kí za	‘he will only eat what’
	arivega hó za	‘he will just shave there’
	korinwa kí llara	‘we will drink what once’
	varinwa rí vvaangu	‘they will drink quickly when’
	arivegá gú marova	‘he will certainly shave Marova’
	arivegá ndí ¹ n-órógéé ¹ mbé gáráha	‘how will he shave quickly with a razor’
	korivohóóllá kí llara	‘we will untie what once’
	varígórá hó vvaangu	‘they will buy by it quickly’

These data clarify that the tone is not removed phrase-medially, it remains present and therefore blocks Tone Shift. However, data in from M9 and data from guuga-modifiers present a different impression, that the tone *should be* deleted, thus we have a paradox that needs to be resolved, as we will discuss in the next section.

Analogous to the loss of melodic tone of M2, the imperative tone also has a phonological effect, that tone shift does not take place from a particle even though the melodic tone deletes.

(88)	rya kó	‘eat a bit!’
	sha kó llara	‘grind a bit once!’
	ng’osá kó	‘pull a bit!’
	gorá kí llara	‘buy what once!’
	rwaaná ¹ kó	‘fight a bit!’
	bimá kó llara	‘measure a bit once!’
	sigámá ¹ ndí	‘kneel this way!’
	korógá ¹ kó	‘stir a bit!’
	chiríng’áná ¹ ndí	‘be quiet thus!’
	veezégérá ¹ ndí	‘belch thus!’
	ríma ndí kó	‘plow this way a bit!’
	vegá kó vuza	‘just shave a bit!’

This outcome is expected under the premise that the imperative actually has M2, plus a special rule affecting toneless verbs.

Unlike the M1 pattern of toneless verbs which are also phonetically all-L toned, the conditional in M11 does *not* allow leftward tone shifting of the particle's tone, because M11 has a specified L.

- | | | |
|------|-------------------|------------------------------|
| (89) | varavariza kó | 'if they had counted a bit' |
| | aravogora kí | 'if he had taken what' |
| | variikara hó | 'if they had sat at' |
| | aratega ndí | 'if he had trapped how' |
| | korageenda kó | 'if we had walked on it' |
| | arachiring'ana rí | 'if he had been silent when' |
| | araseka kó | 'if he had laughed a bit' |

Although the M2, M5 and M11 final tones show evidence of still being phonologically present even though they are not pronounced, the final M7c tone of the explanatory past behaves differently. We observe that (a) particles are toneless after CV toned verbs, (b) tone shifts to the end of a toneless verb and (c) it spreads into a verb having a tone. This is exactly the pattern of M1 verbs.

- | | | | |
|------|----|---|-----------------------------|
| (90) | a. | kwaakaryá ku | 'we ate a bit' |
| | | kwaakáryá ku | 'we ate a bit' |
| | | vaakakwá gu | 'they certainly paid dowry' |
| | b. | vaakázyá ri | 'they went when' |
| | | ndaakágóra kí | 'I bought what' |
| | | waakarímá ho | 'you plowed by it' |
| | | ndaakarímá ku | 'I plowed a bit' |
| | | kwaakáséembéllá kí | 'we weeded what' |
| | | waakámórómá ku | 'you spoke a bit' |
| | | kwaakádígíná ndí | 'we tickled thus' |
| | | vaakákóróra kí | 'they dragged what' |
| | c. | yaakáté ¹ má rí | 'he chopped when' |
| | | kwaakáke ¹ rá ¹ kó | 'we milked a bit' |
| | | vaakákó ¹ zá ¹ ndí | 'they died thus' |
| | | yaakáháá ¹ ngárizáná ¹ kó | 'he argued a bit' |
| | | vaakákó ¹ zá ¹ ndí | 'they died thus' |

This pattern is replicated in (91) with phrase-medial particles

- | | | | |
|------|----|---------------------------------------|-------------------------------------|
| (91) | a. | kwaakaryá ku vwaangu | 'we ate a bit quickly' |
| | | vaakakwá gu vwaangu | 'they certainly paid dowry quickly' |
| | b. | waakarímá ho vva | 'you only chopped by it' |
| | | vaakázyá ri vwaangu | 'they went when quickly' |
| | | yaakádóyá ndi marova | 'he hit Marova thus' |
| | | ndaakarímírá ku marova | 'I plowed a bit for Marova' |
| | | kwaakáséembéllá ¹ kí góógá | 'we weeded what for grandfather' |
| | | waakámórómá ku vwaangu | 'you spoke a bit quickly' |
| | | kwaakádígíná ndi marova | 'we tickled Marova thus' |
| | | vaakákóróra kí hára | 'they dragged what yonder' |

- c. yaakáté¹má rí hara ‘he chopped when yonder’
 kwaakáké¹rá kú zing’oombe ‘we milked the cows a bit’
 vaakákó¹zá ndí ham’gera ‘they died thus at the river’

As suggested above, this can be easily explained by a purely morpho-syntactic solution, that M7b tone is only affixed to a VP-final verb.

In the M10 hodiernal perfective, because the melodic tone is not deleted, we do not predict that tone shifts to a surface toneless verb word, which would be a lexically-toned verb.

- (92) aryɪ kɪ ‘what did he eat?’
 kohoni kó ‘we got better a bit’
 ngeri kó ‘I milked a bit’
 oteji ndí ‘how did you trap?’
 avoni kó ‘he harvested a bit’
 aheenzi kó ‘he looked a bit’
 vadeechi rí ‘they cooked when’
 kucherevi kó ‘we were a little late’

It is noteworthy that spreading does not take place between the particle and an underlyingly toned verb.

When the verb is toneless with the structure CVCV, the particle has no tone. This is because the verb has a final tone, assigned to V2.

- (93) koháni kɪ ‘we closed what’
 ndorí kɪ ‘I saw what’
 koséchi rí ‘when did we laugh?’
 arají gɔ ‘he certainly promised’
 ɔdoyí ndí ‘you beat this way’

On the other hand, when a toneless root is longer, the melodic tone is on a non-final vowel, so the tone of the particle is not deleted.

- (94) ndúú¹mí kó ‘I jumped a bit’
 kiháá¹ndí ndí ‘it got stuck how’
 mboró¹chí ndí ‘I flew this way’
 avágá¹rí ndí ‘he spread out this way’
 koháá¹ndíichí rí ‘we wrote when’
 koséé¹mbélléé ndí ‘we weeded this way’
 agoyáá¹ní kó ‘he went around a bit’
 varakóú¹rí kí ‘what did they release?’
 kidíjǎ¹gání kó ‘it hardened a bit’

The M9 hesternal perfective loses its melodic tone before a modifier, as noted previously. A noteworthy difference between the behavior of the M9 tone and M2 or other melody-deleting tenses is that tone shifts from the particle to the preceding toneless verb.

(95)	kwaaháni kɪ	‘we closed what’
	kwaahoní kɔ	‘we got better a bit’
	ndaaróri kɪ	‘I saw what’
	chaaháándí ndrɪ	‘it got stuck how’
	ndaasáári gɔ	‘I certainly prayed’
	ndaatóúmí kɔ	‘I jumped a bit’
	ndaabóróchí ndrɪ	‘I flew this way’
	ndaasííróri kɔ	‘I chopped weeds a bit’
	kwaaháándííchí rɪ	‘we wrote when’
	chaadíńgání kɔ	‘it hardened a bit’

Contrasting with the situation with M2, this behavior provides evidence for a stronger form of removal of the melodic tone like the case of the M2 tone, not just phonetic suppression; yet unlike M7b where the phrase-medial tone pattern simply changes to M1, we still see the effect of lexical tone deletion in toned verbs like *-túuma* or *-hóna*. M9 is similar to M2, yet different in that the citation pattern is “just final”, not “second vowel or final”. This is explained in §2.4 by positing that the M9 tone is T_F , not $T_{F,\beta}$. The upshot of the M9 data is that we have phonological evidence for two kind of “deletion”, one being where the melodic tone is not phonetically realized but is visible to particle-tone throwback, and one being that it is invisible to throwback. This distinction has to be somehow encoded in the rule system (specifically, deletion for M2 $T_{F,\beta}$ is ordered between two specific rules but deletion for T_F precedes both).

4.4.2. GUUGÁ MODIFIERS

The general tone pattern of *guugá*-class modifiers after M1 was briefly sketched above: there is initial tone unless the preceding verb has a final tone. Further examples are below, from a wider range of tenses and modifiers.

(96)	<i>Final tone</i>	
	aranwá ¹ kíndí kí	‘he will drink what?’
	oratyá ¹ kóózá	‘you will fear uncle’
	ndatyá ¹ báábá	‘I will fear father’
	vaakotyá ¹ vwahá hara	‘they feared who yonder’
	varatyá ¹ samaníni	‘they will fear 80’
	varáryá ¹ kávirí	‘they will eat twice’
	yaakóryá ¹ háí	‘he has eaten where’
	áráryá ¹ sarasíni	‘he will eat 30’
	varatyá ¹ káróono	‘they will fear now’
	korátyá ¹ chígírá kɪ	‘we will fear why?’
	<i>Toned root (non-final)</i>	
	varaká ¹ ráángá kí ¹ ndrɪ kí	‘they will fry what?’
	koráyáárá ¹ kɔ ¹ ozá	‘we will sue uncle’
	ndaakóvé ¹ gá ¹ bá ¹ ábá	‘I shaved father’
	omurógoori ¹ yaakoká ¹ rágá ¹ vwá ¹ há	‘the Logoori that judged who’
	vaakwóú ¹ mbáká ¹ sámaníni	‘they built 80’
	kokó ¹ vódóng ¹ áná ¹ ká ¹ virí	‘to go around you twice’
	varavó ¹ hóóllá ¹ sá ¹ bwíni	‘they will untie 70’

yaakóvó ¹ dóng'ána há ¹ i	'he went around where?'
ndarée ¹ t-árobáini	'I will bring 40'
arávé ¹ gá sá ¹ rásini	'he will shave 30'
varávó ¹ dóng'ána ká ¹ rúonu	'they will go around now'

Toneless root

koráshá kí ¹ ndí kí	'we will grind what?'
waakórorá kó ¹ ózá	'you saw uncle'
wáákósóóvírá bá ¹ ábá	'you believed father'
omsóóréri yaakovárizá vwá ¹ há	'the boy that counted who'
arágávórányá ká ¹ vírí	'he will divide twice'
rwá ¹ ndáákóbíímá sá ¹ bwíini	'when I measured 70'
aráshá há ¹ i	'he will grind where?'
yaakógóriz-árobáini	'he sold 40'
aráshá sá ¹ rásini	'he will grind 30'
arágávórányá ká ¹ rúonu	'he will divide now'
varáshá chígirá kí	'they will grind why?'

Verbs with the M3 pattern clarify the process of tone assignment / deletion to *guuga*-modifiers, since as we see in (97), those modifiers never have initial H, no matter where the verb's tone is. While the first set should not have initial tone given that the verb has a final tone, the tone of the second set of verbs is not final, which establishes that the position of the tone is not what governs the initial tone of the modifier.

(97) *Final tone on verb*

na koshí ¹ sábwíini	'we will grind 70'
naa ngwí ¹ kávírí	'I will fall twice'
n-oororé ¹ gúúgá	'you will see grandfather'
naa ngórí ¹ víné	'I will buy 4'
na kweeyé ¹ kárúonu	'we will sweep now'
n-aagayé ¹ báábá	'he will forbid father'
n-aakozí ¹ kárúonu	'he will die now'
na komóromé ¹ kávírí	'we will speak twice'
na kwúumbáké ¹ sámáníini	'we will build 80'
na koháámbíkí ¹ kárúonu	'we will be drunk now'
naa ndíginyí ¹ báábá	'I will tickle father'
na kogérízí ¹ sárásini	'we will try 30'

Non-final tone on verb

na kovéézégé ¹ ré kátáánó	'we will belch 5 times'
na mbéézégé ¹ ré kávágá	'I will belch thrice'
na vágánágá ¹ né kávírí	'they will think twice'
n-úúsímógókí ¹ zígúógá	'you will revive grandfather'
n-úurííndíí ¹ lí báábá	'you will wait father'
na kovódóng' ¹ á né báábá	'we will go around father'
na koháánzóó ¹ kí kávírí	'we will talk loudly twice'
n-aasínyáá ¹ ré kávágá	'he will sneer thrice'
na vatáángáá ¹ zé kárúonu	'they will announce now'

n-uugíróng'á'nyí kóózá	'you will turn around uncle'
n-aavóhóó'llé báábá	'he will untie father'
naa mbáángá'rí'záné kávirí	'I will argue twice'
na avórógá'nyé kámíllí	'he will stir properly'
na avohóó'llé kóózá	'he will untie uncle'
na korakóó'rí sítími	'we will release 60'

We therefore arrive at the generalization that if the verb contains a *melodic* tone, the initial tone of *guuga*-modifiers is deleted (or left associated).

This generalization predicts – correctly – that there is also no initial tone after a verb in the M4 remote past.

(98) yáá' shá háí	'he ground where?'
kwáará' gá kóózá	'we promised uncle'
vaavódong' ana karóonu	'they went around now'
yaagá' vóráná kávirí	'he divided twice'
vaagá' nágáná sítími	'they thought of 60'
yáárya sarasími	'he ate 30'
váágánagana sítími	'they thought of 60'
vaavó' há vwáhá	'they tied who?'
yááváá' yírá góógá	'he visited grandfather'
yaagóra vyaangá	'he bought how many'

The M8 melody in the stative gives evidence for a refinement of the analysis, since these modifiers *do* take initial tone after this tense.

(99) cháá' shá ká' bísá	'it is totally ground'
wáá' séémbéllá gu' úgá	'you are in the state of having weeded for grandfather'
yáá' róótá gu' úgá	'he is in the state of having visited grandfather'
yáá' kózá há' í	'he is in the state of having died where?'
váá' káraángá há' í	'they are in the state of having fried where?'
wáá' ryá há' í	'you are in the state of having eaten where?'
váá' vódong' áná ká' róonu	'they are in the state of having gone around now'
yáá' rórá ká' vírí	'he is in the state of having seen twice'
yáá' gávórányá ká' vírí	'he is in the state of having divided twice'
kwáá' díírá kó' ózá	'we are in the state of having held uncle'
kwáá' yáará kó' ózá	'we are in the state of having sued uncle'
váá' gánágáná sí' tími	'they are in the state of having thought of 60'
váá' vóhóóllá sá' bwími	'they are in the state of having untied 70'
yáá' máná sá' rásími	'he is in the state of having known 30'
váá' vóhá vwá' há	'they are in the state of having tied who?'

What is special about the M8 melody is that it is assigned at the beginning of the word, not within the stem. This indicates that the fact of being a pre-stem tone takes it out of the domain of the melodic tones which cause deletion of initial tone on *guuga*-modifiers. Since we also observed that particle-throwback *does* apply in (85) after verbs in the stative tense, we know (which is evident from what the two rules do) that particle tone throwback is not the same rule as the rule associating H to *guuga*-modifiers.

Since the explanatory past M7c has no tone melody except prepausally, we predict that it is exactly like the M1 pattern, where H is present at the beginning of the modifier everywhere, except after CV toned stems – as is verified below.

- | | | |
|-------|---|------------------------|
| (100) | yaakáshá sá ¹ bwími | ‘he ground 70’ |
| | kwaakágwá ká ¹ róono | ‘we fell now’ |
| | ndaakáshá ká ¹ vágá | ‘I ground thrice’ |
| | ndaakaré ¹ gá ká ¹ vírí | ‘I won twice’ |
| | vaakagáyá bá ¹ ábá | ‘they forbade father’ |
| | vaakáróra vó ¹ rí | ‘they saw how much’ |
| | ndaakagóra vyá ¹ ángá | ‘I bought how many’ |
| | waakásóó ¹ rá ká ¹ vágá | ‘you refused thrice’ |
| | waakadée ¹ ká ká ¹ né | ‘you cooked 4 times’ |
| | ndaakávó ¹ dóng ¹ áná kó ¹ ózá | ‘I went around uncle’ |
| | kwaakávárízá ká ¹ míli | ‘we counted correctly’ |
| | kwaakásóóvírá sá ¹ láama | ‘we believed safely’ |
| | yaakábádóra kó ¹ ózá | ‘he whipped uncle’ |
| | waakánwá ¹ káva ¹ gá | ‘you drank thrice’ |
| | ndaakátyá ¹ gúúgá | ‘I feared grandfather’ |
| | waakánwá ¹ káné | ‘you drank 4 times’ |
| | yaakanwá ¹ gárí | ‘he drank how much’ |
| | waakaryá ¹ kírí | ‘you ate how much’ |
| | vaakanwá ¹ gáángá | ‘they drank how many’ |
| | vaakánwá ¹ gáángá | ‘they drank how many’ |
| | yaakáryá ¹ kávirí | ‘he ate twice’ |

Melody M7a of the immediate imperative on the other hand always has a melodic tone. It follows from that that the modifier never has an autonomous tone.

- | | | |
|-------|--|---------------------------|
| (101) | kagwí ¹ káróono | ‘now fall now!’ |
| | katé ¹ gúúgá | ‘now bury grandfather!’ |
| | katumí ¹ kóózá | ‘now send uncle!’ |
| | kareeté ¹ góógá | ‘now bring grandfather!’ |
| | kakweesé kamílli | ‘now pull correctly!’ |
| | kaminá ¹ gé káróono | ‘now stir now!’ |
| | karakúú ¹ rí kóózá | ‘now release uncle!’ |
| | kazaazáá ¹ mé sáláama | ‘now taste safely!’ |
| | kahóró ¹ ókí ¹ kávirí | ‘now take a break twice!’ |
| | kavohó ¹ óllé ¹ báábá | ‘now untie father!’ |
| | kahónó ¹ nóké ¹ kávirí | ‘now escape twice!’ |
| | kasimógokizí ¹ kóózá | ‘now revive uncle!’ |

The M10 hodiernal perfective has a melodic tone which does not delete phrase-medially, therefore we expect that guuga-modifiers do not have intial tone after M10, which is correct.

(102)	<i>Toned verbs</i>	
	koveji baabá	‘we shaved father’
	vatemi kavíri	‘they chopped twice’
	kodeechi sitíini	‘we cooked 60’
	ngoonyi baabá	‘I helped father’
	abomori samaníni	‘he destroyed 80’
	njerevi kavíri	‘I was late twice’
	njeerizi guugá	‘I greeted grandfather’
	kohaambaanyii kaviri°	‘we combined twice’

Toneless verbs

kugóri ¹ sábwíni	‘we bought 70’
nzeyí ¹ sáláama	‘I swept safely’
kerorwí ¹ kátááno	‘it has been seen 5 times’
kubóro ¹ chí sáláama	‘we flew safely’
vagayí ¹ kává ¹ gá	‘they forbade thrice’
kuchóó ¹ rí sí ¹ tíini	‘we drew 60’
agéé ¹ ndi kává ¹ gá	‘he went thrice’
móro ¹ mí kává ¹ gá	‘I spoke thrice’
abádó ¹ rí kávirí	‘he whipped twice’
ndáándóllii kooza°	‘I tore for uncle’
vagánágani sitíini	‘they thought of 60’

Likewise, the melodic tone of the M11 counterfactual does not delete phrase-medially, therefore *guuga*-modifiers are initially-toneless after M11, even though they resemble toneless M1 verbs.

(103)	aratya kiríha°	‘if he had feared which one?’
	ararya vyaangá	‘if he had eaten how many?’
	varanwa garí	‘if they had drunk how much?’
	ndatuunga ziri	‘if I had paid how much?’
	varadeeka kavíri	‘if they had cooked twice’
	varakooŋa guugá	‘if they had helped grandfather’
	koravohoola vaangá	‘if we had untied how many?’
	koravoruga vorí	‘if we had mixed how much?’
	koragora garí	‘if we had bought how much?’
	varavariza kavágá	‘if they had counted thrice’
	varavariza sitíini	‘if they had counted 60’
	aravariza vaangá	‘if he had counted how many?’
	varazaazaama vyaangá	‘if they had tasted how many?’

In the previous section we noted a difference between M9 and M2 in terms of application of particle shift. The tone of *guuga*-modifiers serves as an important diagnostic of phonological behavior and therefore features. We observe in (104) that these modifiers have the canonical post-L behavior, as shown in the following examples of the indefinite future.

(104)	arisíníkízá kí ¹ ndí kí	‘he will annoy what’
	ariromá kó ¹ ózá	‘he will bite uncle’
	arireetá sá ¹ rásini	‘he will bring 30’
	aricheerizá vá ¹ táánó	‘he will greet 5’
	arihóllá sá ¹ rásini	‘he will hear 30’
	arikooná vwá ¹ há	‘he will help who’
	aribimá ká ¹ vágá	‘he will measure thrice’
	arírímá gó ¹ ríhá	‘he will plow which one?’
	arivegá gú ¹ úgá	‘he will shave grandfather’
	arigééndá chígirá kí	‘he will walk why?’
	varígwá há ¹ ríhá	‘they will fall by which?’
	varizaazáámá vyá ¹ ángá	‘they will taste how many?’
	váriséémbéllá há ¹ í	‘they will weed where’
	korigórá gá ¹ rí	‘we will buy how much?’

Other tenses with the M2 pattern shown the same fact.

(105)	ningíráá ká ¹ mílli	‘I am entering properly’
	nínzíráá sá ¹ láama	‘I am working safely’
	kodííráá kó ¹ ózá	‘we are holding uncle’
	akedeekérá vwá ¹ há	‘he is still cooking for who?’
	akiviká sá ¹ rásini	‘he is still storing 30’
	kókírímír-áárobaíni	‘we are still cooking for 40’
	kokekoonyá kó ¹ ózá	‘we are still helping uncle’
	kókirakóóra gú ¹ úgá	‘we are still releasing grandfather’
	arikachiríng’áná ká ¹ mílli	‘he would be quiet properly’
	ndikagavórányá kí ¹ ndí kí	‘I will divide out what?’
	varikareetá sí ¹ tími	‘they would bring 60’
	orikuumbáká ká ¹ mílli	‘you would build accurately’
	orikakweesá zí ¹ vírí	‘you would pull 2’
	arikasuurá ká ¹ né	‘you would refuse 4 times’

Since deletion of melodic tone in M2 results in initial tone in *guuga* and the imperative M5 is essentially a non-prefixing subcase of M2, we predict that there should be initial tone in *guuga* after the imperative as well. This is mostly true as seen in the following examples.

(106)	reetá bá ¹ ábá	‘bring father!’
	cheerizá gó ¹ ógá	‘greet grandfather!’
	rasá kó ¹ ózá	‘throw at uncle!’
	ng’osá ká ¹ vágá	‘pull thrice!’
	reetá ká ¹ róonu	‘bring now!’
	vegá ká ¹ vírí	‘shave twice!’
	tará sá ¹ rásini	‘mention 30!’
	huuzá ká ¹ vírí	‘blow twice!’
	geendá sá ¹ láama	‘walk safely!’
	vitá sá ¹ láama	‘pass safely!’
	vohóóllá vá ¹ né	‘untie 4!’
	gorá zí ¹ vírí	‘buy 2!’

A noteworthy complication is that CV imperatives trigger exceptional deletion of the initial tone, regardless of whether the stem is toned or toneless.

(107)	<i>Toned stems</i>	
	ta guogá	‘bury grandfather!’
	nwa kavágá	‘drink thrice!’
	rya vitáánó	‘eat 5!’
	rya kavágá	‘eat thrice!’
	tya baabá	‘fear father!’
	tya koozá	‘fear uncle!’
	<i>Toneless stems</i>	
	gwa káróunu	‘fall now!’
	gwa saláama	‘fall safely!’
	sha kavágá	‘grind thrice!’
	sha sarasíni	‘grind 30!’
	zya háí	‘go where!’

We also noted that the hesternal perfective M9 loses its melodic tone before a modifier, but it is different from M7b where the melody is not even added phrase medially (thus M7b is the same as M1). The crucial difference is that the lexical toned / toneless “re-emerges” phrase medially in M7b, but phrase-medially, M9 behaves like a toneless verb in M1 – the trace of the melodic tone exists in the form of lexical tone deletion. We observe that pattern before *guuga*-modifiers as we did with CV particles.

(108)	vaashíí ká ¹ vágá	‘they ground thrice’
	waatée gu ¹ úgá	‘you buried grandfather’
	ndaanwíí sá ¹ rásíni	‘they drank 30’
	kwaarorí ká ¹ vírí	‘we saw twice’
	chaarórwí ká ¹ táánó	‘it has been seen 5 times’
	vaagééndí chígírá kí	‘they walked why?’
	kwaakoonyí gó ¹ ógá	‘we helped grandfather’
	ndaayéyí ká ¹ bísa	‘I swept totally’
	kwaarájí kó ¹ ózá	‘we promised uncle’
	kwaagórí sá ¹ bwíni	‘we bought 70’
	kwaahaambáányí ká ¹ vírí	‘we combined twice’
	vaakárájí ká ¹ vágá	‘they judged thrice’
	waasíjáarí chígírá kí	‘you sneered why?’
	yaabómórí sá ¹ máníni	‘he destroyed 80’
	yaagánágání ká ¹ vírí	‘he thought twice’
	kwaagávórányí ká ¹ míli	‘we doled out exactly’

The challenge is to integrate the disparate behavior of M2. Just to cover the empirical bases, (109) present relative verb forms of M2, where there is never melody deletion, and we see that *guuga* words do *not* receive initial tone when the melodic tone is retained.

(109)	rwá varitya guugá	‘when they will fear grandfather’
	rwá ndiháánda kává ¹ gá	‘when I will get stuck thrice’
	rwá korikora kamílli	‘when we will do properly’
	rwá koriduuká ¹ gúúgá	‘when we will reach grandfather’
	rw-áriséma ¹ báábá	‘when he will insult father’
	aváána varigwá ¹ kávágá	‘the children who will fall thrice’

The table in (110), which summarizes the behaviors of patterns according to melody content and CV versus guuga context, may aid in understanding the data patterns. Bold marks the minority pattern, the one more likely to be the result of a specific rule.

(110)	Melody content	Floats?	CV	guugá
	M2	$T_{\beta,F}$	Yes	Tone on particle
	M2(rel)	$T_{\beta,F}+$?	Yes	Tone on particle
	M9	T_H	Yes	Tone on verb
	M10	T_{β}	Yes	Tone on modifier
	M3	T_2	No	No tone on modifier
	M4	T_1	No	No tone on modifier
	M8	T_l	No	Tone on verb
	M7a	T_2+T_F	Yes	Tone on modifier
	M11	$T_{L,F}$	(Deletes)	No tone on modifier
	M1	(none)	No	Tone on particle
			Verb ~ particle	Tone on modifier

The most transparent approach to particle tone follows the hint from the M1 data, that shift happens when the stem is toneless, so what distinguishes patterns M9 and M2 is whether the melodic tone is deleted, and the derivationally pertinent question is, *when* is it deleted? Since M9 acts uniformly like a toneless form, we should assume that its tone is deleted early, thus is it always gone before a modifier.

Since M2 acts *differently* for guuga-words versus particles, we should assume that the M2 tone deletes *between* the relevant sandhi rules. This does entail that deletion of T_F and deletion of $T_{F,\beta}$ are different rules, with deletion of T_F being ordered earlier. Given that premise, we focus on the differential effect of still having a melodic tone for the computation of M2 verb plus particle, versus deleting that tone for computation of M2 verb plus guuga-modifier. As laid out in the schematic comparative derivations in (111), first the M9 tone deletes. Then T_1 links to a particle if it is preceded by a stem tone in the verb, and this applies to M2 because it still has a stem tone. Effectively, a stem tone forces the tone of a particle to link to the particle. Rather than seeing the assignment of tone to a preceding toneless verb as being primarily driven by there being a toneless stem, we can equally see the “driving force” as being the definitive association of T_1 to the particle after a stem melodic tone, leaving shift away from the particle as a subsequent alternative.

The third step is to delete the M2 melody, which gives M2 and M9 forms parallel representations. Next, T_1 links to the *initial* vowel of a polysyllable modifier, that is, a non-particle. The exact conditions for association to a guuga-modifier must be worked out, but we have identified the essential fact that the tone of such modifiers is lost when the preceding word has a stem melodic H, implying a deletion rule followed by a general association of T_1 to the left edge of a modifier. What then remains, after the tone of guuga-modifiers is disposed of, is that a remaining floating tone links to the right edge of the preceding word.

(111)	M2 [T _{β,F}] [T ₁]	M2 [T _{β,F}] [T ₁]	M9 [T _F] [T ₁]	M9 [T _F] [T ₁]	
	V cv	V guuga	V cv	V guuga	0: underlying
	[T _{β,F}] [T ₁]	[T _{β,F}] [T ₁]	[T ₁]	[T ₁]	1: T _F -deletion
	V cv	V guuga	V cv	V guuga	
	[T _{β,F}] [T ₁]	[T _{β,F}] [T ₁]	[T ₁]	[T ₁]	2: T ₁ particle link
	V cv	V guuga	V cv	V guuga	
	[T ₁]	[T ₁]	[T ₁]	[T ₁]	3: T _{F,β} deletion
	V cv	V guuga	V cv	V guuga	
	[T ₁]	[T ₁]	[T ₁]	[T ₁]	4: T ₁ polysyl link
	V cv	V guuga	V cv	V guuga	
	[T ₁]	[T ₁]	[T ₁]	[T ₁]	5: T ₁ shift
	V cv	V guuga	V / cv	V guuga	

4.4.3. DEMONSTRATIVES

The final set of phrasally-alternating modifiers are the demonstratives, the ones constructed around a secondary agreement morpheme followed by a distal (-ra) or proximal (-no) morpheme. As noted above and further exemplified below, demonstratives have initial tone unless the preceding verb ends in H. In the case of M1, this means that the stem would be a CV toned stem.

(112)	ndaakɔkwá vara	‘I paid those’
	yaakóryá hara	‘he has eaten there’
	ndaakonwá gano	‘I have drunk this’
	arátá vara	‘he will bury those’
	aranwá vira	‘he will drink those’
	aráshá vóra	‘he will grind those’
	árágwá hára	‘he will fall there’
	aráhó ¹ llá vára	‘he will hear those’
	arávé ¹ gá váno	‘he will shave these’
	arádóyá váno	‘he will hit these’

orágórá mónico	‘he will buy in it’
varakóó ¹ ná vára	‘they will help those’
oránoórá kíno	‘you will get this one’
aráká ¹ rágá vára	‘he will judge those’
aráká ¹ rángá hára	‘he will fry yonder’
varávó ¹ dóng ¹ áná hára	‘they will go around yonder’
arávárízá vára	‘he will count those’
áarákóórá hára	‘he will release yonder’
orázáázámá vára	‘you will taste those’
aráhóónóóná zira	‘he will calm those’
áragávórányirá vára	‘he will divide for those’

Since M2 undergoes a loss of melodic tone phrase-medially, we can easily understand why demonstratives are H-initial after an M2 verb: there is no final H that would trigger deletion of demonstrative H.

(113) arigwa hára	‘he will fall there’
kokitya vára	‘we are still fearing those ones’
arivega vára	‘he will shave those’
orikabiimá kúra	‘you would measure that’
kókivárízá vára	‘we are still counting those’
kokedeekerá vára	‘we are still cooking for those’
varirákóórá kúra	‘they will release that one’
arivohóóllá vára	‘he will untie those one’
vataangáázáá hára	‘they are announcing yonder’
kórigávórányá mónico	‘we will divide up in it’
kosíníkízáá váno	‘we are annoying these’
arikagávórányá víra	‘he would dole out those’

However, in the subordinate clauses of (114) where tone erasure does *not* apply, a final tone *does* lead to deletion of demonstrative when the final vowel has tone.

(114) a. vwahá varishá vora	‘who will grind those’
urí ¹ géná hára	‘the one who will wonder yonder’
omóónd-arigórá kúra	‘the person who will buy that one’
rw-ákikoongá vano	‘when he is still chasing off these’
omóónd-aríkaráángá kúra	‘the person who will fry that’
b. rwá varitya vára	‘when they will fear those ones’
rwá varrya kíno	‘when they will eat this’
avasóóréri varirákóó ¹ rá kúra	‘the boys who will release that one’
aváána varibíí ¹ má hára	‘the children who will measure yonder’
orivega vára	‘the one who will shave those’

We have treated the imperative melody M5 as the result of the same tone affix found in M2, plus deletion which in stem- and word-initial position. That tone deletes before a modifier, therefore we predict demonstratives never lose their tone after an imperative, which is the case.

- (115) kwa vára ‘pay those!’
 gwa hára ‘fall yonder!’
 vegá vára ‘shave those!’
 mapá vára ‘know those!’
 deeká víra ‘cook those!’
 gerízá kíno ‘try this!’
 kárágá vára ‘judge those!’
 rakóórá vára ‘release those ones!’
 vodóng’áná vára ‘go around those!’
 simógókízá vára ‘revive those!’
 garókízá kára ‘return that!’

We also correctly expect M9 to lose its melody and therefore not have a tone that causes deletion of the demonstrative tone, as verified in (116).

- (116) *M9: hesternal perfective*
 yaasaallízi vára ‘he injured those ones’
 vaatejí vára ‘they trapped those ones’
 ndaabíímí zára ‘I measured those ones’
 yaagórí kára ‘he bought that one’
 ndaatuungámínyí víra ‘I inverted those’
 vaayíinzírí hára ‘they worked yonder’

The further prediction, for M3, is that there should be no H when the preceding verb is 1 or 2 syllables, or 3 syllables with a long penult, which is where the final vowel bears tone in this pattern.

- (117) n-aanwí gara ‘he will drink those’
 na utyí vano ‘you will fear these ones’
 n-uushí vono ‘you will grind this’
 n-aavegé vara ‘he will shave those ones’
 na vasémé vano ‘they will insult these’
 n-oodééké kíno ‘you will cook this’
 na varííngí kára ‘they will fold that’
 na kudóvóri vino ‘we will crush these’
 na vakaragé vano ‘they will judge these one’
 naa vasííngírí hano ‘they will stop at it’
 na kusáámbórí zára ‘we will dethatch those’
 na varííndírí¹llí hára ‘they will wait yonder’
 naa nzaazáá¹mé zára ‘I will taste those’
 naa ndákóó¹rí váno ‘I will release these’
 n-aavodóng’á¹né vára ‘he will go around those’
 ni vagánágá¹né váno ‘they will think of these’
 na mbéérérí¹zí váno ‘I will mourn these’
 n-aavéézégé¹ré hára ‘he will belch yonder’
 naa mbáángarí¹záné hára ‘I will argue yonder’

In other words, demonstratives are more like CV particles, in having a ‘robust’ initial H – they are toneless only when the preceding verb ends in a final tone, and so far, that tone has been a surface-realized tone. The one fact distinguishing demonstratives and CV particles is that particles are subject to tone shift, but demonstratives are not.

Based on these facts we correctly expect initial H after the M4 remote and the M8 stative, predictions that are verified in (118) and (119) respectively.

- | | | |
|-------|--|--|
| (118) | yáá ¹ tá vára | ‘he buried those’ |
| | yáá ¹ shá vóra | ‘he ground that’ |
| | yáá ¹ gú ¹ rá kára | ‘he bbought that one’ |
| | ndáábíí ¹ má zára | ‘I measured those ones’ |
| | waaká ¹ mátá vára | ‘you caught those ones’ |
| | yaará ¹ kóórá vára | ‘he released those’ |
| | yaakáraanga víra | ‘he fried those’ |
| | vaavódong’ana hára | ‘they went around yonder’ |
| | | |
| (119) | wáá ¹ ryá kára | ‘you are in the state of having eaten that’ |
| | yáá ¹ shá vóra | ‘he is in the state of having ground that’ |
| | yáá ¹ mápná vára | ‘he is in the state of having known those’ |
| | váá ¹ tégá vára | ‘they are in the state of having trapped those ones’ |
| | yáá ¹ nóórá kíno | ‘he is in the state of having gotten this one’ |
| | yáá ¹ várizá vára | ‘he is in the state of having counted those’ |
| | yáá ¹ káragá vára | ‘he is in the state of having judged those’ |
| | yáá ¹ sáállízá vára | ‘he is in the state of having injured those ones’ |

M10 does not undergo melody deletion, and its tone remains unassociated in toned stems, because the M10 tone only associates to the second V in toneless stems. Although there *is* a melodic tone in all medial forms, that tone has no effect on the demonstrative as we see in (120), except in dimoraic toneless stems where the melodic tone associates to the verb-final vowel, giving rise to the condition for deletion of the demonstrative tone. This follows from the fact that the demonstrative loses its tone only when the final vowel of the preceding word has a tone.

- | | | | |
|-------|----|-----------------------------|---------------------------|
| (120) | a. | ndorí vara | ‘I saw those ones’ |
| | | agéé ¹ ndí hára | ‘he walked yonder’ |
| | | ngavó ¹ rí kára | ‘I divided that one’ |
| | | orakóó ¹ rí váno | ‘you released these ones’ |
| | b. | vatyɪ ¹ vára | ‘they feared those ones’ |
| | | kovoshi kára | ‘we tied that one’ |
| | | kodeechi vára | ‘we cooked those’ |
| | | ovugori kára | ‘you took that one’ |

The immediate imperative with pattern M7a does not lose its tone, and as we see in (121) demonstratives *always* lose their tone. This is almost as predicted, since this melody has a final tone which does not delete, however, this loss of tone even includes trisyllabic short penult stems where the final tone remains floating.

(121)	kang'oodé kíno	'now write this!'
	kasiníkizí vano	'now annoy these!'
	kavegé vara	'now shave those!'
	karakóú'rí vara	'now release those!'
	kazyí hara	'now go yonder!'
	kasuundórányí gano	'now pour these!'
	kadóvóri vora	'now crush that!'
	(kadóvóri	'now crush!')

This is the one context where demonstrative deletion is not strictly based on a surface H, and I will point out that there is dialect variation in terms of whether the final syllable in *kadóvóri* has a citation tone.

One final tense needs to be considered, the M11, which is a final specified L. The evidence of blocking Leftward Spread indicates that this tone remains phrase medially, notice however that the demonstrative tone does not delete in this context.

(122)	koranyoora kúra	'if we had gotten that one'
	varavariza kíno	'if they had counted this one'
	varakooŋa vára	'if they had helped those ones'
	korasimugókiza váno	'if we had revived these'
	orariindírilla hára	'if you had waited yonder'
	ararima háno	'if he had plowed at it'
	orakaraanga víno	'if you had fried these'

The tones which can appear word-finally and which do trigger demonstrative tone deletion are T_2 , T_β and T_F . By the logic of natural classes, those three tones should therefore have some unifying property setting them apart from T_L . Ultimately, we must also account for the fact that T_L , T_1 , T_2 , T_β , T_F all translate to a phonetic raised pitch target within the phonetic component, but T_L does not. One option for accomplishing that is to phonologically delete T_L at an appropriate derivational point. In that case, the problem posed by (122) is solved simply by deleting T_L before demonstrative tone is deleted.

5. Further Issues

There are a number of other phrasal patterns which are relevant to the analysis of the preceding analysis, which have yet to be treated but which also bear on the final statement of these rules. One prominent example is (123), which illustrates an NP linker tone being triggered by certain definitizing modifiers like demonstratives and possessives, where tone goes to the penult.

(123)	korira	kó'íra kw-ízing'oombe	'crying (of cows)'
	omoryaango	omoryáángo gwa marova	'door (of Marova)'
	rishaamogoma	risháámgóma rya kisaato	'gecko (of Kisaato)'
	ikihharaato	ikihárááto kira	'(that) famine'
	om'bano	om'báno gora	'(this) knife'
	imidngiro	imidíígíro jira	'(those) crutches'

Analogous to the treatment of positioned tones in the melodic system, we can account for penult tone assignment by positing a syntactic marker whose content is T_P , a penultimate-targetting tone. Although TP plays no known role in the verbal melody system, it does play a role in nominal tone. We

furthermore need to scrutinize the demonstrative alternations and guuga-modifiers in light of the fact that demonstratives can be modifiers of nouns, and many guuga-modifiers are fundamentally nominal in nature.

A second general area for investigation is the problem of subject tone in (124) where a tone appears on a toneless word before the VP, analogous to particle shift.

(124)	om'birɪ	om'birí guraguunda	'the body (will rot)'
	avasooreeri	vasóóréerí vaséémbellee	'the boys (weeded)'
	eng'oombe	eng'oombé yaakarorwa	'the cow (was seen)'
	inaasoori	ináásóorí yaakogota	'the marijuana (just disappeared)'
	marova	maróvá yaarí yéé'ng'iné	'Marova (was alone)'

This too is a tone-only marker of syntactic structure, with an apparent relationship to particle shift – tone assignment on the preceding word.

There are a number of other phrasal tonological facts which eventually need to be integrated into this theoretical framework. For example, in (125a) we see that an infinitive does not trigger insertion of “subject” tone, even though *Marova* is in some sense the subject of “cultivate”. In (125b), contrary to the pattern shown above in (104), *baabá* does not have initial H after the verb, suggesting a difference in syntactic relation (how then is that realized in phonology?). In (125c), there is not only a tone at the end of the subject of the second S, there is also a tone at the end of the first S. Finally in (125d) we find other constructions with erasure of tone, attributed above to a construction suffix with $T_{F,L}$. all of these facts need to be integrated into a unified account of melodic tones and phrasal sandhi.

(125)	a.	vwáádíjɪa marova kurɪma		'it was difficult for Marova to cultivate'	
	b.	korivega baab-í'yáákaganagana		'we will shave after father thinks'	
	c.	varárimá guug-í'yáá'káryá		'they will plow after grandfather eats'	
		ndaakódéé'k-ínámá na maróvá yaakóréét-amarwa ^o		'I cooked the meat and Marova brought alcohol'	
	d.	sééngɛ	'aunt'	seenge mokáána	'the girl's aunt'
		omwáámi	'chief'	omwaami Rodééji	'Rodejeji's chief'
		baabá	'father'	baaba ródééji	'Rodejeji's father'