

Generating and linking grammatical tones in Bantu: 3 proposals contrasted

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(1) Hyman (2014a:484) “Tone: Is it Different?”

Tone systems have properties which SURPASS segmental and metrical systems...I conclude that tone can do everything that segmental and metrical phonology can do, but that the reverse is not true...Since some tonal phenomena have no segmental or stress analogues, anyone who is interested in the *outer limits* [cue tv music] of what is possible in phonology would thus be well-served to understand how tone systems work. (Emphasis and bracketed commentary mine)

(2) Kisseberth & Odden (2003:70)

The close examination of Bantu tonal systems reveals patters of *extraordinary complexity*...There are few other phonological phenomena as complex as Bantu tone...As a result, the importance of Bantu tone systems for the theoretical study of phonology cannot be overestimated. (Emphasis mine)

Different tones in Bantu: lexical vs. grammatical

(3) Lexical tones: found in nominal, adjectival and verbal roots

- a. Noun roots in Venda: mù-tùkà ‘youth’, mù-ràthú ‘brother’, mù-sélwà ‘bride’, mù-sádzí ‘woman’
(K&O 2003:60)
- b. Adjectival roots in Cilungu: /tifi/ ‘black’, /kúlu/ ‘big’, /sumá/ ‘good’, /nóonó/ ‘small’
(Bickmore 2007)
- c. Verb roots in Bemba: lùk-á ‘weave!’ (/luk/); lúk-á ‘vomit’ (/lúk/)
(Bickmore & Kula 2013)

(4) “Melodic” (aka grammatical/inflectional/affixal) tones

Tone(s) added to a word as an exponent (sometimes in conjunction with segmental affixes) of the expression of an inflectional property or cluster of inflectional properties, e.g. the tense/aspect/mood/polarity (TAMP).

Example of Melodic Tone: Cilungu, Zambian Bantu (examples from Bickmore 2007 and field notes)

(5) Verbal morphology: SubM - TAM [_{Mactostem} ObjM [_{Stem} VRoot - Extensions - Final Vowel]]

(6) Cilungu verbs—shown here in non-phrase-final position; bracket marks stem boundary

a. Verb with no MH; Present Progressive (one of 10 TAM combos)

tú- kú- [sùkílil -à /tú-ku-sukilil-a/
1pl-Prog-accompany-FV (NB: Productive rule of H Doubling)
‘we are accompanying’

b. Verb with MH on μ_2 of stem; Recent Past (one of 4 TAM combos)

w- àà- cí- mú- [sùkílí -íìlè /u-á-cí-mu-[sukilil-ile +H₂/
3sg-Pst-Rec-3sgO-accompany-Pst
‘he/she recently accompanied him/her’

c. Verb with MH on FV; Potential (one of 12 TAM combos)

tù- ngá- mú- [sùkílíl -á /tu-ngá-mu-[sukilil-a +H_{Fin}/
1pl-Pot -3sgO-accompany-FV
‘we can accompany him/her’

d. Verb with MH on μ_2 -FV; Future (one of 12 TAM combos)

tú- lá- [sùkílíl -án -á /tú-la-[sukilil-an-a +H_{2-Fin}/
1pl-Fut-accompany-Recip-FV
‘we will accompany each other’

(7) At the end of their presentation of melodic tones in Chichewa, Downing & Mtenje (2017:208) ask the question I want to examine here: *Where in the grammar* are the grammatical tone patterns represented? Their response:

This issue has, surprisingly, received no attention in the literature on Bantu morphosyntax, as far as we know, and relatively little attention in the phonology literature analyzing

grammatical tone patterns...As we can see, the answer to this question is not obvious, since *a combination of factors* can determine the choice of tone pattern. (Emphasis mine)

- (8) What's obvious here? Both morpho-syntactic (inflectional) AND phonological factors are at play in the realization of Melodic Tones in Bantu.

What's not so obvious? Assuming a model where the morpho-syntax precedes and feeds a phonology component, is it possible that the generation of melodic tones is done solely on the basis of morpho-syntactic factors, and the docking/linking of these tones is done in the phonological component purely on the basis of phonological factors?

Or...does the very generation of the MTs in the morpho-syntax sometimes need to access phonological information, and does the docking/linking of the tones in the phonology sometimes need to be sensitive to morpho-syntactic factors?

3 Proposals Contrasted

#1 “All in the Phonology” Hypothesis

- (9) Melodic tones are not generated by the morpho-syntax, and thus not present in the UR. They are instead both added and linked completely in the phonology. This seems suspicious, at least for Cilungu, as the melodic tone appears to be a *morphological* exponent of inflectional properties on par with concomitant segmental affixes. E.g. the Recent Past in Cilungu (6b) above triggers 2 prefixes /á-/ , /cí-/ , a suffix /-ile/, and a melodic H. What would the evidence be to conclude that the segmental exponents of the inflectional category are introduced in the morphology, but the MH is not?

#2 “Annotated Tones” Hypothesis: distinguishable MTs generated by the morpho-syntax, docked in the phonology

For Cilungu: 3 distinct MHs need to be generated and assigned within the morpho-syntax (approach for Cilungu in Bickmore 2007)

(10) Recent Past (6b)	Potential (6c)	Future (6d)														
u-a-ci-mu-sukilil-ile	tu-nga-mu-sukilil-a	tu-la-sukilil-an-a														
<table border="0"> <tr> <td> </td><td> </td><td></td> </tr> <tr> <td>H</td><td>H</td><td>H_i</td> </tr> </table>				H	H	H _i	<table border="0"> <tr> <td> </td><td></td> </tr> <tr> <td>H</td><td>H_j</td> </tr> </table>			H	H _j	<table border="0"> <tr> <td> </td><td></td> </tr> <tr> <td>H</td><td>H_k</td> </tr> </table>			H	H _k
H	H	H _i														
H	H _j															
H	H _k															

- (11) a. A number of TAMP combos (4, including Recent Past) include exponent H_i
 b. A number of TAMP combos (12, including Potential) include exponent H_j
 c. A number of TAMP combos (12, including Future) include exponent H_k

(12) Phonology: rules/constraints

- a. H_i linked to μ_2
- b. H_j linked to μ_{Fin}
- c. H_k linked to $\mu_2\text{-Fin}$

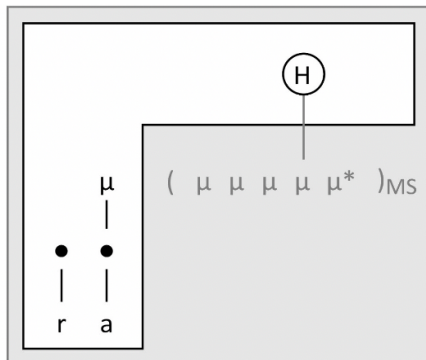
(13) Pros: phonological rules (12) have no *direct* morpho-syntactic conditioning

Cons: 3 different types of floating Hs, which phonological rules are sensitive to

(14) One recent approach in the same spirit: phantom structure (Rolle 2018)

In addition to an underlying TAMP consisting of any segmental exponents and a floating tone (the Melodic High), it also contains “phantom structure,” a plane containing TBUs to which the underlying floating H can be indicated to be linked.

(15) Example of phantom structure in the Kikuria Inceptive, realized as a /ra-/ prefix and a H which links to the fourth mora of the verb stem (Rolle & Lionnet 2020). Constraints will ensure that the tonal associations in the output match (are faithful to) the tonal associations in the phantom structure. Analogous account available for the 3 Cilungu patterns.



#3 “**Single Tone**” Hypothesis: single type of Melodic Tone generated by the morpho-syntax, docked in the phonology

(16) Recent Past

u-a-ci-mu-sukilil-ile
 | |
 H H H

Potential

tu-nga-mu-sukilil-a
 |
 H H

Future

tu-la-sukilil-an-a
 |
 H H

(17) In the phonology: three different MH docking rules, each of which will have a long list of TAMP combos which trigger them (4 for μ_2 , 12 for μ_{Fin} , and 12 for $\mu_2\text{-Fin}$).

(18) Rule which associates some MHs to μ Fin in Cilungu

μ]stem
⋮
Ⓜ

In: Potential, Yesterday Past, Yesterday Past Progressive, Recent Past, Perfect, Affirmative Subjunctive...

(19) Alternative: 4 co-phonologies: one for no MH, and one for each of three MH patterns. Each co-phonology then has the long list of TAMP combos which trigger it.

(20) In order to explore possible differences in the latter 2 hypotheses: We must identify the range of factors which determine

- a. whether a MT will be present in the input or not
- b. the docking pattern of a particular MT

Moving outside Cilungu: Brief summary of morpho-syntactic factors influencing MT pattern

(21) Thematic issue of *Africana Linguistica* (Volume XX, 2014) on Melodic Tones in Bantu, edited by myself and David Odden.

(22) Languages examined (28+ lgs from a dozen countries) by Guthrie (1967-71) zone

A: Bakweri [Cameroon] (Marlo & Odden), Basaa [Cameroon] (Makasso)

B: Orungu [Gabon] (Maniacky & Ambouroue)

C: Dibole [Congo] (Leitch)

E: Dawida [Kenya] (Philippson)

G: Bena [Tanzania] (Morrison)

H: Kamba [Kenya] (Roberts-Kohn)

J: Jita [Tanz] (Downing), Kuria [Tanz] (Marlo et al.), Lulamogi [Uganda] (Hyman), Kifuliiru [DRC] (Van Otterloo), Idhako [Ke] (Ebarb et al.), Nyala-West [Ke] (Ebarb et al.), Wanga [Ke] (Ebarb et al.)

K: Totela [Zambia] (Crane)

M: Lungu [Zambia], Fipa [Tanz], Namwanga [Zam], Bemba [Zam], Lala [Zam], Ndali [Tanz] (Bickmore)

P: Emakhuwa [Mozambique], Ecuwabo [Moz] (Kisseberth & Guérois), Makwe [Moz] (Devos), Simakonde [Tanz] (Manus)

R: Kwanyama, Mbadja [Angola, Namibia] (Halme-Berneking)

S: Shona [Zimbabwe] (Odden)

- (23) Tense/Aspect/Mood: always a factor, but as a package, not individually. E.g. we found no language where all “Past” tenses had a particular MH pattern, or all “Incomplete” aspects, etc.
- (24) Polarity: Extremely common (unless negation uniformly accomplished syntactically rather than morphologically (e.g. Matumbi, Basaa, Lingala)).
- Most languages: a factor in some TAMs but not others (true of Cilungu)
 - Totela: all negatives select the $\mu 2$ melody
 - Kifuliiru (where negation transparent morphologically): no influence on MT pattern
- (25) Subordination & Relativization
- Non-relative vs. relative: Dawida, Jita, Kamba, Dibole
 - Non-relative vs. Subject-relative vs. Object-relative: Bakweri, Lulamogi, Makwe
 - Main clause affirmative vs. any subordinate or any negative: Shona
 - Non-factor: Lungu, Kifuliiru, Bena, and Basaa
- (26) Focus as well as Conjoint/Disjoint: Kikamba, Mbadja, Kuria, Makwe and Emakhuwa.
- (27) Object Marker:
- In many languages, relevant in Subjunctive and Imperative
 - Jita: presence of two OMs
 - Nyala West: presence of OM relevant in Immediate Past Negative
 - Makwe: presence of OM relevant in Negative Progressive
- (28) Subject Marker
- Simakonde Future w/ 3 sg subject takes MH on $\mu 1$ (but not with other SMs)
 - Kuria: inceptive and immediate past anterior with a 1st or 2nd person subject selects H on the 4th mora; with a 3rd person in the same TAMPs there will be a H on the first and fourth morae.
- (29) Reflexive Prefix: triggers particular MT pattern in Bakweri, Lulamogi, and Shona.
- (30) Indications of motion (‘go Verb’, ‘come Verb’): Dibole, Bena
- (31) Presence of verbal extensions: Bena: if extensions present, then penult; if not, then antepenult

(32) Important Question: In addition to the many different morpho-syntactic factors enumerated above, are there also *phonological* factors which influence MT realization?

Cilungu Perfect forms

(33) $\mu 2$ pattern

- a. à-sùkíl-íìl-è ‘he/she has accompanied’ /a-sukilil-il-e + $\mu 2$ /
- b. à-sópólw-íìl-è ‘he/she has untied’ /a-sópolol-il-e + $\mu 2$ /
- c. à-tá-mú-sùkíl-íìl-è ‘he/she hasn’t accompanied him/her’ /a-tá-mu-sukilil-il-e + $\mu 2$ /
- d. tù-tá-mú-sùkíl-íìl-è ‘we haven’t accompanied him/her’ /tu-tá-mu-sukilil-il-e + $\mu 2$ /

(34) μ Fin pattern

- a. à-tá-sópólw-íìl -é ‘he/she hasn’t untied’ /a-tá-sópolol-il-e + μ Fin/
- b. tù-tá-sópólw-íìl -é ‘we haven’t untied’ /tu-tá-sópolol-il-e + μ Fin/

(35) $\mu 2$ -Fin pattern

- a. tú-mú-sùkíl-íìl-é ‘we have accompanied him/her’ /tú-mu-sukilil-il-e + $\mu 2$ -Fin/
- a. tú-sópólw-íìl-é ‘we have untied’ /tú-sópolol-il-e + $\mu 2$ -Fin/

(36) Summary of the Cilungu Perfect; factors: TAM, Polarity, Root tone, SM tone

	Affirmative		Negative	
Root \emptyset	SM \emptyset	$\mu 2$	SM \emptyset	$\mu 2$
	SM H	$\mu 2$ -Fin	SM H	$\mu 2$
Root H	SM \emptyset	$\mu 2$	SM \emptyset	μ Fin
	SM H	$\mu 2$ -Fin	SM H	μ Fin

(37) Annotated Tones Hypothesis (morphological factors in green, phonological factors in red.)

Morphosyntax:

- a. Perfect in affirmative, toneless SM, Perfect in negative, toneless root: H_i ($\mu 2$)
- b. Perfect in negative, H root: H_j (μ Fin)
- c. Perfect in affirmative, H SM: H_k ($\mu 2$ -Fin)

Phonology: Linking rules sensitive to annotations (e.g. phantom structure)

(38) Single Tone Hypothesis

Morphosyntax: all **Perfect** forms generate a uniform MH exponent

Phonology:

- a. μ 2 co-phonology: **Perfect** in **affirmative**, **toneless** SM, **Perfect** in **negative**, **toneless** root
- b. μ Fin co-phonology: **Perfect** in **negative**, **H** root triggers
- c. μ 2-Fin co-phonology: **Perfect** in **affirmative**, **H** SM

Summarizing and contrasting the two hypotheses for Cilungu

(39) Annotated Tones Hypothesis

- a. Both **morpho-syntactic** and **phonological** info accessed in URs
- b. No morpho-syntactic information needed in phonology, just faithfulness to phantom structure. (Some languages might employ a regular **phonological** rule to link MHs.)

(40) Single Tone Hypothesis

- a. Just **morpho-syntactic** info used to generate melodic tones in URs
- b. In phonology, both **morpho-syntactic** as well as **phonological** information required to link melodic tones.

(41) Is it the case that the Single Tone Hypothesis does NOT ever need any reference to phonological information? I.e. that MTs can be generated solely on the basis of morphosyntactic/inflectional factors, and that it is just the linking of the MHs in the phonology which would naturally be sensitive to phonological factors. Or, are there cases where the morpho-syntax requires some phonological information just to correctly generate MTs in the first place.

(42) Lala (M.52), Zambian Bantu language (author fieldnotes) has the same set of MH patterns found in Cilungu: 1) no MH, 2) MH on μ 2, 3) MH on μ Fin, MH on μ 2-Fin. In Cilungu we find that some TAMs never have any MH and others always do (though an individual TAM, like the Perfect, can exhibit multiple docking patterns, depending on other factors). While this is generally true in Lala, it is not always so. In the Perfect, verbs with toneless roots have no MH, while those with H-toned roots have a MH which docks onto μ 2-Fin.

- (43) a. $t\grave{u}-li-shiik-il\grave{e}$ /tu-li-[shiik-ile/
1PL.SM-PRF-bury-PST
'we have buried'
- b. $t\grave{u}-li-b\acute{e}l\acute{e}ng-\acute{e}l\acute{e}$ /tu-li-[b\acute{e}leng-ile + μ 2-Fin/
1PL.SM-PRF-read-PST
'we have read'

- (44) a. tu-li-shiik-ile (43a) b. tu-li-beleng-ele (43b)
- H? | \ : /
- H H

(45) If the morphosyntax generates MHs purely on inflectional factors, w/o any recourse to the phonological properties of the form, then either: both forms above have a MH or neither does.

(46) If neither do, then some rule/constraint in the phonology inserts a H tone and links it to $\mu 2$ -Fin *just in the event there is stem-initial H* (i.e. in (44b) but not (44a)). This would not only be the only H insertion rule in the language (as all other MHs are present due to being inserted in the morpho-syntax) but such a process obviously is a strange (highly marked) phonological rule, flagrantly violating the OCP.

(47) If a MH *is generated* by the morpho-syntax for both forms, the co-phonology it triggers would link the H to $\mu 2$ -Fin, but the MH would need to be deleted (or left unassociated) just in the event that it was preceded by a toneless mora (44a), but not a H-toned one (44b), again, a typologically very strange phonological rule.

Other analogous examples in the literature

(48) Tura, Kenyan Luyia language (Marlo 2008) has MH patterns accounted for by 2 docking rules: 1) stem-initial syllable, and 2) stem-final mora. No tonal contrast in verb roots—all toneless.

(49) Marlo’s “Pattern 4c” (relevant for negative imperatives)

a. o-la-mú-[kaangúlul-a] tá
 2sg-IMP-3Os-untie-FV NEG
 ‘don’t untie him!’

b. o-la-[liingeer-a] tá
 2sg-IMP-watch-FV NEG
 ‘don’t watch!’

(50) In Marlo’s analysis of this pattern, the MH docks onto the first syllable of the stem and shifts to the following syllable (since the stem is larger than 2 syllables), but only initially docks onto the stem-initial TBU *if the pre-stem TBU is High*. If it is toneless then the MH fails to dock. (Thus, it only docks if it would cause an OCP violation.)

(51) Logoori, Kenyan Luyia language (Odden 2018) mainly exhibits MH on: first syllable, μ_2 of stem, second mora after the initial syllable, final mora.

(52) Imperatives in Logoori (Odden 2018)

- | | | | |
|----|----------------|--------------------------|------------------|
| a. | tuŋámínánínání | ‘invert for each other!’ | /túŋamijaninani/ |
| b. | vuruganya | ‘stir’ | /vuruganya/ |

(53) Odden analyzes forms such as (52a) with H-toned roots as having a MH assigned to the final mora and spreading leftward to μ_2 , ultimately inducing deletion of the root H. For imperatives such as (52b), he states “Toneless verbs on the other hand have no H at all.”

(54) The choice here is to either 1) have the generation of the MH by the morphology be sensitive to the phonological structure of the form and simply not be generated in (52b), or 2) if a MH is generated in both cases and undergoes unbounded leftward spreading, there will be a rule which deletes the multiply-linked H just in case it does NOT violate the OCP (52b), and leave the one that does (52a).

(55) Tachoni imperatives (Odden 2009) have a similar pattern. In forms with H-toned roots, a MH docks onto the FV, spreads left, deletes the root H, and delinks from FV, but does not link at all if root is toneless.

- | | | | |
|----|------------|----------|-------------|
| a. | karáánga | ‘fry!’ | /káranga/ |
| b. | beechakala | ‘belch!’ | /bechakala/ |

One additional fact about Cilungu...

(56) In TAMs with /á-/ (and 2 with /á-cí-/), one generally finds the MH on μ_{Fin} .

- | | | | |
|----|-----------------|-----------------------------------|-------------------------------------|
| a. | tw-áá-súkílíl-á | ‘we have just accompanied’ | /tú-á-sukilil-a +H _{Fin} / |
| b. | yá-á-súkílíl-á | ‘they (C2) have just accompanied’ | /yá-á-sukilil-a +H _{Fin} / |
| c. | vy-áá-súkílíl-á | ‘they (C8) have just accompanied’ | /ví-á-sukilil-a +H _{Fin} / |
| d. | tw-áá-sópólól-á | ‘they have just untied’ | /tú-á-sópolol-á +H _{Fin} / |

(57) But just in case the SM is toneless (class 1 /u-/, class 4 /i-/, class 9 /i-/), then no MH is realized on the FV (or anywhere else)

- | | | | |
|----|----------------|-----------------------------------|-----------------|
| a. | w-àà-súkílíl-à | ‘he/she has just accompanied’ | /u-á-sukilil-a/ |
| b. | y-àà-súkílíl-à | ‘they (C4) have just accompanied’ | /i-á-sukilil-a/ |
| c. | y-àà-súkílíl-à | ‘it (C9) has just accompanied’ | /i-á-sukilil-a/ |
| d. | w-àà-sópólól-à | ‘he/she has just untied’ | /u-á-sópolol-a/ |

- (58) a. tu-a-sopolol-a (56d) b. u-a-sopolol-a (57d)
- | | | |
|-------|---|--------|
| | : | |
| H H H | H | H H H? |

(59) Rolle & Bickmore (2022) argue that this should be treated in the morpho-syntax as phonologically conditioned suppletive allomorphy and not within the phonology as a phonological process (even if morphologically conditioned). If correct, this would be further evidence that it's probably not possible to make the generation of MTs completely blind to phonological structure.

Summary/Conclusion

(60) Annotated Tone Hypothesis

- a. The generation of the MTs in the morpho-syntax must consider a range of **inflectional properties** of the verb, as well as various **phonological properties** of the form.
- b. The phonology generally does not need access to morpho-syntactic information, but simply docks the tones according to the specified annotation (e.g. faithfulness to phantom structure).

(61) Single Tone Hypothesis

- a. The generation of the MTs in the morpho-syntax in many Bantu languages (including Cilungu) is solely dependent on **inflectional factors**, and is phonology-free. In order for it to be completely free of phonological considerations (in all Bantu languages), we end up having to posit linking and/or deletion rules in the phonology of some languages (Lamba, Tura, Logoori, Tachoni) which are typologically very strange, e.g. running counter to normal OCP expectations, or long-distance reference to the tonal status of a particular prefix (57).
- b. The phonology requires access to both **morpho-syntactic** information (some of which is duplicative in what was required in the morpho-syntax) as well as **phonological** information in order to associate the MTs correctly.

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