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Author
Hyman, Larry M

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Morphological Tonal Assignments in Conflict: Who Wins?
Larry M. Hyman
University of California, Berkeley

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ABSTRACT

In this paper I am concerned with the following three issues: (i) What is the inventory of morphological "contributors" to verb tone paradigms? (ii) What happens if the different contributors conflict? (iii) What does this say about how (tonal) morphology works in general? Drawing mostly on African examples I show that although tonal morphology can do everything that non-tonal morphology can do, it can also do much more. The paper ends with cases where tonal morphology applies at the phrase level, blurring the distinction between phonology, morphology, and syntax.

1.   Introduction

The goal of this paper is to address the following questions: (i) What is the inventory of morphological "contributors" to verb tone paradigms? (ii) What happens if the different contributors conflict? (iii) What does this say about how (tonal) morphology works in general? In §2 I present examples showing that tonal morphology can do anything that non-tonal morphology can do. This is followed by an examination of Haya verb stem tonology in §3. In §4 I then present cases that show that the reverse is not true: tonal morphology can do things that non-tonal morphology cannot do. In these cases which involve tonal action across words, the result is that tonal morphology often obscures the compartmentalization of phonology, morphology and syntax. The question of why tone should have such unique properties is addressed in the conclusion in §5.

2.   Tonal morphology can do whatever non-tonal morphology can do

As discussed in Hyman (2011: 203), it is sometimes claimed that tone cannot mark certain things. For example, a proposed universal made in the presidential address at the Linguistic Society of America a few years ago was that "No language uses tone to mark case". That this is not true is observed in the following examples from Maasai [Nilotic; Kenya, Tanzania] (Tucker & Ole Mpaayei 1955: 177-184; cf. Bennett 1974; Plank 1995: 59-62; Payne 2008):

(1)		*nominative*	*accusative*			*nom. vs. acc. tone patterns*
	class I:	èlùkònyá	èlúkúnyá	'head'		L^n-H vs. L-H^n
		èncùmàtá	èncúmátá	'horse'		
	class II:	èndérònì	èndèrónì	'rat'		H on σ_2 vs. σ_3
		ènkólòpà	ènkòlópà	'centipede'		
	class III:	òlmérégèsh	òlmérègèsh	'ram'		H on σ_2 & σ_3 vs. on σ_2 only
		òlósówùàn	òlósòwùàn	'buffalo'		
	class IV:	òmótònyî	òmótònyî	'bird'		identical tones—no change
		òsínkìrrî	òsínkìrrî	'fish'		

As seen in the examples and summarized to the right, the first three declension classes show only a tonal difference between their nominative vs. accusative forms. Many other languages could be cited to show that it is not only case that can be exclusively marked by tone. As Hyman & Leben (2000: 588) put it, "tonal morphology... exhibits essentially the same range of morphological properties as in all of segmental morphology". As common linguistic sense tells us, if tone can be a morpheme, it can do everything that a morpheme can do.

Concerning verb tone paradigms, the focus of this paper, we therefore expect that anything that can be marked by a segmental affix or process can also be marked by tone. This includes inflectional marking of subject, object, transitivity, tense, aspect, mood, negation, clause type etc. as well as derivational marking of causative, applicative, reciprocal, passive and other verb forms, as well as processes that derive one word class from another. As an example, verbs are detransitivized in Kalabari [Ijoid; Nigeria] by assigning a /LH/ melody (Harry & Hyman 2012):

(2)   *transitive*   *intransitive*

   a. kán   H   'tear, demolish'   kàán   LH   'tear, be, demolished'
       kɔn   L   'judge'   kɔɔ́n   LH   'be judged'
   b. ányá   H-H   'spread'   ànyá   L-H   'be spread'
       dìmà   L-L   'change'   dìmá   L-H   'change'
       sá↓kí   H-↓H   'begin'   sàkí   L-H   'begin'
   c. kíkímà   H-H-L   'hide, cover'   kìkìmá   L-L-H   'be hidden, covered'
       pákìrí   H-L-H   'answer'   pàkìrí   L-L-H   'be answered'
       gbóló↓má H-H-↓H 'join, mix up'   gbòlòmá L-L-H   'be joined, mixed up'

The "tone is like everything else" idea would lead us to expect the same degree of uniformity of tonal exponence as in a segmental paradigm. The same tone or tonal melody should be as consistent a spell-out of a given morphosyntactic feature. However, this may not always appear to be the case. Tone has a greater independence ("autosegmentality") and ability to wander (see §4). Any study of a tone system with a reasonably complex tonal morphology must find a way to describe the alternations that take place within the verb system. Verb tone paradigms are often presented in prose, as a table, or more rarely of individual tone assignment rules. I reproduce an example of one such table in (3) vs. a set of rules in (4).

(3)   Tone on verb stems in Mambay [Adamawa; Cameroon] (Anonby 2011: 374)

tonal verb class	example verb	PERFECTIVE	PERFECT	PLUPERFECT	FUTURE	OPTATIVE	IMPERFECTIVE (verbal noun)
1 (intr., CVX)	yáá	H	°H[L	H	H	H	(lex.)
1 (intr., CV)|	gé	H	HL*	H	H	H	(lex.)
1 (tr.)	ɓéé	H	H	H	H	H	L
2 (intr.)	sùù	L	°H[L	H	H	H	(lex.)
3 (intr.)	vè	L	L	L	H	L	(lex.)
4 (intr.)	hèè	L	L	L	L	L	(lex.)
4 (tr.)	gùì	L	L*	L*	L	L	L
5 (intr., tr.)	yàà	L	LHL*	LHL*	LH	LH	HL
6 (intr., tr.)	ʔòògí	LH	LHL*	LHL*	LH	LH	HL

°H[L = floating H tone on the left boundary of a L stem
* = replacive melody, i.e., dominates the entire verb word (see 7.3.2.2.3)

(4)   Final stem tone assignment rules in Haya [Bantu; Tanzania] (Hyman & Byarushengo 1984: 76)

Such differences raise the issue of how tones should be assigned within a verb paradigm: (i) by global patterning of partially or fully arbitrary "tonal verb classes", as proposed for Mambay; (ii) by reference to the morphosyntactic features of individual cells, as proposed for Haya; (iii) by some other way? To a large extent it may depend on the situation in the individual language. (I return to Haya in §3.)

What is particularly striking in such systems is that the tone assignments can conflict in a number of ways: (i) by domain (e.g. root vs. stem vs. word); (ii) by function (e.g. lexical vs. derivational vs. inflections); (iii) by morphosyntactic feature (e.g. tense vs. aspect vs. negation). Such potentials hold whether the base is mono- or polysyllabic, contrasting only two tone heights or several. In the latter case consider for example the eight tone patterns on monosyllables in Iau [Indonesian; Papuan], which are lexical on nouns vs. morphological on verbs ($^{\uparrow}$H = superhigh).

(5)
Tone	Nouns		Verbs		(Bateman 1990: 35-36)
H	bé	'father-in-law'	bá	'came'	*totality of action punctual*
M	bē	'fire'	bā	'has come'	*resultative durative*
H$^{\uparrow}$H	bé$^{\uparrow\prime}$	'snake'	bá$^{\uparrow\prime}$	'might come'	*totality of action incompletive*
LM	bè$^{-}$	'path'	bà$^{-}$	'came to get'	*resultative punctual*
HL	bê	'thorn'	bâ	'came to end point'	*telic punctual*
HM	bé$^{-}$	'flower'	bá$^{-}$	'still not at endpoint'	*telic incompletive*
ML	bē`	'small eel'	bā`	'come (process)'	*totality of action durative*
HLM	bê$^{-}$	'tree fern'	bâ$^{-}$	'sticking, attached to'	*telic durative*

Although the inflectional categories on Iau verbs in (5) lend themselves to a featural, paradigmatic display, the portmanteau tone patterns do not appear to be segmentable. From the summary table in (6) the only generalizations that can be extracted are that telic and incompletive both begin H and resultative ends mid:

(6)

	telic	*totality of action*	*resultative*
Punctual	HL	H	LM
Durative	HLM	ML	M
Incompletive	HM	H$^\uparrow$H	

In other cases segmenting the tones by morpheme is straightforward, as in Modo [Central Sudanic; Sudan] (Nougayrol 2006):

(7)

		/ata, H/ 'be bitter'		/uba, L/ 'sing'	
1sg, 2sg, 2pl	/H-/	átá H-H	'you are bitter'	úbà H-L	'you sing'
3sg. 1pl, 3pl	/L-/	àtá L-H	'it is bitter'	ùbà L-L	's/he sings'

As seen, verb roots can be H or L which, when conjugated, can acquire a H- vs. L- prefix. While the output consists neatly of the four logical combinations in succession of two tones x two tones (inflection + root) in succession, a consistent exponent can be "subtonal", consisting of less than a full tone. For example, the four combinations of person + tense features also produce a four-way distinction in Gban [Mande; Ivory Coast] (Zheltov 2005: 24):

(8)

	present		*past*		
	sg.	*pl.*	*sg.*	*pl.*	
1st pers.	ĩ^2	u^2	ĩ^4	u^4	[+upper]
2nd pers.	εε^2	aa^2	εε^4	aa^4	
3rd pers.	ε^1	ɔ^1	ε^3	ɔ^3	[-upper]
	[-raised]		[+raised]		

As seen, tone differs consistently between 1st/2nd vs. 3rd person, the latter being one step lower. In addition, all tones are two steps higher in the past than they are in the present. In (8) I have arbitrarily represented the person features as [±upper] and the tense features as [±raised], although they could have been reversed.

In addition to the above concatenativity, tone (and other prosodic features) show the familiar sensitivity to internal morphological structure. Thus consider the "tonal layers" [strata] which Andersen (1992-4: 61) reports for Dinka [Western Nilotic; Sudan], which is monosyllabic, but polymorphemic:

(9)   wệec 'kick it hither!' [kick.CENTRIPETAL.2sg]

		voice	*length*	*tone*
inflectional layer	(2sg)	—	—	H
derivational layer	(CP)	[+breathy]	+1	L
root layer	('kick')	—	1	HL

In derivational terms, the root /wêc/ 'kick' acquires breathiness, vowel length, and L tone to become intermediate *wẹ̀ec* when undergoing the centripetal ('hither') derivation. The L is then replaced by H to realize the 2nd person singular subject of the imperative. As Andersen puts it, "The morphological layers are simultaneous but 'vertically' ordered, with the root as the 'deepest' layer, optionally followed by the derivational layer, followed by an inflectional layer."

This results in the above "cyclic" effects. (For more on cyclicity in tonal phonology and morphology, see Pulleyblank 1985, 1986.)

In a quite different kind of system, polysyllabic Chichewa [Bantu; Malawi], verb stems can be toneless or can have a single H on either their final or penultimate syllable (Kanerva 1989, Mtenje 1987, among others). With some dialect differences, H tones are assigned as follows (Hyman & Mtenje 1999: 98-99):

(10) a. Final H tone is assigned by

   (i)   verb roots with a lexical /H/
   (ii)   certain derivational suffixes such as /-its-/ 'intensive', /-ik-/ 'stative', /-uk-/ 'reversive intr.' and (in Nkhotakota dialect) passive /-idw-/
   (iii) the subjunctive final vowel /-é/ (= the only case of a TAM conditioning final H
   (iv)   non-reflexive object prefixes (in Nkhotakota dialect).

   b. Penultimate H tone is assigned by

   (i)   some affirmative tenses
   (ii)   most negative tenses
   (iii) the reflexive prefix /-dzí-/
   (iv)   object prefixes in Ntcheu dialect (vs. final H in Nkhotakota)

   c. In the absence of one of the above conditioning factors the stem will be toneless.

As seen, final H is mostly lexical and derivational (with the exceptions of subjunctive *-é* and object prefixes in Nkhotakota dialect), while penultimate H is inflectional, marking TAM, negation, the relative prefix, and object prefixes in Ntcheu dialect.

In cases where the more than one morpheme contributes the same tonal assignment, only one H is realized. Thus, although the following example from Nkhotakota dialect (Sam Mchombo, pers. comm.) has four sponsors of final H tone, only one final H actually materializes (Hyman & Mtenje 1999: 101):

(11) [ti- [[[[pez-] -etsets-] -edw-] -e]] → ti-pez-etsets-edw-é ...   'let's be found a lot'
           H   H   H   H   1pl-find-INTENS-PASS-SBJV

In general, in cases of conflict, penultimate H overrides final H—but with one crucial exception: subjunctive final *-é* overrides reflexive/object prefix penultimate, presumably because of scope considerations. While it may seem that all Hs may be assigned by rule, Hyman & Mtenje point to evidence that at least some Hs need to be underlyingly linked to their sponsor—but still follow instructions as to where to go (to the final or penultimate syllable). In (12a), the object prefix /H/ shifts to the penult (Ntecheu dialect). (The remote past tense marker is /-naa-/ to which the H of the subject prefix /tí-/ spreads. The phrase-penultimate vowel lengthens by general rule.)

(12) a. /tí-naa-mú-fotokozer-a/ → tí-naa-fotokozéer-a   'we explained to him'
              | | |⸝⸍ |
              H$_i$ H$_j$ H$_i$ H$_j$

     b. /ti-ná-mú-fotokozer-a/ → tí-na-mu-fotokoz̲eer-a   'we explained to him'
                | | |⸌⸍⸍
                H   H → Ø   H

However, whenever an object prefix is preceded by a H tone morpheme, there is no penultimate H tone. This is seen in (12b), where the general past prefix is /-ná-/. As shown, the /H/ of the /-mú-/ is deleted by what is commonly known as Meeussen's Rule in Bantu: the second of two Hs in succession is deleted. Since it would be odd to have a rule that said "object prefixes assign a H to the penult unless they are preceded by a H", I follow the earlier account with underlying sequences of Hs as in (12b).

Finally, note that there no rules in Chichewa which shift a pre-existing final H to the penult: all penultimate assignment rules insert a /H/ at the same time. For this reason one cannot assume that the penultimate pattern simply applies an instruction to mark off the last syllable as extrametrical. Hyman & Mtenje's (1999: 102) proposal is that final H is assigned at the stem domain, while penultimate H is assigned within a larger "macro-stem" domain. The "later" macro-stem domain thus overrides the earlier stem domain. The major exception is subjunctive -*é*, which is stem-level despite its greater scope.

Other cases in the literature show that the "uppermost" morphological structure wins. Thus, Inkelas (2011: 75) provides the following word tree structure from Hausa [Chadic; Nigeria]:

(13)   nèn-nè:mó: 'seek repeatedly!'

      nén-né:mó: i.e. imperative >> ventive >> base

                    né:mó:

CVC-   nè:má: (LH)   -ó: (H)   -Ø (LH)
PLURACTIONAL-   'seek'   -VENTIVE   -IMPERATIVE
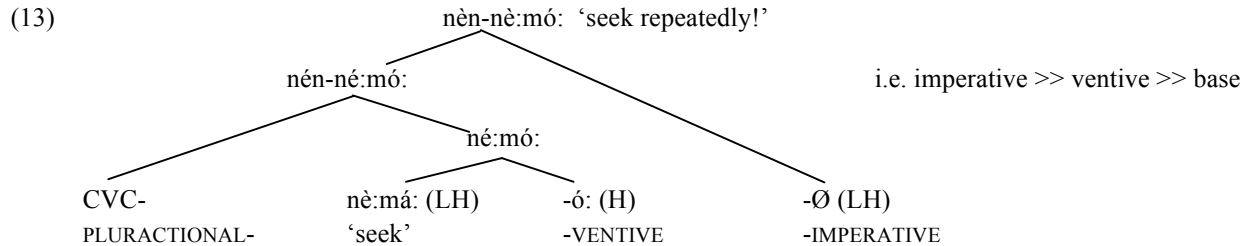
As seen, there is an override system of imperative >> ventive >> base not unlike the Dinka example: inflectional tone overrides derivational tone which in turn overrides base tone.

In addition to "layers" (cycles, strata, domains) based on derivational vs. inflectional morphology, paradigmatic conflicts may require a hierarchical ranking of the tonal spell-outs by inflectional features (tense, aspect, mood, negation). A case of this arises in Leggbó [Cross River; Nigeria] (Hyman, Narrog, Paster & Udoh 2002: 407). In the following table, the first indicated tone goes on the root and the second on a suffix (if present). (MCA = main clause affirmative; SRA = subject relative affirmative clause; ORA = object relative affirmative clause; NEG = negative (all clause types); "irrealis" = future/conditional.)

(14) a.

	MCA/ORA		SRA		NEG		
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/	
Perf./Prog.	H-M	M-M	L-M	M-M	H-M	M-M	
Habitual	L-L	M-L	L-L	M-L	H-M	M-M	
Irrealis	L-L	M-L	L-L	M-L	L-L	M-L	(irrealis assigns L-L / M-L)

b.

	MCA/ORA		SRA		NEG		
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/	
Perf./Prog.	H-M	M-M	L-M	M-M	H-M	M-M	(other than irrealis, negatives
Habitual	L-L	M-L	L-L	M-L	H-M	M-M	assign H-M / M-M)
Irrealis			L-L	M-L			

c.

	MCA/ORA		SRA		NEG	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
Perf./Prog.	H-M	M-M	L-M	M-M	H-M	M-M
Habitual	L-L	M-L	L-L	M-L		
Irrealis			L-L	M-L		

(other than irrealis and negatives, habituals assign L-L / M-L)

d.

	MCA/ORA		SRA		NEG	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
Perf./Prog.	H-M	M-M	L-M	M-M	H-M	M-M
Habitual		L-L	M-L			
Irrealis		L-L	M-L			

(unshaded leftover cells require specific tone assignments)

Although Leggbó noun roots lexically contrast H, M and L tone there is only a binary contrast on verb roots: M tone roots vs. roots which alternate between H and L. In (14) I have represented the contrast as one between /L/ and /M/. In looking over such tabular arrays, the strategy is to start with tone assignments that affect an entire row or column. We see first see that no column has the same tonal pattern throughout. However, in (14a) there is one row that is consistent: the irrealis assigns a L tone suffix deriving L-L and M-L patterns independent of clause type or negation. Once we take this predictable assignment out of the equation we see in (14b) that the next generalization is that negation assigns H-M to L roots and M-M to M roots. In (14c) we can now see that the habitual aspect assigns L-L/M-L to cells unclaimed by the irrealis or negation. This leaves a few leftover cells in (14d) where the lexical L vs. M root tones are realized with a M suffix. By following this precedure Hyman et al (2002) were able to establish the following ordered hierarchy, where earlier assignments block later tonal assignments:

(15)   *Irrealis*   >>   *Negative*   >>   *Habitual*   >>   *Other*
          L-L/M-L   H-M/M-M   L-L/M-L

Hyman & Olawsky (2004: 107) follow the same procedure in analyzing verb tones in Dagbani [Gur; Ghana], shown in the tables in (16). (Incipient = 'about to'; tones in parentheses were inadvertenly not elicited, but are extrapolated.)

(16) a.

	MCA		MCN		RCA		RCN	
	Perf	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*
Present	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Rec.Past	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Gen.Past	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Incipient	*lex*	LH	*lex*	LH	*lex*	LH	*lex*	(LH)
Future	H	H	H	H	(H)	(H)	H	H

b.

	MCA		MCN		RCA		RCN	
	Perf	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*
Present	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Rec.Past	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Gen.Past	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Incipient	*lex*	LH	*lex*	LH	*lex*	LH	*lex*	LH
Future				H				

c.

	MCA		MCN		RCA		RCN	
	Perf	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*
Present		LH	*lex*	LH	*lex*	LH	*lex*	LH
Rec.Past	LH		*lex*		*lex*		*lex*	
Gen.Past			*lex*		*lex*		*lex*	
Incipient	*lex*		*lex*		*lex*		*lex*	
Future	H							

d.

	MCA		MCN		RCA		RCN	
	Perf	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*	*Perf*	*Imperf*
Present	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
Rec.Past			*lex*		*lex*		*lex*	
Gen.Past			*lex*		*lex*		*lex*	
Incipient	*lex*		*lex*		*lex*		*lex*	
Future	H							

In 16a) we observe that the future assigns the same H tone to all verbs in all contexts. Once the future is removed, in (16b) we see that the imperfective assigns LH tone to all remaining verbs. In (16c) we assign LH tone to main clause affirmative perfectives—with the exception of the incipient . At this point, in (16d), the remaining perfectives (non-MCA and incipient) receive their lexical H or L tone as a kind of default. (It is interesting to note that the underlying verb root tones are distinguishable only in these contexts.) We can in fact combine (16b,c) to arrive at the following ranking:

(17)   *Future*   >>   *{MCA [-Incip], [Imperfective]}*   >>   *Lexical (default)*
                H   LH   H vs. L

It can be noted that in both Leggbó and Dagbani, future tense ~ irrealis mood are ranked higher than aspect, as per Bybee's (1985) Relevance Hierarchy. We should think of such disjunctive tone patterns as vying for the same "slot" exactly as Anderson (1986) discussed some time ago for Georgian prefixes. With this in mind we now return to a more complicated case from Haya, which was briefly displayed in (4).

3.   Haya verb stem tonology

Recall the Mambay and Haya cases in (3) and (4), neither of which recognized hierarchies as in Leggbó and Dagbani. In Mambay, Anonby (2011) sets up a table of "tone classes" to summarize the paradigmatic tones across different TAMs, while Hyman & Byarushengo (1984) present a number of morphological rules assigning tones by specific combinations of inflectional features. At the time I considered Haya to be relatively unruly, defying generalization. I now return after three decades to see if we can do better. In what follows I am concerned only with the assignment of H tones within the verb stem (root + suffix(es)), not with the prefixal domain.

As seen in (18), Haya verb stems may have one of four tone patterns with at most one H tone, predictable from whether the root is underlying /H/ or toneless and whether there is a suffixal H or not:

(18)　　　*root tone + suffix tone　output H*

	root tone	suffix tone		
a.	/H/	/H/	on final vowel	suffix H is assigned to FV; root H is deleted
b.	/Ø/	/H/	on second mora	suffix H is realized on second mora of stem
c.	/H/	/Ø/	on first mora	root realizes its /H/ on its first mora
d.	/Ø/	/Ø/	none	no stem H

As summarized to the right, a single H may be realized on the final vowel, the second mora, or the first mora, depending on the input tones. In the one case where the root is toneless and there is no suffix H, the verb stem will be toneless. Examples are given in (19), where the tones are indicated as they appear before the application of postlexical tone rules (Hyman & Byarushengo 1984: 60):

(19)　　　*root + sfx　output H　　　underlying　　　　　output of lexical phonology*

a.　/H/　/H/　on FV　　(ba-) /kom-il-e/　→　(ba-) kom-il-é　'they tied up' (Past$_2$)
　　　　　　　　　　　　　　　H　　H　　　　　　　　　　H

b.　/Ø/　/H/　on μ_2　　(ba-) /jun-il-e/　→　(ba-) jun-íl-e　'they helped' (Past$_2$)
　　　　　　　　　　　　　　　　　H　　　　　　　　　　　H

c.　/H/　/Ø/　on μ_1　　(ba-aa-) /kom-il-e/　→　(b-áa-) kóm-il-e　'they have tied up' (Perf)
　　　　　　　　　　　　　　　　H　　H　　　　　　　　　　H

d.　/Ø/　/Ø/　Ø　　　　(ba-aa-) /jun-il-e/　　(b-áa-) jun-il-e　'they have helped' (Perf)
　　　　　　　　　　　　　　　H

The main clause affirmative forms in (19a,b) are in the yesterday past tense (Past$_2$) which requires a suffixal H, while those in (19c,d) are in the perfect (Perf), which does not assign a H. In fact, such suffix tones are assigned by the morphology in one of three ways: (i) a suffixal H is assigned to the FV, e.g. the Past$_2$ tense in (19a,b); (ii) no suffixal H is assigned, e.g. the Perfect tense-aspect in (19c,d); (iii) a suffixal H is assigned to the FV only if the root is toneless. This is the case in the past habitual (PH) forms in (20).

(20)　　　*root + sfx　output H　　　underlying　　　output of lexical phonology*

a.　/H/　/-Ø/　on μ_1　　(ba-a-) /kom-ag-a/　→　(ba-a-) kóm-ag-a　'they used to tie up' (PH)
　　　　　　　　　　　　　　　　H　　　　　　　　　　　　H

b.　/Ø/　/-H/　on μ_2　　(ba-a-) /jun-ag-a/　→　(ba-) jun-ág-a　'they used to help' (PH)
　　　　　　　　　　　　　　Ø　　H　　　　　　　　　　　H

In (20a) there is no suffixal H tone, since the root /-kóm-/ 'tie up' has H tone. In (20b), however, there is a suffix H, since /-jun-/ 'help' is toneless. This H is realized on the second mora of the verb stem, as expected. Hyman & Byarushengo refer to this as the "polar H" suffix, since it is present if the root is Ø, but absent if the root is H. One might propose that the H suffix is assigned to all verb forms in such tenses, but that it is subsequently deleted after a H root. The same Meeussen's Rule applying in (12b) in Chichewa is independently required in Haya to delete the second of two Hs are on adjacent moras, so one might first shift the suffixal H to the second mora and then delete it after a H root initial mora. Since the two types of H suffix would still have to be distinguished (those which would shift even after a H root vs. those which don't), I will instead assume that there are two different H assignment rules, one of which is sensitive to whether the root has a H tone or not.

With this established we now can consider which combinations of inflectional features and clause types require which finals. In the following table, H indicates that a suffix H is assigned when the root is either Ø or /H/, while (H) indicates the polar suffix which is assigned only when the root is Ø. Those cells which do not take either suffixal H are indicated by Ø:

(21)

	MCA	SRA	ORA	MCN	SRN	ORN	Focus
Pres Hab	H	Ø	H	(H)	(H)	(H)	---+++
Past$_1$	Ø	Ø	H	Ø	Ø	Ø	---+++
Past$_2$	H	Ø	H	H	H	H	---+++
Past$_3$	Ø	(H)	(H)	Ø	Ø	Ø	+--+++
Past Hab	(H)	(H)	(H)	Ø	Ø	Ø	---+++
Future$_1$	(H)	(H)	(H)	(H)	(H)	(H)	---+++
Future$_2$	H	Ø	H	Ø	Ø	Ø	---+++
Progressive	H	Ø	Ø	Ø	Ø	Ø	+++++
Perfect	Ø	Ø	Ø	Ø	Ø	Ø	+++++
Inceptive	Ø	Ø	Ø	Ø	Ø	Ø	+++++
Persistive	Ø	Ø	Ø	Ø	Ø	Ø	+++++
Subjunctive	(H)			(H)			+ +
Imperative	H			(= subjunctive)			+ +

(MCA = main clause affirmative; SRA = subject relative affirmative; ORA = object relative affirmative; MCN = main clause negative; SRN = subject relative negative; ORN = object relative negative.)

As seen, Haya distinguishes three degrees of past tense, and two degrees of future tense. The inceptive is translated as 'to have done X before', while the persistive translates as 'to still do X'. (I address the last Focus column below.) As in the Leggbó and Dagbani cases, I have begun by shading in the rows that have the same tone assignment throughout. As seen, the Future$_1$ assigns a H suffix tone throughout, despite the fact that the segmental morphology may differ between main vs. relative and affirmative vs. negative clauses. In the following examples it is observed that Future$_1$ takes the marker /-la-V-/ in the affirmative, but only the empty mora /-V-/ in the negative (-V- is realized by lengthening of the preceding vowel, i.e. [a] in these examples):

(22) a.   AFF   (ba-la-a-) kom-a   vs.   (ba-la-a-) /jun-a/   'they will tie up/help' (F$_1$)
                              H   H
      b.   NEG   (ti-ba-a-) kom-e   vs.   (ti-ba-a-) /jun-e/   'they will not tie up/help (F$_1$)
                              H   H

Note that the FVs are also different in the affirmative vs. negative, and yet the polar suffixal H remains constant. In addition, a number of TAMs fail to have a suffix H, which I have also shaded. One other important generalization is that although the segmental morphology can vary, any given tense has the same negative tones, whether in the MCN, SRN, or ORN. I shall therefore conflate the last three columns as NEG in what follows.

In (23) I reorganize the material in the earlier table by their affirmative tone patterns to reveal that there are in fact three TAM "tone classes", with affirmative TAM residues marked by an asterisk (I will deal with each of these separately below):

(23)

		MCA	SRA	ORA	NEG	Focus	*comments:*
1a	Past$_2$	H	Ø	H	H	---+	none of these change their TAM segmental marking in neg (or affirm)
1b	Present Habitual	H	Ø	H	(H)	---+	
1c	Future$_2$	H	Ø	H	Ø	---+	
1d	Past$_1$	Ø*	Ø	H	Ø	±--+	MCA has different segmental marking
2a	Future$_1$	(H)	(H)	(H)	(H)	---+	(H) throughout, -la- prefix only in AFF
2b	Past Habitual	(H)	(H)	(H)	Ø	---+	all have same segmental TAM marking
2c	Past$_3$	Ø*	(H)	(H)	Ø	+--+	MCA has different segmental marking
3a	Perf, Incep, Persist	Ø	Ø	Ø	Ø	++++	all Ø; Perf, Incep change marking
3b	Progressive	H*	Ø	Ø	Ø	++++	MCA has different segmental marking

# H	=	4	Ø	4	1	= 9	
# (H)	=	2	3	3	2	= 10	the most common = Ø, hence Hyman &
# Ø	=	5	8	4	8	= 25	Byarushengo propose rules assigning Hs

Since there are three possible suffix tone assignments (H, (H), Ø) and three affirmative clause types (MCA, SRC, ORA), there are in principle 3 x3 = nine possible tone assignments. Instead, there are three general affirmative patterns, with the asterisked exceptions to be explained below. (There are nine patterns when we include negatives, not 27.) Class 1 consists of TAMs which have H-Ø-H tonal suffix assignments in the three affirmative columns. Class 2 consists of TAMs which have polar (H) tonal suffix assignments throughout. Class 3 consists of those TAMs which do not receive either type of suffixal H. In other words, we come close to being able to equate class 1 with -H, class 2 with -(H), and class 3 with -Ø. (The class 1 SRA forms present an obvious obstacle.) For reference, I have included comments on the segmental morphology in the last column. Full paradigms of examples are available in Hyman & Byarushengo (1984: 93-101).

I have yet to discuss the focus column, where [+F] refers to TAMs which resist H tone deletion when non-final in their clause, while those which reduce their H tones are marked [-F]. For example in (24a) that the present habitual affirmative final H suffix is deleted when a word follows:

(24) a.   Pres Hab Affirmative is [-F] :   /ba-jun-á/   →   ba-jun-a káto   'they help Kato'
      b.   All negatives are [+F]   :   /ti-ba-jun-á/   →   ti-ba-jun-á káto   'they don't help Kato

In the corresponding negative in (24b), however, which is built by prefixing *ti-* to the affirmative, the same final suffix H does not delete. As indicated, all negatives are [+F], whereas affirmative TAMs can be [+F] or [-F], as discussed by Hyman & Watters (1984: 259-262), who argue that the [+F] TAMs are "intrinsically focused". The reason for going into this is that there is further generalization: all tensed affirmative [+F] are Ø except the MCA progressive, which receives a H suffix. Progressive forms are illlustrated in (25).

(25) a.   MCA marked by ni- : /ni-ba-jun-á/   → ni-ba-jun-á káto   'they are helping Kato'
     b.   MCN Prog with -li : /ti-bá-lí-ku-jun-a/ → ti-bá-li-ku-jun-a káto 'they aren't helping Kato'
                                          NEG-they-COP-INF-help-FV
     c.   SRA Prog with -li : /á-ba-lí-ku-jun-a/ → a-bá-li-ku-jun-a káto   'they who are helping Kato'

The reason why the MCA progressive is exceptionally in class 1 is that it is built by adding the focus marker *ni-* to the present habitual (cf. *ni káto* 'it's Kato'). While the progressive is intrinsically [+F] and therefore should have a -Ø final, its H suffixal tone is a carry-over from the

present habitual. The two other asterisked exceptions can also be accounted for historically (see below).

What the above analysis suggests is that the tone patterns can be assigned by classes of TAMs, at least as far as the affirmative forms are concerned. The following questions thus naturally arise:

First, do the affirmative groupings represent natural classes of TAM features? It does not appear so. Class 1 includes the present habitual, the two more recent past tenses ($Past_1$, $Past_2$), and the general future tense ($Future_2$). Class 2 is also incoherent: while past habitual and $Past_3$ go together as distant pasts (they partially share segmental morphology as well), the near future ($Future_1$) doesn't. Finally, however, class 3 has been claimed to be coherent: all are [+F]. (I am limiting my attention to the indicative TAMs, since the imperative and subjunctive, both [+F], take H and (H), respectively.)

The second question concerns whether one can predict one column from another. The quick answer is: not across the board. In class 1 the MCA and ORA are identical, both receiving suffixal H (vs. SRA Ø). Class 2 affirmatives all take suffixal H, with the MCA $Past_3$ being exception (see below). We have already seen that all class 3 TAMs are Ø except for the MCA progressive explained above.

A third question is what the significance is of the near future (F1) always receiving a polar (H) suffixal tone? (There is undoubtedly an historical explanation involving the source of the empty -V- mora alluded to above.)

What remains to be explained is why the MCA $Past_1$ and $Past_3$ are exceptional. The $Past_1$ should be H, but is exceptionally Ø. The reason for this is seen in (26).

(26) a. y-áa-kóm-a   'he tied up'   [+F]   (= "disjoint" form)
     b. y-a-kom-a káto 'he tied up Kato' [-F]   (= "conjoint" form)

As seen, when the verb is phrase-final, the tense marker is *-áa-*. When it is followed by any word within the same clause, as in (26b), not only do the H tones of the tense marker and verb root reduce, but the tense marker is now *-a-*, i.e. short. This is the only tense that does this. The prefixal differences in (26a,b) are in fact a relic of an older system which Meeussen (1959) termed "disjoint" vs. "conjoint" verb forms: *-áa-* was the focused (or disjoint) marker of this tense and *-a-* the unfocused (or conjoint) marker, as they are in the recent past in Kirundi. My hypothesis therefore is that phrase-final $Past_1$ ends Ø rather than H because the form with *-áa-* is in fact [+F]. We of course can't tell this for certain, because the [±F] distinction has an effect only when something follows the verb. The second part of the hypothesis is that the non-final form with *-a-* is not only [-F], as we know from (26b), but also takes a suffixal H in line with other class 1 TAMs, which however automatically deletes. In this way $Past_1$ falls into place.

There is also an historical explanation for why $Past_3$ is [+F] only in the MCA. First, as seen in (27), it is only in the MCA that it is marked with the prefix *-ka-* and the FV *-a*, as in (27a).

(27) a. /bá-ka-jun-a/   'they helped'   →   bá-ka-jun-a káto   'they helped Kato' [+F]
     b. /a-ba-a-jun-íl-e/ 'they who helped'   →   a-ba-a-jun-il-e káto 'they who helped Kato' [-F]

In the SRA in (27b) the markers are *-a-* and the final *-il-e*, which also occur in $Past_3$ negative forms. What's significant is that the prefixal and suffixal segmental allomorphy corresponds with [±F]. This is because the *-ka-* prefix has a rather complex history (see Botne 1999 and Nurse

2008 for discussion). In Haya, *-ka-* has an interesting complementary distribution in three different contexts: In MCA, it marks distant past (Past₃), as in (27a). In negative clauses it marks the perfect and incipient, contrasting with the affirmative as in (28a,b).

(28) a. MCA perfect : b-áa-jun-il-e   'they have helped'   [+F]
     b. MCN perfect : ti-bá-ka-jun-il-e 'they haven't helped' [+F]

Its third function is to mark past consecutive clauses following either a negative or relative clause ('he didn't come *and see* me', 'the man who came *and saw* me'). To account for the exceptional Ø and [+F] of the MCA Past₃ form all we need to say is that these were features of its originally function (I would guess perfect, since the perfect tends to be inherently focused in the sense of Hyman & Watters 1984).

As seen, although Haya tonal assignments appear to be somewhat chaotic on first approach, there are some major regularities, which are obscured in a few cases by recent changes in the TAM system. What then can we conclude from this admittedly limited look at three languages? If Leggbó, Dagbani, and Haya are representative—and I can add that other Bantu languages are often like Haya—then I would suggest two generalizations: (i) there is a tendency for negatives to be tonally identical across clause types (MCN, SRN, ORN); (ii) there is a tendency for a future or irrealis to be tonally identical across clause types and negation. However, I would not be surprised to find completely contradictory systems, as TAM systems are relatively unstable and may change in one, but not other clause types, as we saw in the case of Haya Past₃.

4. Tonal morphology can do more than non-tonal morphology can do

In §1 I suggested that tonal morphology often obscures the compartmentalization of phonology, morphology and syntax. In this final section I would like to demonstrate this, and at the same time show that grammatical tone can do things that non-tone cannot.

The first example comes from Kikuria [Bantu; Tanzania, Kenya], which assigns a H tone to one of the first four moras of the verb stem, depending on the tense (Marlo & Mwita 2009: 2). As seen in (29), once this H is assigned to the underlined mora, the H spreads to the penult:

(29) a. μ_1 n-to-o- [hóótóótér-a   'we have reassured'   *Past*
     b. μ_2 n-to-o- [ho<u>ó</u>tóótér-a   'we have been reassuring' *Past progressive*
     c. μ_3 n-to-re- [hoot<u>ó</u>ótér-a   'we will reassure'   *Future*
     d. μ_4 to-ra- [hooto<u>ó</u>tér-a   'we are about to reassure' *Inceptive*

The interesting question which arises is: What happens if the verb stem is too short, i.e. doesn't have enough moras for the intended H tone assignment, e.g. to the fourth mora? Marlo & Mwita demonstrate the results as in (30).

(30) a. μ_4 to-ra- [karaaŋg-á   'we are about to fry'   *H tone assignment:*
     b. μ_4 to-ra- [sukur-ă   'we are about to rub'   [sukur-a μ́
     c. μ_4 to-ra- [βun-aº   'we are about to break'   [βun-a μ μ́
     d. μ_4 to-ra- [ry-aº   'we are about to eat'   [ry-a μ μ μ́

In (30a) the verb stem has four moras and the H therefore is assigned to the FV. In (30b), where the stem is one mora short, a rising tone is obtained. When the stem is either two or three moras short as in (30c,d), there is a level Lº tone, as if the H tone is floating after the verb, keeping the

L tone from downgliding, as a prepausal L would normally do. What is extremely interesting is that when the verb is non-final, the mora count continues onto the next word. Marlo & Mwita show this with the toneless noun object *eɣetɔɔkɛ* 'banana':

(31) a. μ₄ to-ra- [karaaŋg-á éɣétɔ́ɔ́kɛ 'we are about to fry a banana'
    b. μ₄ to-ra- [sukur-a éɣétɔ́ɔ́kɛ 'we are about to rub a banana'
    c. μ₄ to-ra- [βun-a eɣét<u>ɔ́</u>ɔ́kɛ 'we are about to break a banana'
    d. μ₄ to-ra- [ry-a eɣetɔ́<u>ɔ́</u>kɛ 'we are about to eat a banana'

Again, the H is assigned to the FV in (31), since the verb stem has four moras. The H continues to spread to the penult of the noun object. In (31b) it is assigned to the first mora of the noun and then again spreads to the penult. In (31c) the H is assigned to the second mora of the noun, and then spreads. Finally, in (31d), the H is assigned to the third mora of the noun and spreads just one mora to the penult. Such an array of tone assignments is already quite remarkable (particularly to the fourth mora). However, what is really unusual is that this suffixal H is expected to be stem- or perhaps word-level morphology (although the prefixes are irrelevant), as in other Bantu languages, but is calculated at the phrase level! There seems to be a violation of a basic principle, a violation of what we might think of as canonical morphology (Corbett 2007): Morphs should stay on their own word! Instead, we have something that seems like co-phonologies operating at the phrase level. (For co-phonologies, see Inkelas 2011 and references cited therein.)

    A second such violation occurs in the rather restricted tone system of Chimwiini [Bantu; Somalia], which has the following properties (Kisseberth 2009): (i) Tone is only grammatical. There are no tonal contrasts on lexical morphemes, e.g. noun stems or verb roots. (ii) Privative H tone is limited to the last two syllables: final H vs. penultimate H. As an example consider the paradigm in (32).

(32)

			singular			*plural*		
1st pers.	} final H:		n-	ji:lé	'I ate'	chi-	chi-ji:lé	'we ate'
2nd pers.		≠ {		ji:lé	'you sg. ate'	ni-	ni-ji:lé	'you pl. ate'
3rd pers.	penult H:	{		jí:le	's/he ate'	wa-	wa-jí:le	'they ate'

As seen, first and second person subjects condition final H tone in the past tense, while third person subjects condition penultimate H tone. As also seen in the above table, the only difference between second and third person singular is tonal. It is clear that tone has a morphological function in the above examples.

    But the plot thickens when an object is added, as in (33).

(33) a. jile: n̪amá 'you sg. ate meat' jile ma-tu:ndá 'you sg. ate fruit'
    b. jile: n̪áma 's/he ate meat' jile ma-tú:nda 's/he ate fruit'

We now see that the final vs. penultimate distinction is realized on the noun object. The tonal morphology is thus phrasal. Kisseberth (2009) also shows that phrasal domains can be nested, depending on information structure, with each right edge receiving the appropriate final or penultimate H:

(34) a. Ø-wa-t̪in̪d̪il̪il̪e w-a:ná] n̪amá] ka: chi-sú] 'you sg. cut for the children meat with a knife'

      b.   Ø-wa-ṭind̪iḻiḻe w-á:na] n̪áma] ka: chí-su]   's/he cut for the children meat with a knife'

What we have here is a case of tone being able to have long distance effects: If the H had been a lexical property, say, of the verb root, as it can be in Digo (Kisseberth 1984) or Giryama (Volk 2011), we would treat this as pure phonology. Given however that the tonal distinctions are exclusively grammatical, conditioned by specific grammatical morphemes or constructions, we have to address the question of what exactly this is? If tone is a phrasal clitic, it's quite unlike English possessive *'s*, which serves an appropriate grammatical function at the end of a noun phrase. Should the above tonal distinctions be identified with:

(35) a.   morphology?   = a property of [1st/2nd pers.] vs. [3rd pers.] subject prefixes
       b.   phonology?   = a property of the phonological phrase—H is semi-demarcative)
       c.   syntax?   = a property of the syntactic configurations which define the P-phrases
       c.   intonation?   = not likely—who ever heard of a 1st/2nd vs. 3rd person intonation?

    As seen, both the Kikuria and Chimwiini cases do a good job of obscuring the boundaries between morphemes, words and phrases, and ultimately phonology, morphology, and syntax. Both are effective examples of how tone can function as the glue holding a grammar together. This brings us to the last question: What else can do this other than tone? What can be sponsored by a morpheme in one word but travel at considerable distance to be realized on another? There are more such cases, in fact (see Harry & Hyman 2012 for a preliminary survey). Speakers of languages seem to be better equipped to package and exploit melodies and other syntagmatic properties of pitch at both the word and phrase level than any other phonological property. It seems superfluous at this time, but I can't help repeating: Tone is different! (Hyman 2011)
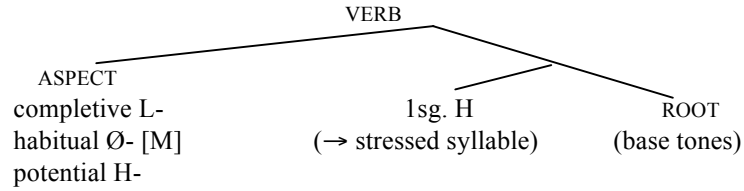
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APPENDIX

Since the workshop at which this paper was presented was organized by Jean-Léo Léonard and Enrique Palancar, specialists of Mexican tone systems, I decided to offer a few words on an interesting tonal paradigm from Macuiltianguis Zapotec for which Broadwell (2000) presents evidence for the following (partial) structure:

```
                                    VERB
              ┌──────────────────────┴──────┬──────────┐
         ASPECT                            1sg. H      ROOT
         completive L-                   (→ stressed   (base tones)
         habitual Ø- [M]                  syllable)
         potential H-
```

In the following table, two possible input systems are considered: Broadwell's /H, M, L, Ø/ vs. /H, M, Ø/. The stressed syllable is underlined.

Base Tone (Broadwell)	(without /M/)	(underline = stress)		Completive L-	Habitual Ø-	Potential H-	assignment of grammatical Hs:		
Ø̲-M	Ø̲-Ø	1st pers	H	H-M	H-M	H-M	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L-M	M-M	H-M			H₁:Pot
Ø-M̲	Ø-Ø̲	1st pers	H	L-H	M-H	H-M	H₂:1sg	H₂:1sg	H₁:1sg
		3rd pers	Ø	L-M	M-M	H-M			H₁:Pot
Ø̲-H	Ø̲-H	1st pers	H	H-H	H-H	H-H	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L-H	M-H	H-H			H₁:Pot
Ø-H̲	Ø-H̲	1st pers	H	L-H	M-H	H-H			H₁:Pot
		3rd pers	Ø	L-H	M-H	H-L			H₁:Pot
Ø̲-L	Ø̲-L	1st pers	H	H-L	H-L	H-L	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L-L	M-L	H-L			H₁:Pot
L̲-M	L̲-Ø	1st pers	H	HL-L	HL-L	HL-L	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L-M	L-M	HL-L			H₁:Pot
L̲-H	L̲-H	1st pers	H	HL-L	HL-L	HL-L	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L-H	L-H	HL-L			H₁:Pot
L-H̲	L-H̲	1st pers	H	L-H	L-H	HL-H			H₁:Pot
		3rd pers	Ø	L-H	L-H	HL-H			H₁:Pot
LH	LH	1st pers	H	HL	HL	LH	H₁:1sg	H₁:1sg	
		3rd pers	Ø	LH	LH	LH			
L	L	1st pers	H	HL	HL	HL	H₁:1sg	H₁:1sg	H₁:1sg
		3rd pers	Ø	L	L	L			
H̲-M	H̲-Ø	1st pers	H	H-M	H-M	H-M			H₁:1sg
		3rd pers	Ø	H-M	H-M	H-M			H₁:Pot
HL + ᴴ	HL + ᴴ	1st pers	H	HL-ᴴ	HL-ᴴ	LH-ᴴ			
		3rd pers	Ø	HL-ᴴ	HL-ᴴ	LH-ᴴ			

The rules that appear to be needed are as follows:

1. 1sg. H is assigned to the stressed syllable. If the latter is lexically H, the rule is blocked.
2. Aspectual H- or L- is assigned to first syllable, overriding /Ø/. Potential H- forms HL contour with lexical L
3. Phonology: HL-Ø → HL-L (H-L if first vowel is short); ex. of HL-H has V: in both syllables (dùàdíí')
4. Shaded = not predicted by my rules:
   (i) /Ø-H̲/ 3sg. potential should be H-H̲ (H → L after H?)
   (ii) /LH/ 1sg. potential should be HL if 1sg. is spelled out first
   (iii) 3rd pers. /L/ potential should be HL. Avoidance of *HLH is general.