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## Towards a Typology of Tone System Changes

**Abstract:** Most general discussions of tonal change are concerned with the issues of tonogenesis and tonal splits, i. e. the questions of how non-tonal languages become tonal and how these tones later split to produce more tones. In this article I am concerned with two issues: (i) how tone systems acquire more tonal contrasts; (ii) how tone systems lose tonal contrasts. The first issue concerns both laryngeal factors as well as the natural pitch effects that tones have on each other. The second concerns both tonal mergers as well as the restriction of tonal contrasts to certain positions of the word or phrase, which may ultimately lead to *tonoexodus*, the complete loss of tone.

**Keywords:** tone, typology, phonation, contours, mergers

### 1 The Sinosphere vs. the world

Most of the well-known work on diachronic tonology has focused on two issues: (i) tonogenesis, whereby non-tonal languages acquire tone; (ii) tonal splits, whereby languages with tone acquire more tones. Concerning the first, it is widely accepted that tonal contrasts most commonly derive either from the loss of earlier laryngeal segments, e. g. glottal stop or *\*h*, or from phonation, e. g. voicing, breathiness, creakiness. Occasionally it is proposed that tones compensate for changes in the number of syllables, e. g. syncope in Korean (Ramsey 2001). Tonal splits may also derive from earlier laryngeal segments, e. g. Mixtec final glottal stop (Longacre 1957; Dürr 1987) and phonation (but also from interactions between the tones themselves—see below). Most scholars thus follow some version of the Haudricourt (1961) model schematized in (1) (see also Matisoff 1973, Svantesson 1989, Thurgood 2002, and Kingston 2011, among many others):

(1)	<i>pre- tonal</i>	<i>H vs. L</i>	<i>register split</i>	<i>multiple heights</i>	<i>contours</i>	<i>obscure</i>
a.	*paʔ	> pǎ	> <sup>^</sup> pá	pa <sup>4</sup>	pá	[H] I
b.	*baʔ	> bǎ	> <sup>˘</sup> pá	pa <sup>3</sup>	pǎ	[LH] II
c.	*pəh	> pǎ	> <sup>^</sup> pà	pa <sup>2</sup>	pâ	[HL] III
d.	*bəh	> bǎ	> <sup>˘</sup> pà	pa <sup>1</sup>	pà	[L] IV

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In (1) I start with glottalization accompanying the final glottal stop and breathiness accompanying final *\*h*. In (1a,b) the loss of final glottal stop produces a H(igh) tone (marked by an acute accent), while in (1c,d) the loss of final *\*h* produces a L(ow) tone (marked by a grave accent). In the next development the contrast between voiced and voiceless onset consonants produces a register split (slight raising or lowering of pitch following the release of the consonant, marked by arrows), which becomes contrastive when obstruents are devoiced. This may ultimately produce multiple tone heights (where 4 = highest pitch and 1 = lowest), or contour tones. Another possibility is that the four-way contrast may ultimately cease to be transparent or consistent, as indicated by the arbitrary Roman numeral designations in the last column.

Although there are other cases, most of the documentation of tonogenesis and tonal splits due to laryngeal consonants and phonation have been studied in East and Southeast Asian languages, e. g. Chinese and Vietnamese. Three relevant properties are common in Southeast Asian tone or, as I like to put it, adopting Matisoff's (1999) term, in the Sinosphere (vs. the world): First, contour tones abound, often without the beginning/end points occurring independently (cf. K. Pike's 1948 typological distinction between "contour tone languages" vs. "register tone languages"). Second, tones are often restricted in "stopped syllables" (syllables closed by an oral stop). Finally, while tones typically correspond in closely related languages, it is often hard to describe the variations in terms of tones becoming other tones (instead, the differences may result from independent tonogenesis (cf. Matisoff 1974)). As Evans' (2009: 214–215) puts it,

For groups such as TGTM [Tamangic] and Lolo-Burmese, tonal splits can be detected, but the origin of tones at the proto-subgroup level are obscure. In other subgroups, such as Qiangic, there does not appear to be any tonal correspondence between languages.

While the developments in (1) and the three properties just mentioned are most closely associated with the Sinosphere, there are hints of one or another of the above properties in other parts of the world, e. g. breathy or creaky tones in Otomanguean (Mexico). However, even when there is monosyllabicity and multiple contours, these latter are easily decomposable, e. g. low rising =  $\widehat{LM}$ , high rising =  $\widehat{MH}$ . The differences one finds in one vs. another part of the world are largely due not only to the nature of the tonogenetic processes, but also to the relative maturity (time-depth) of the tone system (and ultimate independence from the laryngeal origins): with time, pitch takes over from phonation and acquires a life of its own, both building up and breaking down, as it has in African languages (see below).

Consider for example the differences observed between the Kuki-Chin tone systems of NE India and Myanmar vs. the typical African situation (represented

below by Eastern Grassfields Bantu). The table in (2) provides a comparison of underlying tones in seven Kuki-Chin languages (t1-t4 = the reconstructions of VanBik 2006; T = stop or glottalized sonorant consonant, smooth syllables are either open or closed by a non-glottalized sonorant consonant):

(2)	<i>Falam</i>	<i>Hakha</i>	<i>Thlantlang</i>	<i>Kuki- Thaadow</i>	<i>Tedim</i>	<i>Mizo</i>	<i>Sizang</i>	<i>Smooth σ's</i>	<i>CVT</i>	<i>CVVT</i>
*t1	H	H̄L	H̄L	H̄L	L̄H	L̄H	H	√	*	*
*t2	H̄L	L	L	H̄L	L̄H	H̄L	L̄H	√	*	√
*t3	L	LH	H	L	H̄L	L	H̄L/H	√	√	*
*t4	L̄H	H̄L	H̄L	H	L	H	L	√	*	*

As seen, VanBik was not able to give phonetic values to the four proto tones: Even though the corresponding reflexes from one language to another are quite regular, it is hard, if not impossible to provide tonal values for the four-way contrast from which the different realizations can be derived. Instead, it is as if Proto-Kuki-Chin started with a four-way contrast in laryngeal features which the different languages reinterpreted as tone in different ways. It is thus the pre-tonal laryngeal values which correspond, but which gave rise to different tones in different languages. (Since only Falam, Mizo and perhaps Sizang contrast four distinct tones, it is of course possible that the other languages once had four tones, but merged two of them to produce their current three-way contrast.)

Compare this now to the regular reflexes of the four-way contrast in Proto-Eastern Grassfields Bantu (PEG) tones in Cameroon (Hyman & Tadadjeu 1976: 66), where L° = a level L tone (which contrasts with a falling L tone before pause), (H), (L) = floating tones, and the initial \*L is a prefixal tone (e. g. noun class 5 \*lì- in the proto language):

(3) Language↓ / PEG →	*L-L-L	*L-L-H	*L-H-L	*L-H-H	e. g. *lì-sòηá 'tooth'
Mankon	L-L-L	L-L-H	L-H-L	L-L-H	ně-sòηá
Mundum I	L-L-L	L-L-H	L-H-L	L-L-H	ně-sòηá
Nkwen	L-L-L	L-L-L°	L-H-L	L-L-H	ně-sòηà°
Pinyin	L-L-L	L-L-L°	L-H-L	L-L-H?	ně-sòηà°
Mbui	L-L	L-L°	L-H (L)	L-H	nì-sòη°
Bamenyan	L-L	L-L̄H	L-H̄L	L-H	nà-súo
Babadjou	L-L	L-L°	L-H̄L	L-L̄H	là-sòη°
Babete	L-L	L-L°	L-H	L-H	nà-sòη°
Bati	L	L	H	H	sòη
Bagam	L	L°	H	H	sòη°
Batcham	L-L	L-L°	L-H	L-L̄H	là-sòη°
Dschang/Ngwe	L-L	L-L°	L- <sup>↓</sup> H	L-H	lì-sòη°

Baloum	L-L	L-L <sup>o</sup>	L-H (L)	L- $\widehat{LH}$ ?	<i>nà-sḵ<sup>o</sup></i>
Fomopea	L-L	L-L <sup>o</sup>	L-H (L) ?	L-H	<i>è-sḵ<sup>o</sup></i>
Bamendjou	L-L	L-L <sup>o</sup>	L- <sup>↓</sup> H	L-H	<i>nà-sḵ<sup>o</sup></i>
Baleng	(L) L	(L) L <sup>o</sup>	(L) H	(L) H	<i>nà-sḵ<sup>o</sup></i>
Bandjoun	L	L <sup>o</sup>	$\widehat{LH}$	H	<i>sḵ<sup>o</sup></i>
Batie	(L) L	(L) L <sup>o</sup>	(L) H	(L) H	<i>è-sḵ<sup>o</sup></i>
Bangou	L	L (H)	M	H	<i>sḵ<sup>o</sup></i>
Batoufam	L	L (H)	M ?	H	<i>sḵ<sup>o</sup></i>
Fotouni	(L) L	(L) L <sup>o</sup>	(L) H	(L) H	<i>è-sḵ<sup>o</sup></i>
Fondjomekwet	L	L (H)	H	H	<i>sḵ<sup>o</sup></i>
Feʔfeʔ	L	L <sup>o</sup>	$\widehat{LM}$	M	<i>sèʔ</i>
Bangangte	L	L <sup>o</sup>	H (L)	H	<i>sḵ<sup>o</sup></i>
Bamoun	L	L	H	H	<i>sḵ</i>

As can be seen from the different realizations, the development of new tonal contrasts in the different Eastern Grassfields languages directly results from the loss of the final stem (and ultimately prefix) syllable: In Bamenyan, where the bisyllabic stem was \*L-H the single remaining stem syllable has a  $\widehat{LH}$  rising tone; similarly, PEG bisyllabic \*H-L stems are realized with a monosyllabic  $\widehat{HL}$  falling tone. Not only do these languages/dialects directly correspond, but their derivation from a common tonal source is transparent. The difference between Proto EGB and Proto-Kuku-Chin is that the former language was tonal, while the latter was not necessarily tonal, rather more likely phonational. In what follows I will be less concerned with tonogenesis and more interested in how tones can change into other tones.

## 2 Two-height tone systems

In this section I address the following question: If a tone system contrasts two pitch heights, H and L, what can happen next? And by what means? First, the two-height system can develop more tones. Thus the reflexes of \*H and \*L in (3) result in cases of M, rising, falling and a contrastive level low (L<sup>o</sup>) tone. Two other possibilities is that the system can change from one “type”: to another, e. g. an original contrast between “bivalent” \*H vs. \*L can become reinterpreted as a privative /H/ vs.  $\emptyset$  contrast (and vice-versa). A final outcome would be for the language to restrict the tonal contrasts to certain positions of the word or phrase and perhaps ultimately become non-tonal (cf. Ratliff 2015). In order to determine the nature of these changes, one has to first come to an understanding of what the

relevant typological properties of tone systems are and agree on how they should be interpreted.

Much of the previous work on the typology of tone systems has focused on defining what a tone system is (K. Pike 1948; Welmers 1959, 1973), often concerned with contrasting the notions of tone vs. “pitch-accent” systems (McCawley 1970, 1978; Hyman 1977, 2006, 2009; Beckman 1986; van der Hulst and Smith 1988; Gussenhoven 2004, 2006, etc.). Such studies are concerned primarily with determining what should be considered to be “tone” vs. something else. In what follows I will consider tonal any language where pitch is a contrastive property of morphemes. Such a general definition masks considerable typological differences between tone systems. Previous surveys have shown that tone systems can differ in (i) their inventories, e. g. the number of tone heights, the presence vs. absence of contours, tonal downstep, phonations (Maddieson 1978, 2005); (ii) the distributional restrictions they place on tones and their domains, leading to proposals to distinguish syllable tone, word tone, and “pitch-accent” (Donohue 1997; Matisoff 1999; Mazaudon 2005); (iii) lexical vs. grammatical functions of tone (Welmers 1973; Ratliff 1992a, 1992b; Hyman 2001); (iv) presence vs. absence of phonological alternations (sandhi): assimilations, dissimilations, contour simplification, reductions (Chen 1992, 2000; Hyman and Schuh 1974; Hyman 2007; Schuh 1978). However, characterizing the above properties, is not always straightforward (and can be subject to different interpretations).

Consider for example the question of determining how many tone heights a language distinguishes. Let us take a traditional “Praguian” perspective and ask, first, what counts as a two-height tone system, and second, whether a two-height system should be analyzed as bivalent (H vs. L), privative (H vs.  $\emptyset$  or L vs.  $\emptyset$ ), or perhaps a combination of H vs. L vs.  $\emptyset$ . The first question runs into the problem of discrepancies between levels of representation: Some languages have a binary contrast underlyingly, but derive up to five surface-contrasting tone heights, which may be surface contrastive. Some of the ways to derive a third tone height from the interaction of H and L are shown in (4).

- (4) a. lowering of H after L, e. g. Kom (Hyman 2005) L-H > L-M > M  
 b. raising of L before H, e. g. Ik (Heine 1993) L-H > M-H > M  
 c. raising of H before L, e. g. Engenni (Thomas 1978) H-L >  $\uparrow$ H-L >  $\uparrow$ H

As indicated, the development proceeds in two steps: First a tone is raised or lowered in the context of another tone. Then, when the latter loses its tone-bearing unit (TBU), the conditioned raised or lower tone becomes contrastive on the surface. As an example, consider how Heine (1993: 18) characterizes the M tone in Ik (Eastern Sudanic; Uganda):

A low tone is realized as mid if followed by a high tone in the same word. The mid tone is retained even when the high tone is deleted due to word-final devoicing.

As a result, although the contrast is underlyingly two-height, derivations such as the following produce a three-height contrast H, M, L on the surface:

- (5) /cèkí/ → cēkí → [cēk] ‘woman’ *cf.* /bòsì/ → [bòs] ‘ear’  
                        /tsútsá/ → [tsúts] ‘fly’

In terms of typology, the question is whether Ik has a two-height or three-height tone system? What is clearly needed is a typological approach which encodes both underlying and surface contrasts. Thus, Ik might be considered to have a 2T3 height system: two input vs. three output tone heights.

Even if the system is 2T2, i. e. with two heights in both input and output, the main question is whether the contrast is bivalent (H vs. L) or privative (H vs. ∅ or L vs. ∅). As Stevick (1969: 330) points out:

Whenever a system consists of two contrasting entities, the analyst may suggest an alternative interpretation whereby one of the entities is ‘zeroed out’ and the contrast is regarded as presence vs. absence of some one positive entity.

This is of course a matter of interpretation and analysis, which may vary according to the theoretical framework or working assumptions of individual researchers. Still, two-height systems do differ in just this way. The following four different tone systems have been proposed in the literature:

- (6) a. /H, L/    e. g. Baule, Bole, Mende, Nara, Falam, Kuki-Thaadow, Siane,  
                        Sko, Tanacross, Barasana  
       b. /H, ∅/    e. g. Afar, Chichewa, Kirundi, Kiwai, Tinputz, Una, Blackfoot,  
                        Navajo, Seneca, Slave  
       c. /L, ∅/    e. g. Malinke (Kita), Ruund, E. Cham, Galo, Kham, Dogrib,  
                        Tahltan, Bora, Miraña  
       d. /H, L, ∅/ e. g. Ga, Kinande, Margi, Sukuma, Tiriki, Munduruku, Puinave,  
                        Yagua

The most familiar situation is (6a), where the underlying contrast is between /H/ and /L/. However, there are good reasons to recognize the privative systems in (6b,c), where one member of the tonal opposition is ∅ (absence of tone), and even (6d), which requires /H/, /L/ and toneless TBUs. The guiding principle is to posit the one vs. two tones which are “phonologically active”, i. e. invoked by the language’s constraints/rules. This is what Clements’ (2001, 2003) calls “representational economy”:

... features are specified in a given language only to the extent that they are needed in order to express generalizations about the phonological system. (Clements 2001: 2).

So the question in each case becomes: What is the evidence that H and/or L need to be specified? Or that one or the other “needs” to be absent?

Let us start with the first case: A two-height contrast should be analyzed /H, L/ if both features are phonologically activated. The following three properties have generally provided the most compelling arguments that both /H/ and /L/ are activated:

- (i) *Contour tones*. The presence of  $\widehat{HL}$  and/or  $\widehat{LH}$  tonal contours on a single TBU requires both features, as  $\emptyset$  can't form a contour.
- (ii) *Floating tones*. The presence of both floating H and floating L would require that both features be activated, since  $\emptyset$  cannot float. Examples can be seen from Eastern Grassfields Bantu in (3) above. To illustrate the need for both floating tones consider the following data from Babanki (Kejom) [Western Grassfields Bantu; Cameroon] (Hyman 1979b):

- (7) a. *kà-kám* [L-H] ‘crab’    *kà-kám*    *ká ñàm* ‘crab of animal’    /-kám/  
 b. *kà-fó* [L-H] ‘thing’    *kà-fó*     $\downarrow$ *ká ñàm* ‘thing of animal’    /-fó`/  
 c. *kà-mbò°* [L-L°] ‘bag’    *kà-mbò*    *ká ñàm* ‘bag of animal’    /-mbò´/  
 d. *kà-ndǝŋ* [L-L] ‘throat’    *kà-ndǝŋ*    *ká ñàm* ‘throat of animal’    /-ndǝŋ/

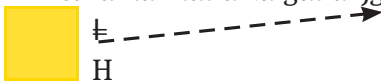
The nouns in (7a,b) are both pronounced L-H in isolation. However, as seen in the phrases to the right, ‘thing’ conditions a downstep on the connective (genitive) marker  $\downarrow$ *ká* which is lacking in ‘crab of animal’. The reason can be seen in the underlying forms to the right: /-fó`/ has a final floating L tone (left behind when the second stem syllable fell out historically), which conditions the downstep; /-kám/ does not have a floating tone, and hence no downstep occurs. While (7b) demonstrates that Babanki therefore needs a floating L tone feature, the contrast in (7c,d) shows the need for a floating H: The noun *kà-ndǝŋ* ends in a L tone which undergoes final downgliding. The noun *kà-mbò°*, on the other hand, ends in a level L tone (transcribed as L°) which is prevented from downgliding by the final floating H. For this and other reasons, both H and L are phonologically activated in Babanki.

(iii) *Tone rules*. Languages in which tone rules need to refer to both H and L require both features to be activated. This is seen most clearly in languages which have both H tone spreading (HTS) and L tone spreading (LTS), especially if the result is a contour tone: /H-L/ → H- $\widehat{HL}$ , /L-H/ → L- $\widehat{LH}$ .

In short, any evidence that both H and L “must” be referenced in the tonal phonology or morphology. (I put “must” in quotes since abstract analytic devices

can sometimes do a similar job, e. g. a floating empty tonal node instead of a floating L tone.)

Privative systems are quite different from bivalent /H, L/. In a privative /H/ vs.  $\emptyset$  system, since [L] is underspecified ( $\emptyset$ ), the H in principle: (i) cannot form  $\widehat{HL}$  and  $\widehat{LH}$  contours on a single tone-bearing unit (TBU); (ii) can be a floating tone, whereas L cannot; (iii) can be subject to an obligatory contour principle (OCP) constraint (\*H-H), whereas L cannot; (iv) can shift over long distances, since there are no specified L tones to block the shift; (v) can interact with (“see”) another H tone at long distance, since there is no L between them; (vi) is a pitch target, whereas  $\emptyset$  may not be. Property (iv) is illustrated from Giryama [Bantu; Kenya] in (8), where a H may be displaced one or more words to the right (Volk 2011: 1):

- (8) a. *ni-na-mal-a ku-gul-a nguwo* ‘I want to buy clothes’  
 b. *a-na-mal-a ku-gul-a nguúwo* ‘s/he wants to buy clothes’
-  H

In (8a) the utterance is underlyingly toneless, with all TBUs being realized with default L pitch. In (8b), the only difference is that the subject prefix /á-/ ‘s/he’ has an underlying H tone. As seen, this H shifts to the penultimate mora of the phonological phrase, here realized on the underlyingly toneless noun object ‘clothes’. This shift would not be possible if the intervening TBUs had specified L tones. Although less common, privative /L/ vs.  $\emptyset$  systems have the same but inverted properties as /H/ vs.  $\emptyset$ . Thus, Bora-Miraña [Witotoan; Peru] has floating L (but not floating H) and an OCP constraint against \*L-L (but not H-H) (Weber and Thiesen 2000; Seifart 2005).

Long-distance effects such as in (8) require low tonal density, defined as a calculation of TBUs with vs. without tone (Gussenhoven 2001: 152967). Systems requiring a tonal specification on every syllable or mora will have greater tonal density than those which restrict tone to a subset of syllables/moras. Equipollent /H, L/ systems will thus be more dense than privative /H/ vs.  $\emptyset$  (or /L/ vs.  $\emptyset$ ) systems. Systems which contrast /H/, /L/ and  $\emptyset$  will be in between: The TBUs marked by /L/ will have a stable or recognizable L tone with potential blocking effects, while those which are unmarked ( $\emptyset$ ) will not. In addition, three-, four- and five-height systems will tend to have greater tonal density than two-height systems. Finally, systems with tonal contours will generally have greater tonal density than those which have the restriction “one tone per TBU”.



### 3 How do two-height tone systems acquire more tones?

Having established that there are the four different types of two-height systems in (6), we now turn to the question of change. Which way do such systems change? In both directions in (9)? In one direction more than in another?

- (9) a. tonogenesis > \*H, \*L > H, Ø  
 b. tonogenesis > \*H, \*Ø > H, L

The brief answer is: It depends! If tonogenesis creates sparse tone, the contrast should be privative, as in Somali, where H is limited to last two moras of the word, also Mohawk, and Athabaskan tone systems, where most TBUs are toneless. If, on the other hand, tonogenesis creates dense, “omnisyllabic tone” (Matisoff 1999), the contrast should be bivalent (H vs. L). It also may depend on whether the language in question has long vs. short words: The Southeast Asian tonogenesis schematized in (1) generally produced monosyllabic words, which therefore will produce high tonal density (reduction processes whereby a tone is deleted, as in the Chinese “neutral tone” phenomenon, are generally later developments). Note that the schemas in (9) show tonogenesis directly producing two level tone heights, whereas it may also directly create contours; it may presumably also directly create a L, Ø privative system.

The following are suspected correlations: (i) As a system changes from dense to sparse tone, we expect \*H, \*L > H, Ø. (ii) As a system changes from sparse to dense tone, we expect \*H, \*Ø > H, L. (iii) Some tone systems are more syntagmatic than others in the sense that they place tones, e. g. H, on specific positions defined with respect to a stem or word boundary (initial, final, penultimate etc.). The more syntagmatic the tone system, the more likely that the language has privative tone. (iv) Languages which are poly-agglutinative, like canonical Bantu, don’t develop true M tones; a /H/ vs. /M/ vs. /L/ system would be highly paradigmatic, at odds with the syntagmaticity of the language. To appreciate this, consider a word with six agglutinated monosyllabic morphemes, each contrasting /H, M, L/. This would produce 729 (3<sup>6</sup>) tone combinations. Such a system thus has to be syntagmatic, i. e. with severe restrictions on where the tones can contrast. Whether Proto-Bantu reconstructs with \*H/\*Ø or \*H/\*L depends on how agglutinative the original system was. Tone was inherited from pre-Proto-Bantu, however, and is quite old. On the other hand, Bantu languages which shorten their words through maximum size conditions or final erosion are definitely /H, L/, e. g. Grassfields Bantu in (3) and (7).

Another generalization is that languages which develop a third pitch height will tend to have dense tone. Where occurring, the languages will tend to have shorter words, developing the extra tone height from three sources: phonation, tonal assimilations, contour simplifications. We have already discussed the first, phonation/consonant-induced in (1). An African case of tone splitting occurs in Masa [Chadic; Chad], where /H/ appears after all consonants, but the two allophones of the non-H tone have become marginally contrastive (Caïtucoli 1978: 77):

(10) <i>initial root segments</i>	<i>non-H tone:</i>
b, d, g, v, z, ʒ, ʒ, fi	L
p, t, k, f, s, tʃ, ʃ, h, b, d, l, r, w, y, a, e, i, o, u	M
m, n, ŋ	L, M

As seen, the non-H tone is realized [L] after “depressor” voiced obstruents and mid tone after voiceless, implosive and oral sonorants consonants, as well as on vowels which have no preceding onset. It is after nasal consonants that there is a contrast. The contrast results from the merger caused by the simplification of prenasalized consonants: \*mb, \*nd, \*ŋg > m, n, ŋ. This can be verified in closely related Musey, where the retained prenasalized consonants pattern with voiced obstruents as depressors (Shryock 1993: 2).

The second source of third pitch heights is from tonally induced “vertical adjustments” triggered by adjacent tones:

(11) <i>Assimilation</i>	<i>Dissimilation</i>
L-H → M-H (Ik)	H-L → <sup>^</sup> H-L (raising)
L-H → L-M (Kom)	H-L → H- <sup>↓</sup> L (lowering)

As schematized in (11), /L-H/ frequently undergoes anticipatory raising or perseverative lowering, while /H-L/ rarely undergoes anticipatory lowering or perseverative raising. As seen a /L-H/ interval is subject to compression: L-H → M-H, L-M. A /H-L/ interval is instead subject to expansion: H-L → <sup>^</sup>H-L, H-<sup>↓</sup>L. As an example of the latter, the following examples from Engenni [Edoid; Nigeria] show that a H becomes superhigh (‘’) before either a linked or floating L (Thomas 1978):

(12) a. /únwónì/ ‘mouth’	b. /únwónì + ólíló/ ‘mouth of a bottle’
↓	↓
[únwónì]	[únwón ólíló]

(12a) shows the second H of ‘mouth’ becoming raised before the final L, while (12b) shows that the new superhigh tone becomes surface-contrastive when the vowel /i/ is deleted. (The L of the syllable /ni/ can be represented as floating in the output of (12b).)

The third source for developing a third tone height is from contour simplification. By the Principle of Ups and Downs (Hyman 1978: 261) tone systems tend to modify tonal changes between syllables, but especially contour tones, where tone heights change on a single TBU. In this case a former contour tone is compensated by the creation of an additional tone height. Compare the different ways of simplifying /L-HL-H/ to reduce its three ups and downs in Grassfields Bantu:

(13)	<i>Language</i>	<i>Output</i>	<i>Process</i>	<i>Reference</i>
a.	Mankon	L-H- <sup>^</sup> H	H-upstep	Leroy (1979)
b.	Babanki	L-M-H	HL-fusion	Hyman (1979a)
c.	Babadjou	L-H- <sup>↓</sup> H	H-downstep	(personal notes)
d.	Dschang	L- <sup>↓</sup> H-H	HL-fusion+downstep	Hyman and Tadadjeu (1976)
e.	Kom	L-M-M	H-lowering	Hyman (2005)
f.	Aghem	L-H-H	L-deletion	Hyman (1986b)

As indicated in (13), an alternative to developing a M tone is “downstep” (<sup>↓</sup>H), which is a syntagmatic phenomenon, since it lowers the register of all of the following tones occurring within the downstep span. This can be seen in the following illustrations of the non-phonemic vs. phonemic downstep in (14), where 1 = the highest pitch:

- (14) a. automatic or non-phonemic downstep (“downdrift”), e. g. Hausa [Chadic; Nigeria] (Welmers 1973: 94)  
*í:yà tá: dáfà dánkàlì: dà ná:mà:* ‘the teacher didn’t come’  
 1 3 2 2 4 4 3 5 5 4 6
- b. non-automatic or “phonemic” downstep, e. g. Igbo [Benue-Congo; Nigeria] (Welmers 1973: 84)  
*ńwá ñ<sup>↓</sup>né ñ nà ónyé ñkúzí <sup>↓</sup>yá byàrà ń<sup>↓</sup>l<sup>↓</sup> ń<sup>↓</sup>ányí*  
 11 2 2 4 3 3 3 3 4 6 6 5 6 7 7  
 ‘my brother and his teacher came to our house’

Since H-M and H-<sup>↓</sup>H sequences may be phonetically identical, care must be taken to determine if a third tone height is a M or downstepped H tone. The following three criteria characterize “canonical” downstep tone systems (Hyman 1979a: 11): (i) If the tone is <sup>↓</sup>H, it will contrast with H only after a H (or another <sup>↓</sup>H); (ii) If the tone is <sup>↓</sup>H, a following H tone will necessarily be realized on the same pitch level. (iii) If the tone is <sup>↓</sup>H, the language should theoretically permit an unlimited number of non-low tone levels (i. e. H-<sup>↓</sup>H-<sup>↓</sup>H-<sup>↓</sup>H), as in Igbo example in (14b). The following summarizes the expected differences in creating a third height from an earlier \*H, \*L system (Hyman 1986a: 128):



In the Yoruba examples, when the H tone of the verb combines with the initial L of the following noun, the latter delinks and produces a LH rising tone in the first example, but a downstepped  $\downarrow$ M in the last. In the second Gokana example the floating H tone oblique marker combines with a preceding L, the result is a M- $\downarrow$ M sequence.

## 4 How do multiple height tone systems lose tones?

As seen in the previous sections, we have a pretty good idea of where new tone heights come from. In this sections I will briefly consider cases where an inherited tone height is lost. Mergers of tone heights can be recovered by the comparative method and often by internal reconstruction. Kagwe (Dida) [Kru; Ivory Coast] has three surface tone heights, but two kinds of /M/: /M<sub>a</sub>/ (class A) alternates between M and H, while /M<sub>b</sub>/ (class B) remains M (Koopman & Sportiche 1982). The relevant rule (18a) is that a M<sub>a</sub> becomes H after another M<sub>a</sub>:

- (18) a. M<sub>a</sub> → H / M<sub>a</sub>\_\_  
 b. M<sub>a</sub> : *lē* ‘spear’    *mànā lé* ‘this spear’  
           : *jō* ‘child’    *mànā jō* ‘this child’  
 c. M<sub>b</sub> : *kp̄l̄* ‘bench’    *mànā kp̄l̄* ‘this bench’  
           : *l̄* ‘elephants’    *mànā l̄* ‘these elephants’

In all other contexts /M<sub>a</sub>/ is realized phonetically M, hence identical to /M<sub>b</sub>/ . In (18b) the demonstrative *mànā*# ‘this/these’ is underlying /L-M<sub>a</sub>, hence conditioning the change of the M<sub>a</sub> of ‘spear’ and ‘child’ to H. As seen in (18c), the /M<sub>b</sub>/ of ‘bench’ and ‘elephants’ does not change in this environment. The reason for the two Ms is that pre-Kagwe used to have four tone heights, as in other Dida dialects: M<sub>a</sub> was an upper M tone, while M<sub>b</sub> a lower-mid tone. The two have merged as M except in the one environment in (18a).

A second example comes from Villa Alta Yatzachi Zapotec [Zapotecan; Mexico] (E. Pike 1948) which has three surface tones, H, M, L, but two kinds of L tones (Pike’s class A vs. B, respectively): L<sub>a</sub>, which remains L vs. L<sub>b</sub> which becomes M before another M or H:

- (19) a. L<sub>b</sub> → M / \_\_ {M, H}  
 b. L<sub>a</sub> : *bìa* ‘cactus’    *bìa gōlī* ‘old cactus’  
       L<sub>b</sub> : *bìa* ‘animal’    *bìa gōlī* ‘old animal’

A minimal pair is given in (19b). The reason for this differential behavior is again that a previous stage of the language contrasted four tone heights:  $L_b$  was once a tone between L and M, while  $L_a$  was simply /L/.

Another case of simplifying tone heights occurs when languages lose their downsteps. The widespread Eastern Bantu tone rule known as Meeussen's Rule by which /H-H/ becomes [H-L] (or [H-Ø], depending on the language) is the synchronic product of an earlier change  $H-\downarrow H > H-L$  and is thus a telescoped version of two separate changes:  $*H-H > H-\downarrow H > H-L$ . First, a sequence of Hs is realized with downsteps, as Odden (1982) originally documented in Shambala [Bantu; Tanzania], followed by the change of  $\downarrow H$  to L (or Ø). On the other hand, Aghem [Western Grassfields Bantu; Cameroon] changed in the opposite direction. It once had M tone like Kom (recall (4a), (11), (13e)), which it reinterpreted as  $\downarrow H$  (Hyman 1986b):

- (20) a.  $*H-M > H-\downarrow H$   
 b.  $*H-M-M > H-\downarrow H-H$

Recall that because H-M and H-H usually represent the same tonal interval, the change in (20a) is not a phonetic change, rather a structural one: What started out as a paradigmatic contrast between H and M is now a syntagmatic contrast between H and  $\downarrow H$ . However, given the differences between M and  $\downarrow H$  outlined in (15), there are consequences. Thus, when the change in (20b) affects  $*H-M-M$ , this sequence merges with  $*H-M-H$ .

The above examples represent some of the ways in which tone systems can change, in some case leading to a loss of certain tonal contrasts. In fact, the change of multiple tonal contrasts to few contrasts to none can occur in stages. First, there are the different ways in which relatively dense tonal contrasts can become sparse: (i) four heights  $>$  three heights  $>$  two heights; (ii) H, L  $>$  H, Ø; (iii) omnisyllabic distributions become restricted, such that only certain TBUs contrast tone. A consequence of this is that tone, a paradigmatic exponent of morphemes, can come to be realized syntagmatically at the phrase level, as in the Giryama long-distance H tone shift in (8). This in turn can lead to loss of tone entirely, as happened in Swahili.

## 5 From lexical to phrasal tone

I will now conclude with examples showing how lexical tone comes to have a phrasal character. The first case comes from Kalabari [Ijoid; Nigeria], which assigns tonal schemas by specific syntactic constructions (Harry 2004; Harry and Hyman 2014). Whenever the noun is non-initial in its noun phrase, it loses its

tones and receives one of four “melodies” depending on the word class of the preceding modifier. Thus the /H-H/ tone of /námá/ ‘animal, meat’ has four different realizations after the all L words in (21).

(21)	construction	phrasal tones	example	
a.	N <sub>poss</sub> + N	HL	tòbò námà	‘the child’s animal’
b.	PRO <sub>poss</sub> + N	HLH (→ H-↓H)	ìnà ná <sup>↓</sup> má	‘their animal’
c.	Det + N	LH	tò nàmá	‘which animal?’
d.	Quant + N	L	jà nàmá	‘some meat’

As seen in (21a), a possessive noun (N<sub>poss</sub>) will assign a HL tone pattern to the possessed noun, while a possessive pronoun (PRO<sub>poss</sub>) will assign a HLH melody, as in (21b), where the HLH sequence is simplified to H followed by downstepped ↓H. Similarly, (21c) shows that a determiner (Det) will assign a LH melody, while quantifiers (including most numerals) will assign a L melody, as in (21d). The following shows the mapping of the N<sub>poss</sub> HL and PRO<sub>poss</sub> HLH melodies over the sequence of possessed nouns féní ‘bird’ + námá ‘meat’:

(22) a.	tòbò	+	féní	+	námá	→	tòbò	fèní	nàmà	‘the child’s bird’s meat’
	L-L		H-H		H-H		L-L	H	L	
b.	ì	+	féní	+	námá	→	ì	fèní	nàmá	‘my bird’s meat’
	L		H-H		H-H		L	H	L	H

The diachronic analysis accounting for the N<sub>poss</sub> HL melody starts with the reconstruction of a H tone connective (genitive) particle which occurred between the two nouns: N<sub>poss</sub> + CONNECTIVE + Noun. Three steps are involved: (i) reduction: all but the first word of a noun phrase was reduced to L after a connective; (ii) the segments of the connective marker fell out, with its H tone being assigned to the following all L word; (iii) the resulting patterns were generalized to the entire construction, thus assigned to the NP as a whole. In support of this analysis, Kalabari maintains two connectives, ná and b́é, used in specific constructions only: ná is used to mean ‘associated with’ a particular people or language, and b́é is used to indicate something associated with a place (whether a proper or common noun). As seen in the following examples, both have H tone and both make the following noun all L:

(23) a.	Kálábàrì ná fèní	‘Kalabari bird, a bird that the Kalabaris have’
	HH L L <u>H</u> <u>L</u>	(cf. féní ‘bird’)
b.	Dégémà b́é fìè	‘Degema food’ (cf. fíé ‘food’)
	H H L <u>H</u> <u>L</u>	
c.	wá <sup>↓</sup> rí b́é nùmè	‘the house song’ (cf. nùmé ‘song’)
	HLH <u>H</u> <u>L</u>	

The underlined HL melody of the connective + following noun presumably also occurred in other  $N_{\text{Poss}} + N$  constructions where the connective has since been lost. A similar story can be told about the  $\text{PRO}_{\text{Poss}} + N$  HLH melody, where the final H is from a lost final determiner morpheme (see Harry and Hyman 2014 for more discussion).

The second case of phrasal tonology comes from Chimwiini [Bantu; Somalia], which has evolved into an extremely restricted privative H vs.  $\emptyset$  tone system (Kisseberth 2009). First, there is only grammatical tone in Chimwiini. Second, the H tone is limited to one of the last two syllables, i. e. final H vs. penultimate H. (It is tempting to attribute this pattern to the areal influence of Somali, which however assigns a H to final vs. penultimate moras, not syllables; cf. *túug* ‘thief’, *tuúg* ‘thieves’). As seen in (24), first and second person subjects condition final H vs. third person which conditions penultimate H:

(24)		<i>singular</i>		<i>plural</i>	
	1st pers. } final H:	<i>n- ji:lé</i>	‘I ate’	<i>chi- chi-ji:lé</i>	‘we ate’
	2nd pers. }	≠ { <i>ji:lé</i>	‘you sg. ate’	<i>ni- ni-ji:lé</i>	‘you pl. ate’
	3rd pers. } penult H:				

As indicated, the only difference between the 2nd and 3rd person singular (noun class 1) is tonal. The first/second person final H vs. third person penultimate H tone in Chimwiini is actually a property of the phonological phrase (Kisseberth 2009). Thus, the tonal difference attributable to the subject of the verb is realized on the object noun in (25).

(25) a.	<i>jile: ṅamá</i>	‘you sg. ate meat’	<i>jile ma-tu:ndá</i>	‘you sg. ate fruit’
b.	<i>jile: ṅáma</i>	‘s/he ate meat’	<i>jile ma-tú:nda</i>	‘s/he ate fruit’

Such a long distance effect is reminiscent of the example in (8) from Giryama which, however, has a fuller tone system (see Volk 2011). Although a single final or penultimate H is possible on the sentences in (26), Kisseberth also shows that depending on the information structure, the phonological phrases may be nested. In this case more than one H tone is realized:

(26) a.	$\emptyset$ - <i>wa-tindilile w-a:ná</i> ]	<i>ṅamá</i> ]	<i>ka: chí-sú]</i>	‘you sg. cut for the children meat with a knife’
b.	$\emptyset$ - <i>wa-tindilile w-á:na</i> ]	<i>ṅáma</i> ]	<i>ka: chí-su]</i>	‘s/he cut for the children meat with a knife’

That the subject prefixes should have such a phrasal effect raises the question of what exactly the H tone contrast is: Is it still “tone”? It clearly has morphological properties, as the first/second vs. third person distinction is responsible for the contrast. It is also phonological, as Kisseberth (2009: 6) argues that the



phonological phrase is a “phonological construct”, which however is defined by syntactic configuration (time adverbials like ‘the day before yesterday’ would fall outside the phonological phrase). Finally, since the nested realizations in (26) are intimately tied to the expression of information structure, should the H tones be considered “intonational”? The major argument against this is functional: It would be strange for there to be an intonation that expressed first/second vs. third person subjects.

## 6 Summary

In the preceding sections I first considered the different factors that may determine not only tonogenesis, but also tonal splits. It was suggested that it is not always possible to reconstruct a proto-tone system, rather a system of earlier laryngeal contrasts that subsequently develop into different tonal contrasts in the various daughter languages. This appears to be the case, for example, in Kuki-Chin vs. Proto-Bantu (or even earlier in Proto-Bantoid) where two tones \*H and \*L are safely reconstructed with direct reflexes in the present day offspring languages. While emphasis in studying tonal splits has focused either on voicing distinctions on onsets or on phonation contrasts, I showed that multiple tone height systems can derive by simple interaction between two tones \*H and \*L, especially if certain TBUs are lost. I then considered the reverse situation whereby a multiple tone height system may lose a contrast to change from four to three or from three to two contrasting tone heights. Finally, the contrasts in a two-height tone system can change from being primarily paradigmatic (with lexical minimal pairs etc.) to phrasally syntagmatic. The last stage is the complete loss of tone, or “tonoexodus” (Lea 1973; Green 2010; Ratliff 2015).

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