

TONEMES OF XHOSA

by

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THE TONEMES OF XHOSA: A RESTATEMENT

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1. Introduction.

1.0. A first attempt at describing the Xhosa tonemic system was made in The tonemes of Xhosa, African Studies 17:2, 1958. The present paper was, for the most part, written a year later; it was edited, with corrections and minor changes, for the present publication. There is need for further improvements in this statement of Xhosa tonemics, but the complete rewriting of the paper has not been possible.

1.1. Xhosa (hereafter Xh) is a Bantu language of the Nguni subgroup in the Central Branch of the Niger-Congo family, located in southeastern Africa. Its closest relatives are Zulu, Ndebele, Swazi (hereafter Z, Nd, Sw). In these languages pitch differences are organized within the tonemic and intonation systems and these two systems interact in the manner described at 5.1. The tonemic systems of the Nguni languages would seem to be the most complex of all the Central Branch languages.

The linear phonemes of Xhosa are:

i	u	ɔ																	
e	o	p	t	ts	ty	č	k	kr [kx]	c	q	x								
	a	b	d	dz	dy	ǰ	g		gc	gq	gx								
		ph	th	tsh	tyh	čh	kh		ch	qh	xh								
		f		s		š		r [x]			hl								
		v		z				ɣ			dl								
		w	l		y														
		m	n		ñ		ŋ		c <sup>n</sup>	q <sup>n</sup>	x <sup>n</sup>								
		mh	n		ñh				c <sup>n</sup> h	q <sup>n</sup> h	x <sup>n</sup> h								
								h											
								hh											

Syllables are defined by a contrastive tone and are structured as V, CV, (syllabic) m. Permitted consonant clusters are nC, Cw, nCw (n=homorganic nasal; w=labiovelar semivowel /w/). Vowel length (the feature "long") in word-penultimate syllables serves to signal a juncture demarcating syntactic



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structures, usually at the level of phrase in semi-formal speech. "Extra-long" in this same position utterance finally has contrastive function in the intonation system.

1.2. The relativistic basis of phonologic contrasts is nowhere more evident than in a tonemic system such as that of Xh. Only to a very limited extent are the representatives of Xh tonemes distinguishable per se; the accurate identification of a Xh allotone usually requires a certain minimum background of contrasting tones in addition to a knowledge of allotonic variations and the environments that condition them. It is mainly the phenomenon of "tonal stepping" that renders it possible and even common for an allotone of one toneme to be phonetically identical with the allotone of another toneme within a single utterance. Under these circumstances the most effective type of description is one that concentrates more on explaining the wide range of allotonic diversity in Xh than on describing it.

In the speech of one individual a toneme may be realized at levels widely separated within the speaker's pitch-range, depending on such factors as his physical and emotional state, constraints imposed by the intonation system, etc. In such cases, however, it is not single tones but sequences of tones overlaying whole utterances, or substantial portions thereof, which are affected, and normal contrasts between tonemes are usually maintained within the sequence. Within the tonemic system changes in "key" have no significance. It is true however that even within a short utterance a "high" toneme near the end may be realized at the same pitch level as that of a "low" toneme near the beginning, or may even be lower in pitch. It is clear therefore that there is some smaller unit within which significant pitch contrasts are maintained. This unit is the "tonal step" which, apart from a few accountable exceptions, always contains at least one high and one low toneme.

Apart from the factors mentioned which produce changes in "key", it is possible to identify within an utterance allotonic variations associated with specific points in the segmental and suprasegmental environment. At such points conditioning influences are found which operate regularly and uniformly, forcing tones higher or lower or producing glides in place of level tones. It is these influences (which include the phenomenon of tonal stepping) that determine the range of allotonic variation and to describe







them fully is to provide an adequate account of the representation of tonemes.

1.3. In any piece of spoken Xh of sufficient length, it is possible to identify tones which can be described by the conventional terms "high tone, mid tone, low tone" etc., and also "rising" and "falling glides". These terms have no structural connotation, however. Tonemic equivalents will be found in terms such as "the raised allotone of the high toneme", etc. Tonetic data are presented in this paper by marking pitch levels and contours with short lines within square brackets. Five relative levels are distinguished within these brackets, but there is no indication as to where these levels occur in the pitch-range of the speaker. The upper and lower limits of the brackets are adjusted to accommodate differences in pitch with regard to a particular utterance heard from a particular informant at a particular time. Where immediate comparisons are made between minimal or nearly-minimal pairs, however, we intend that the limits indicated by each set of brackets should be regarded as located at approximately the same pitch.

## 2. The Tonemes.

2.1. Pitch contrasts. In the shape of the tonemic norms, the majority of pitch contrasts in Xh are between a high level tone, a low level tone and a high-falling gliding tone. The latter is always bound to concomitant vocoid length and for reasons given later the glide is best interpreted tonemically in terms of its end-points, i.e., as the close-knit cluster "high-low" which falls upon a single syllable whose peak vocoid incorporates the length feature in order to accommodate the cluster. Xh thus has two register tonemes and every syllable of every utterance bears one or the other of these tonemes, or the close-knit cluster of two.

2.2. The high toneme. When uninfluenced by any of the conditioning factors described below, this toneme is realized at a pitch level discernibly higher than that of the allotone of the low toneme to be found in a similar non-influencing environment. The pitch is maintained without any marked rise or fall. H symbolizes the high toneme in isolation; in association with the vowels and syllabic /m/, it is represented thus: /á é í ó ú m/. There are no restrictions on the distribution of H within an utterance.

The same set of tonemes in one tonal step may be represented by



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markedly higher or lower pitches in another step. The tonal-downstep phenomenon thus produces its own allotonic variations which are, however, purely gradational and thus defy precise definition. A full description of the phenomenon of tonal stepping is sufficient to account for these allotones.

Within any particular tonal step the following principal allotones of H appear as a result of environmental influence: (a) A rising glide as a result of consonantal influence, see 3.2; (b) a raised high level tone as a result of a tendency of high tones in sequence to rise in crescendo, see 3.8.

2.3. The low toneme. When uninfluenced by its environment, this toneme is realized at a relatively low pitch level by a tone which does not rise or fall. The symbolization of this toneme is by L and /à è ì ò ù ò̃/.

Within any particular tonal step the following principal allotones of L appear as a result of environmental influence: (a) A falling glide resulting from assimilation to a high toneme in the immediately preceding syllable, which commences at a fairly low level and glides gradually to a lower level; (b) a raised low or mid level tone resulting from assimilation to Hs in the immediately preceding and succeeding syllables. Allotone (a), when coinciding with the average short peak vocoid, may not always have an easily discernible glide. A certain minimum duration is necessary to recognize the glide, which is, however, always heard in slow precise speech, or where junctural or intonational length prolongs vocoid duration. In partially devoiced final syllables and very short syllables a raised level tone may be heard instead of a glide.

2.4. The close-knit cluster of two tonemes HL. Examples given at 2.9. illustrate the contrastive quality of the high-falling glide which differs from occurrences of the glide allotone of L mentioned above, by (a) a higher starting point and a more rapid descent, and (b) by always coinciding with a long vocoid. The pitch interval through which the glide moves varies considerably according to vocoid duration, but the fact that it always coincides with a length feature ensures that the glide is never obscured (cf. the glide allotone of L). The high-falling glide has a variant in the form of a rising-falling glide found under the same conditions of consonantal influence that produce the rising-glide allotone of H.

2.5. In an earlier analysis (The tonemes of Xhosa, African Studies,



...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...

...the ... of ... in ... the ... of ...



17:2, 1958) the high-falling glide was interpreted as a third toneme and the associated length feature tentatively identified as a non-distinctive, conditioned concomitant. It now seems preferable to reinterpret this tone-length complex and to identify the tone constituent as representing a cluster of two tonemes--virtually the only example of such clustering in the tonemic system of Xh. One reason for preferring this interpretation is that in the tonal morphology of Z, Nd and Sw the description of the tonal grammar is greatly simplified if toneme clustering on single syllables is recognized. In these languages the individual tonemes of some such clusters have to be assigned to different tonal morphemes. Although this is never the case in Xh, there are advantages in retaining the same descriptive frame for the basically similar tonemic systems of Nguni.

2.6. It is of interest to notice the close association between the tone-length complex under discussion and certain points in the segmental morphology. These points are located where systematically ordered syllable elision has occurred, either synchronically or diachronically. It is the length feature in particular which serves to indicate the former presence of an elided syllable because neither H or L of the HL cluster can consistently be identified as the toneme of the lost syllable. Pursuing the investigation of length as a mark of syllable elision, it is found that in a very small number of forms such length coincides with a sustained high tone and not a falling tone.

Examples of these forms are (penultimate-syllable length is the intonational/junctural feature referred to at 1.1.):

[bá:kuthé:nga] </bázákùthêngà/ 'They will buy'

[la:] </lèyá làwá/ etc. 'that' or 'those yonder'.

These contractions are perfectly regular in colloquial and formal speech. In connection with the latter a minimal pair is to be found, viz.

[lamadó:da] 'these men' : [la:madó:da] 'those yonder men'

For reasons evident from the discussion in the next paragraph, it is best to regard the length feature in these forms as conditioned rather than contrastive and to recognize toneme clustering as the conditioning factor. There is in Xh therefore the common cluster HL, and the rare cluster HH appearing in forms such as those cited above, viz.: /bázákùthêngà/, /lá/, /lámádòdà/.

The extra length of certain syllable-peak vocoids is a complex phenomenon







in Xh and different occurrences demand different interpretations. Firstly there is length which is part of an utterance but not an integral part of any constituent morph or word, i.e. it can be "lifted off". Such length is located in the penultimate syllable of words but not found in every word of an utterance, except in a quite abnormal "dictation" style of speech. As indicated in 1.1., utterance medially the function of such length is demarcative (i.e. junctural, marked in this paper as /+/); utterance finally it is best assigned to an intonation. Secondly, there is the length concomitant of toneme clusters (nearly always HL) which is rigidly bound and not isolable. It is perfectly possible for toneme clusters to occur in word-penultimate syllables and, therefore, for the two types of length occurrence to coincide. The apparent effect of such coincidence would be the weakening of the signalling power of the juncture. As indicated at 4.7., however, this situation is largely obviated by a morphotonemic process which replaces HL with H when no juncture follows.

2.7. The following exemplification of HL includes an indication of the extent to which these clusters are morphologically bound to items of segmental morphology and how closely they are associated with points at which historical or synchronic syllable elision has occurred (revealed in allomorphs such as the synchronic alternants /f-íli-/ as the prefix of class 5 of nouns).

(a) HL with the short perfect tense suffix /-ê/, cf. /ile/ the long form of the suffix.

/ndìthê/ 'I said'                      /bâbêthê/ 'They have hit'

(b) HL with indicative remotepast tense subjectival concords, e.g. /ndâ- < ndi-a-/, /wâ- < u-a-/, etc.

/wâphâ/ 'You gave'              /ndâlîmâ/ 'I ploughed'

(c) HL with locative demonstrative copulatives. 1st position form: /nâsí/ 'Here it is' (a dish). 3rd position form: /nâsiyâ/ 'There it is yonder' (a dish).

(d) HL with class 2a noun prefix /ô-/, cf. the alternant /awo-/ found in Z.  
/ôbawô/ 'our fathers'

(e) HL with the short 2nd positional demonstrative /lô/, cf. the long forms /léyò/, /lówò/.

/lôntô/ 'that thing'                      /lômntù/ 'that person'



In the first instance, the subject of the proposition is not a part of the predicate, and the predicate is not a part of the subject. In the second instance, the subject is a part of the predicate, and the predicate is a part of the subject. In the third instance, the subject is not a part of the predicate, and the predicate is not a part of the subject. In the fourth instance, the subject is a part of the predicate, and the predicate is not a part of the subject. In the fifth instance, the subject is not a part of the predicate, and the predicate is a part of the subject. In the sixth instance, the subject is a part of the predicate, and the predicate is a part of the subject. In the seventh instance, the subject is not a part of the predicate, and the predicate is not a part of the subject. In the eighth instance, the subject is a part of the predicate, and the predicate is not a part of the subject. In the ninth instance, the subject is not a part of the predicate, and the predicate is a part of the subject. In the tenth instance, the subject is a part of the predicate, and the predicate is a part of the subject.

- (1) The following propositions of the first class are included in the second class, and the second class is not included in the first class.
- (2) The following propositions of the second class are included in the first class, and the first class is not included in the second class.
- (3) The following propositions of the third class are included in the first class, and the first class is not included in the third class.
- (4) The following propositions of the fourth class are included in the second class, and the second class is not included in the fourth class.
- (5) The following propositions of the fifth class are included in the first class, and the first class is not included in the fifth class.
- (6) The following propositions of the sixth class are included in the second class, and the second class is not included in the sixth class.
- (7) The following propositions of the seventh class are included in the first class, and the first class is not included in the seventh class.
- (8) The following propositions of the eighth class are included in the second class, and the second class is not included in the eighth class.
- (9) The following propositions of the ninth class are included in the first class, and the first class is not included in the ninth class.
- (10) The following propositions of the tenth class are included in the second class, and the second class is not included in the tenth class.



- (f) HL with the prefix /f̃n-~f̃m-~f̃n̄-~f̃ŋ-/ of certain class 10 nouns, cf. the disyllabic prefix /izin-~izim-~iziñ-~iziŋ-/ found with monosyllabic stems. (Class 10 nouns fall into two groups, viz. (a) those identical in singular and plural, e.g. /intàk'a/ 'bird' or 'birds', /ic<sup>n</sup>wàdí/ 'book' or 'books'; (b) those which differentiate singular and plural by the toneme of the prefix, e.g., /i<sup>q</sup>welò/ 'wagon', /i<sup>ŋ</sup>kâbì/ 'oxen' (cf. the plural forms above). A strong, but incomplete, correlation exists between (a) and tonomorphologic classes of nouns with an initial L on the stem, and (b) with tonomorphologic classes with initial H.)

/i<sup>q</sup>welò/ 'wagons'                      /i<sup>ŋ</sup>k'âbì/ 'oxen'

- (g) HL with the allomorphs /î-/ and /û-/ of the prefixes of noun classes 5 and 11, cf. /ilì-/ and /ulù-/ occurring with monosyllabic stems. (Nouns with a stem-initial H have the variants /î-/ and /i-/ , /û-/ and /u-/ in the speech of our informants, with /û-/ and /î-/ usually associated with careful speech, e.g. /ihhâè-î<sup>h</sup>nhâè/ 'horse', /ûthangò-û<sup>h</sup>thangò/ 'fence'. Nouns with stem-initial L have only /i-/ and /u-/ as prefixes, cf. /i-/ and /u-/ as variants in Z and possibly other dialects of Xh.)

/îthembâ/ 'hope'                      /ûnwelè/ 'a hair'

- (h) HL in tense forms of the copulative conjugation marking a point where a defunct copulative auxiliary verb \*-li previously occurred.

/èkhonâ/ < \*elikhona 'while he is present'

/èmhle/ < \*elimhle 'she being beautiful' (participial tense)

- (i) Examples in which HL is not morphologically bound, but takes its place with H and L in the toneme patterns associated with particular tonomorphologic classes of nouns, verbs, etc., are provided at 4.3. and 4.4.

2.8. The conditioning of allotones. Environmental features on both the segmental and suprasegmental planes influence the representation of tonemes very profoundly. Of the five main conditioning factors given below, it will be seen that the first is associated with the segmental environment and the remainder with the suprasegmental environment. The latter arise out of the mutual influence of tonemes in sequence. Only an outline of the effects of these conditioning factors is given below, a full description being postponed until 3.1. ff.

- (1) A consonant frequently produces a distortion of the representation of the toneme borne by the immediately-succeeding vowel. Approximately one-third



(1) It is the first time that the history of the world has been written from the point of view of the common people. The author has taken into account the lives and struggles of the masses, and not only the kings and emperors. He has shown how the great changes in the world have been brought about by the action of the people, and how they have shaped the course of human events. The history is written in a simple and straightforward manner, and is easy to read. It is a valuable work for all who are interested in the history of the world.

(2) The author has also shown how the different nations and peoples have been affected by these changes, and how they have adapted themselves to the new conditions. He has shown how the great empires have risen and fallen, and how the world has been divided into different nations and peoples. The history is written in a simple and straightforward manner, and is easy to read. It is a valuable work for all who are interested in the history of the world.

(3) The author has also shown how the different nations and peoples have been affected by these changes, and how they have adapted themselves to the new conditions. He has shown how the great empires have risen and fallen, and how the world has been divided into different nations and peoples. The history is written in a simple and straightforward manner, and is easy to read. It is a valuable work for all who are interested in the history of the world.

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of the total number of consonants act as "depressors" and produce lowered allotones of H. Non-phonemic rising glides are the result of the influence of depressor consonants. Depressors are consonants incorporating the sound features: voicing accompanied by stop, or constriction which produces friction. (See 3.2. for a full list of these consonants.) Consonants which lack these features in combination are "non-depressors" and exercise no influence on tones. A depressor separated from the vowel by /w/ still exercises its influence.

- (2) In sequences including high and low tonemes the representation of a high toneme immediately succeeding a low toneme is nearly always lower in pitch than that of any preceding high toneme (e.g., in sequences of the type HLH,  $\overline{HLH}$ ,  $\overline{HLHL}$ ,  $\overline{HLHL}$  and also HLLH,  $\overline{HLLH}$ , etc.), and a low toneme immediately succeeding a high toneme has an allotone lower in pitch than that of any preceding low toneme, although this tonal downstep is less prominent than that involving the high tonemes. The phenomenon of the tonal downstep is a common one in Bantu and accounts for the pitch descent from the beginning to the end of an utterance or portion thereof. The boundary of the tonal step, which is the unit within which pitch contrasts are rigidly maintained, always lies between the tonemes in the sequence LH. The sequence  $\overline{HLLHLHLHLHL}$ , for example, can be broken up into the following tonal steps:  $\overline{HLL}-\overline{HLL}-\overline{HL}-\overline{HL}-\overline{HL}$ . Downsteps do not normally occur in sequences of like tonemes.
- (3) A low toneme coinciding with a non-depressor and immediately succeeding a high toneme is raised by assimilation and is usually realized as a falling glide.
- (4) In sequences of the toneme H, there is a tendency for each H to be realized at a pitch slightly higher than the preceding H or, alternatively, a sequence of three or more Hs is realized as a sequence of relatively high pitches of about the same level, except for the final H which is of a higher pitch than any preceding H. This "crescendo of Hs in sequence" is, however, seldom evident when the sequence is broken by a syllable in which H coincides with a depressor. (The use of the term "tendency" in statements regarding the conditioning of tonemes, indicates that the effects of the conditioning factor under discussion are nearly always, but not invariably, evident. Where "tend" or "tendency" is not used, the







occurrence can be regarded as one of perfect regularity.)

- (5) A low toneme falling between two high tonemes is raised by assimilation to the latter. This process takes place even if the low toneme coincides with a depressor.

2.9. The tonemes exemplified. The aim of this paragraph is to illustrate the pitch contrasts that occur at syllable peaks, in substantiation of our interpretation of such contrasts. By means of minimal or nearly-minimal pairs L and H are contrasted, and each is then contrasted with the cluster HL.

(a) The H:L contrast:

/úkùsìndà/ [ - - ] 'to escape': /úkùsìndà/ [ - \ ] 'to smear'

Note on /úkùsìndà/: (i) Tonal downstep between 2nd and 3rd tonemes. (ii) The 2nd toneme is raised by assimilation to the preceding and succeeding H.

Note on /úkùsìndà/: (i) The realization of the 3rd toneme by a falling glide is due to assimilation to the preceding H. (ii) 1st and 2nd tonemes rise in crescendo.

/úqálílè/ [ - - ] 'he has started': /úqálílè/ [ - - ] 'You have started'

/ámàthàngá/ [ - \ ] 'thighs': /ámàthàngá/ [ - \ ] 'pumpkins'

Note that depressor /g/ coinciding with H produces a rising glide.

/ndiyàqàà/ [ - - ] 'I select': /ndiyàqábà/ [ - - ] 'I smear clay'

Note that the assimilation of the final L to the preceding H tends to neutralize the effect of the downstep process.

/ísízìbà/ [ - - ] 'piece of cloth': /ísízìbà/ [ - - ] 'pool'

/síkhòná/ [ - \ ] 'It is present' (class 7 reference): /síkhòná/ [ - - ] 'We are present'

(b) The H:L contrast:

/úkùsìndà/ [ - - ] 'to escape': /úkùsìndà/ [ - \ ] 'to weigh down'

(The form /ukusinda/ provides a satisfactory triplet, in which the third syllable illustrates the H:L:HL contrast, in the case of some idiolects only. In others /úkùsìndà/ signifies both 'to weigh down' and 'to escape'.

In Z also the latter are homophones. Observe in the examples given how the toneme pattern coinciding with the noun prefixes is entirely determined by the first toneme of the stem.)

/ndiyàkùbòná/ [ - - ] 'I see you': /ndiyàkùbòná/ [ - \ ] 'I will see'

/lómntù/ [ - - ] 'this person': /lómntù/ [ - - ] 'that person'

/í'lókhwè/ [ - - ] 'dress': /í'lókhwè/ [ - \ ] 'dresses'







/lífúnílè/ [ - - ] 'It has wanted' (indicative perfect tense): /lífúnílè/  
 [ - \ ] 'it having wanted' (participial perfect tense)  
 /síkhóná/ [ \ - ] 'It is present': /síkhóná/ [ \ - ] 'it being present'  
 (participial tense)

(c) The HL:L contrast:

/í]thàngà/ [ \ - ] 'cattle post': /íthàngà [ \ - ] 'pumpkin' (Informants also  
 give the alternant /íthàngà/ [ \ - ])  
 /síkhóná/ [ \ - ] 'it being present' (participial tense): /síkhóná/ [ - - ]  
 'we are present'  
 /bálímé/ [ \ - ] 'they have ploughed' (indicative perfect tense): /bálímé/  
 [ - - ] 'they should plough' (subjunctive present tense)  
 /í]mbàlà/ [ \ - ] 'a single one' (used in negative constructions signifying  
 "not a single one"): /ímbàlà/ [ - - ] 'skin blemish'  
 /úkùsíká/ [ \ - ] 'to cut': /úkùsíthà/ [ - \ ] 'to screen'

#### 2.10. Pitch contrasts associated with unpredictable tonal downsteps.

In sequences of Hs tonal downsteps do not occur, there being, in fact, a tendency towards stepping up rather than down (see 3.8). Allotones of H which, in an utterance, become progressively lower in pitch can only be interpreted as such if the boundary of a tonal step (lying between the tonemes in the sequence LH) falls somewhere between such allotones. Downsteps in the representation of Hs in unbroken sequence have been recorded, however, and these occur mainly at points where syllable elision has reduced disyllabic noun prefixes to single syllables, i.e., /úlù- > ú-/ , /íli- > í-/ (see 2.7 (g)). In such cases syllable elision has caused L between two Hs to disappear, thus removing in the process an overt tonal-step boundary. There is, however, no subsequent readjustment in the representation of the second H, whose representative is then, by comparison with that of the first H, a lowered high tone, e.g.:

/únwélè/ [ - - ] 'a hair' < \*úlùnwélè  
 /íthembà/ [ - - ] 'hope' < \*íliithembà

It is noteworthy that certain class 9 nouns are similarly affected (only nouns with stems of more syllables than one in our data), and also nouns in class 1a, particularly loanwords, e.g.:

/ínhlókò/ [ - - ] 'head' < \*inihloko  
 /íntwánà/ [ - - ] 'small thing' < \*inithwana







(The two preceding reconstructed stems are presented in present-day phonemic shape as a matter of convenience. They are not correlated with any particular historical level.)

/iŋkwɛŋkwézi/ [̄̄\_ ] 'star'

/ú,á/ [̄\_ ] 'A'

/úkhókò/ [̄\_ ] 'grandmother'

(It is often assumed that the reduction of the class 9 prefix to a monosyllable outdates historically the similar process that has affected class 5 and 11 prefixes. This view is supported by the presence synchronically of the allomorphs /ili-*i*-/, /ulu-*u*-/, but the total absence of \*ini- as a prefix. It is of interest, therefore, that an unpredictable tonal downstep resulting from the reduction of a disyllabic prefix, can occur in class 9 in the same way as in classes 5 and 11.)

Contractions that produce unpredictable downsteps between Hs are confined to certain morphologic categories and this creates potentially a new set of contrasts (i.e., that between a high and a lowered-high tone, or a raised high tone and a high tone). A small number of minimal pairs attest to the fact that these contrasts do, in fact, exist, even though their functional load is small.

/ígílà/ [̄\_ ] 'fowl's crop': /ígílà/ [̄/ ] 'he knocking against' (participial present tense of /-gila/ 'knock against')

/bèthembà/ [̄\_ ] 'of hope' (possessive qualificative) (or /bèthembà/ of which the alternant /fthembà/ 'hope' is part): /bèthembà/ [̄̄\_ ] 'they hoping' (participial present tense of /-themba/ 'hope')

/íq<sup>n</sup>hulà/ [̄/ ] 'larynx': /íq<sup>n</sup>hulà/ [̄\_ ] 'it giving abundant milk' (participial tense of /-q<sup>n</sup>hula/ 'give abundant milk')

2.11. To identify a third toneme as a solution to the problem of pitch contrasts associated with unpredictable tonal downsteps is unsatisfactory from a number of aspects. For example, the interpretation as two distinct "high" tonemes of two identical sets of tones--which under normal circumstances have a fixed allotonic relationship to one another--on either side of a transient tonal step (it is alternatively overt and covert in the alternation of noun prefixes /íll--*i*-/, /úlù--*ú*-/ and also between singular and plural forms--see below) greatly complicates Xh morphotonemics: In some nouns the same stem would appear sometimes with one and sometimes with the



The first part of the paper is devoted to a description of the experimental apparatus and the method of observation. The results are given in the following tables.

Time (min)	Temperature (°C)	Pressure (mm Hg)
0	37.0	760
5	37.2	760
10	37.5	760
15	37.8	760
20	38.0	760
25	38.2	760
30	38.5	760
35	38.8	760
40	39.0	760
45	39.2	760
50	39.5	760
55	39.8	760
60	40.0	760

The results show that the temperature of the blood rises during the experiment. This rise is supported by the increase in the rate of metabolism. It is of interest to note that the rate of metabolism is not affected by the rise in temperature. This is in agreement with the results of other workers.

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other of two patterns, e.g. (the problematic "lowered-high" toneme is not marked in the following):

/íthembà/ [̄-] 'hope', cf. /ámáthembà/ [̄-] 'hopes'

/íćící/ [̄-] 'earring', cf. /ámáćící/ [̄-] 'earrings'

The recognition of a third toneme would result in a substitution of tonemes between the singular and plural forms of these nouns, which in every aspect are members of the tonomorphologic classes with stem patterns Hl and HH respectively.

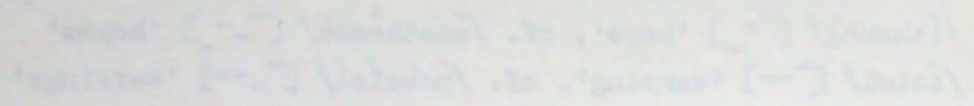
Descriptive complexity associated with the recognition of a third toneme must, if possible, be avoided and our solution is to phonemicize the covertly present tonalstep boundary at the point where high tones are stepped down. It requires the setting up of a "step juncture" (symbolized by /ʹ/) which is realized phonetically in the form of the downstep between "high" tones in sequence and this juncture marks the boundary of a tonal step in the same way as the sequence LH. (In pitch, the downstep is approximately the difference between one of the five levels that we recognize, and the next below it.) Examples given above are thus transcribed as follows: /úʹnwélè/ 'a hair', /íʹnhlók'ó/ 'head', /íʹntwánà/ 'small thing', /úʹ,á/ 'A', /íʹgílà/ 'fowl's crop', /bèʹthembà/ 'of hope', /íʹqʹhulà/ 'larynx', /íʹthembà/ 'hope', /íʹćící/ 'earring'. (Class 5 and 11 nouns may appear with the prefix alternants /í-/ and /ú-/ , in which case no step juncture need be marked as the boundary of the tonal step is contained in the toneme patterns HLHL, HLHL, etc.)

Step juncture is entirely confined to a position between two Hs and, should either H disappear as a result of the workings of tonal morphology, /ʹ/ disappears also. "Between two Hs" includes H of the cluster HL, e.g., /úʹkhûnì/ [̄\\_] 'wood', /íʹŋk'òsì/ [̄\\_] 'chief' (i.e. HHLL).

The occurrence of /ʹ/ is predictable morphologically to a high degree, i.e., in singular nouns of classes 5, 9 and 11 whose stem-initial syllable coincides with H or HL. (Those with L in a similar position have, of course, no tonal step to be marked, e.g. /ídàdà/ 'duck'.) It may also occur elsewhere, notably: (a) in pronominal possessives, e.g., /óʹlwákhò < ó-lwá-khò/ 'your one'; (b) at points where the morphotonemic change HHLL > HʹHH occurs (see examples at 4.7 below).



of the reaction, and the products are shown in the  
table in the following



The reaction of a third component would result in a modification of the  
between the nitrogen and other forms of nitrogen which in every aspect  
of the nature of the compound is shown with great clarity in the  
following

Reaction (3) indicates the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
presence of a third component at the point where the reaction is  
indicated

It is noted that the reaction is characterized by the presence of a  
third component in the form of the nitrogen which is shown in the  
table in the following

Reaction (4) shows the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
presence of a third component at the point where the reaction is  
indicated

Reaction (5) shows the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
presence of a third component at the point where the reaction is  
indicated

Reaction (6) shows the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
presence of a third component at the point where the reaction is  
indicated

Reaction (7) shows the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
presence of a third component at the point where the reaction is  
indicated

Reaction (8) shows the formation of a third component  
and, in general, it is noted that the reaction is characterized by the  
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### 3. Environmental influences: their nature and effects.

3.1. Allotones are conditioned by factors already referred to at 2.8. These conditioning factors exercise a uniform influence on the representation of all tonemes, although the full effects of their influence are not entirely predictable and require examination in detail.

3.2. Factor 1. The high toneme is lowered by depressors. Depressors are voiced consonants with an inherent low tone and because of this the voice is forcibly lowered to a pitch well below that which would provide the normal realization of H. The full list of depressors is: /b d dy g mh nh v z gr hh dl dz j gc gq gx c<sup>h</sup> q<sup>h</sup> x<sup>h</sup>/. The influence of a depressor is not lost when /w/ intervenes between it and a vowel. The representatives of vowels exercise no influence whatsoever on tones and in passing from a depressor at the syllable margin to the immediately succeeding vowel, there is release from the effect of the depressor and a consequent striving to achieve the required pitch level of H. It is clear that under these circumstances a rising glide results and a glide of this kind coinciding with a depressor is a certain indication of H. H can thus be realized by an allotone of the shape ['] at various pitch levels. The representation of HL is by a rising-falling glide [^].

Allotone ['] exemplified:

- /ndizámè/ [ \_/\_ ] 'I should strive' (subjunctive present tense)  
 /ùvúkìlè/ [ \_/^- ] 'You have wakened'  
 /izilòndà/ [ -/\_ ] 'wounds'  
 /ézámà/ [ -/\_ ] 'He striving' (participial present tense)  
 /ndìngáhámà/ [ \_/\_ ] 'I can walk'  
 /ngásò/ [ /- ] 'by means of it' (instrumental adverb)  
 /éç<sup>w</sup>adínì/ [ ^-/\_ ] 'in the book', cf. /éçk'òménì/ [ ^-/\_ ] with the same toneme pattern.  
 /ndâkhèthá/ [ ^ \- ] 'I chose' (indicative remote past tense)  
 /zâlimá/ [ ^ \- ] 'They ploughed'  
 /í<sup>m</sup>bûzì/ [ ^/\_ ] 'goat'  
 /úkùdêlà/ [ ^/\_ ] 'to despise'  
 /éñjé/ [ ^/ ] 'like this' (relative qualificative)

3.3. The auditory perception of all conditioned glides, including those occurring as the result of conditioning factor 3, is heavily dependent upon



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vocoid duration. The duration of the normal short peak vocoid in quick speech may not be sufficient to discern the glide and, instead, a very short level tone near to the starting point of the glide is heard. A keen ear may, of course, discern a glide in the majority of cases. All glides emerge clearly, however, when they coincide with a vocoid made long by the presence of juncture, or when the rate of utterance is slowed down.

It will be seen therefore, that as a result of the conditioning factors discussed in this section, H may be heard as a "mid tone" or even a "low tone". Similarly L may be heard as a "mid tone" or even a "high tone".

3.4. Factor 2. A high toneme is lower in pitch than any preceding high toneme if separated from it by one or more low tonemes (or by step juncture). Similarly a low toneme tends to be lower in pitch than any preceding low toneme separated from it by one or more high tonemes. In sequences of tonemes contained between the beginning of an utterance and the first juncture, utterance-medially between junctures, or between juncture and the end of an utterance, a tonal downstep nearly always occurs after the boundary that lies between the tonemes in the sequence LH. Where H is involved (e.g., in the sequence HLH) the fall in pitch from the first to the second high toneme is usually more noticeable than in the case of the low toneme, as, for example, the fall between the first and second L in the sequence LHL. Not only is the downstep between low tonemes less prominent, but it is also more frequently neutralized by the operation of factors 3 and 5.

Many short utterances thus descend towards their end in a series of tonal steps with results such as: (a) L in the final step is lower than any preceding L; (b) H in the final step is lower than any preceding H, and, in fact, may be little higher than L in an immediately preceding step. (All utterances are not a straight descent from their beginning to their end. See 3.12 below.)

The phenomenon of tonal downsteps provides the interpretation of "mid tones" which confused earlier investigators, e.g., in /niyàfùndà/ [---] 'You are learning'. A superficial examination made in ignorance of the downstep phenomenon may result in the postulation of three significant pitch levels in this form.

Examples given at 3.6. illustrate fully the phenomenon of the tonal



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... of the ...  
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downstep.

3.5. Conditioning factors 4 (crescendo of Hs in sequence) and 5 (tonal assimilation of a low toneme between two high tonemes) tend to neutralize the downstep phenomenon and affect in particular the toneme L. An example in connection with conditioning factor 5 will be found in /aliyíkhèthàngà/ at 3.11. The following illustrate downstep neutralization as a result of factor 4:

/ímfè éc ínánè/ [̄-̄-̄-] 'small sugar cane'

(H on the 1st and 5th syllables is realized at the same pitch level. A crescendo of Hs in sequence occurs over the 3rd, 4th and 5th syllables.)

/ndíbùlélè/ [̄-̄-] 'I killed'

(L on the first and last syllable has about the same pitch level.)

The downstep phenomenon as it affects L is also likely to be absent where L coincides with a non-depressor and a peak vocoid which is either of very short duration, or is in utterance-final position. In both cases (as a result of devoicing in the latter case) the usual low-falling glide is often not discernible and only the initial, consonantly-influenced portion of the allotone is perceived.

3.6. The phenomenon of the tonal downstep is illustrated by the following examples which are grouped initially according to sequence types. Within phonologic phrases (portions of utterances delimited by /+/) tonal downstepping proceeds across word-boundaries and is unaffected by them. Examples of this are included under "miscellaneous examples".

Sequence HL̄:

/índímá/ [̄-̄-] 'patch of cultivated ground'

/índlèbé/ [̄-̄-] 'ear'

/úmsébéndzi/ [̄-̄-] 'worker'

/úbùhíé/ [̄-̄-] 'beauty'

/ábàbántù/ [̄-̄-] 'these people'

/ísìngésì/ [̄-̄-] 'English'

/ndìngàhhambì/ [̄-̄-] 'I should not go' (present subjunctive tense)

Sequence HL̄L̄:

/ámàfùthà/ [̄-̄-] 'fat'

/emìníndzì/ [̄-̄-] 'many'

/úmzìmbà/ [̄-̄-] 'body'

/úmphùngà/ [̄-̄-] 'lung'



The following table shows the results of the experiments conducted in the laboratory of the American Chemical Society, Washington, D. C., in the year 1900. The results are given in the following table:

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Sequence  $\overline{HLHL}$ :

/fyóŋk'è/ [ \ - ] (cf. /iyóŋk'è/ [ - - ] 'It is all there') (a near equivalent to English "after all said and done")

/únwélò/ [ \ - ] 'a hair'

Sequence  $\overline{HLLH}$ :

/ndálima/ [ ^ \ - ] 'I ploughed'

/wákhèthá/ [ \ - ] 'You' or 'He chose'

/lòntòmbí/ [ \ \ / ] 'that girl'

## Sequence LHL:

/úbúlèlè/ [ - \ - ] 'You have thanked'

/ákùthándì/ [ - - - ] 'You do not like'

Sequence  $\overline{LHLL}$ :

/ndiyákùbòphà/ [ - - - \ ] 'I will tie'

/úkùvúyà/ [ - ^ - ] 'to be joyful'

## Miscellaneous examples:

HL-H: /ábántù ábàngénántó/ [ - - - / - ] 'people who have nothing'

/úfúndà ísìngésì kákùhlé/ [ - - - / - - ] 'He reads English well'

H-LH: /ínkómó iyékwè/ [ - - - ] 'The beast should be left'

HL-HL: /úntù wámphà imàlì/ [ - \ - - ] 'The person gave him money'

$\overline{HL}$ -LHL: /bábèthé kàkhùlù/ [ - \ \ - ] 'They have hit a great deal'

3.7. Factor 3. The low toneme coinciding with a non-depressor and immediately succeeding a high toneme is raised by assimilation to the latter. Falling glides are the usual result of the influence of this conditioning factor, unless the peak vocoid is so short that the glide is obscured. The following examples illustrate the allotone [ \ ] of L.

/úbàwó/ [ \ - ] 'my father'

/báyálimà/ [ - \ - ] 'They are ploughing'

/úkúsìndà/ [ - \ - ] 'to smear'

/éntwánèní/ [ - \ - ] 'in a small thing', cf. /éntáñjèní/ [ - - - ] 'on a rope', of the same toneme pattern.

It is the effect of the preceding high toneme alone which conditions the glide, as the following comparison shows:

/sìsìndìlè/ [ - - - ] 'We have smeared', cf. /úkúsìndà/ 'to smear'

3.8. Factor 4. In a sequence of Hs each H tends to be higher in pitch than the preceding toneme, or, alternatively, final H in a sequence of Hs







tends to be higher in pitch than any other. The crescendo of Hs in sequence (tonal upstops) is a process most evident when three or more Hs occur in sequence, none of which coincide with a depressor consonant. The process is also often discernible when the sequence consists of two Hs only. In this connection the presence of a tonal upstep in noun prefixes with the toneme pattern HH will have been observed in examples previously given. Further examples are provided by the following:

- /líbónílè/ [---] 'It has seen' (indicative perfect tense)  
 /ítí/ [^-] 'tea'  
 /lámádòdà/ [^-] 'these men'  
 /bónání/ [^-] 'See!'  
 /ésásébèndzà/ [^-] 'he still working' (participial present tense)  
 /únámámdlà/ [^-] 'He has strength'

When a sequence includes a syllable in which H coincides with a depressor, the process is not as noticeable as in the examples given above, but it may occur, as the last two examples given below indicate. The crescendo becomes more prominent if the syllable introduced by the depressor is long enough for H to recover from the lowering effect of the consonant.

- /bàngáfúndà/ [-^] 'They can learn'  
 /ávumélàná/ [-^] 'They agree'  
 /úhhámbilè/ [-^] 'He has gone'  
 /ndìngázúzá/ [-^] 'I can earn'  
 /ézíndábèní/ [-^] 'in the affairs'

H in the cluster HL does not take part in this process of tonal upsteps, e.g.

- /éffhlà/ [-^] 'he concealing'  
 /bésáfúnà/ [-^] 'they still wanting'

3.9. It has been stated that the crescendo of Hs in sequence is most noticeable when Hs are unfettered by depressors in the sequence. In this connection it will have been observed that in a sequence of Hs in which none coincide with depressors, the complete sequence is often raised in the pitch-range of the speaker above the region within which a similar sequence incorporating a syllable with depressor consonant would occur. Particular attention is drawn to this phenomenon where it occurs in the noun prefixes. For example, /ísí-/ is likely to bear allotones noticeably higher in pitch than



... to be ... in ... The ... of ... in ...  
 ... is a ... with ... of ... in the ...  
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than /ízi-/ , e.g.

/ísityà/ [ˉˉ] 'a dish', cf. /ízityà/ [ˉ, ] 'dishes'

/ísíhlangú/ [ˉˉ˘] 'shoe', cf. /ízíhlangú/ [ˉ˘˘] 'shoes'

The following comparisons provide further illustrations:

/líphélilè/ [ˉˉˉ] 'It has finished', cf. /lívúyílè/ [ˉˉˉ] 'It has been joyful'

/líbízíflè/ [ˉˉˉ] 'He has reported', cf. /líbízíflè/ [ˉˉˉ] 'He has called' (indicative perfect tense) and /líbízíflè/ [ˉˉ˘] 'he having called' (participial perfect tense)

3.10. As a corollary to factor 4, it may be stated that "a sequence of Ls always proceeds at approximately the same pitch level and tonal steps do not occur within the sequence", e.g.

/síbèkìlè/ [ˉˉˉˉ] 'We have looked at'

/ésíndzùlù kàkhùlù+/ [ˉˉˉ˘˘] 'very deep'

3.11. Factor 5. The low toneme between two high tonemes tends to be raised by assimilation. The following comparisons illustrate this process of tonal assimilation:

/úbúbìní/ [ˉ˘˘] 'two', cf. /úbúhlòbò/ [ˉ˘˘] 'friendship'

/índlèbè/ [ˉˉˉ] 'ear', cf. /índlàlà/ [ˉˉˉ] 'famine'

/ízífúndò/ [ˉˉˉ] 'lessons', cf. /úzìphò/ [ˉˉˉ] 'nail'

The process is less evident when L between two high tonemes coincides with a depressor consonant, e.g.

/ísífúngò/ [ˉˉˉ] 'oath', cf. /ízífúngò/ [ˉˉˉ] 'oaths'

/àlìyìkhèthàngà/ [ˉˉˉˉ] 'He has not chosen it', cf. /àlìyávalàngà/ [ˉˉˉˉ] 'He has not shut it'

3.12. The influence of conditioning factors at syntactic boundaries. Environmental influences operate at word-boundaries as well as word-medially. See, for example, the tonal downstep phenomenon as illustrated at 3.6; assimilation in: /ábántù báníndzì/ [ˉˉˉˉ] 'The people are many'; and the crescendo of Hs in sequence in the following

/ítí íphélilè/ [ˉˉˉˉ] 'the tea is finished'

/sàkhèthá ísìbùlù/ [ˉ˘˘˘˘] 'We chose Afrikaans'

/íntó yákhò/ [ˉˉˉ] 'your thing'

However, an utterance-medial juncture marks a point at which factors 2, 3, 4 and 5 often cease to exercise any influence. (The only other points at which



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The ninth experiment was conducted in the laboratory of the Royal Society of Medicine, London, W. 1, on the 17th of June 1903.

The tenth experiment was conducted in the laboratory of the Royal Society of Medicine, London, W. 1, on the 17th of June 1903.



the influence of conditioning factors is regularly suspended is immediately before and after an ideophone. The representation of /+/ never coincides with an ideophone.) Portions of utterances marked off by /+/ are "phonologic phrases" and many internal pauses, including pauses for breath, are made at a phonologic-phrase boundary. (In normal speech /+/ usually marks off such syntactic units as: noun-adjective, verb-adverb, noun-adjective-adverb, etc.) When tonal downstepping is broken, as it obviously must be in long utterances, it is after /+/ that a new starting level for the stepping process is assumed. Where phonologic phrase and macrosegment boundaries coincide, there is a particularly strong likelihood of the stepping process starting at a different level (usually higher) from that at which it left off. (An intonation is the unique constituent of a macrosegment. The end of an intonation coincides with the end of a macrosegment.) The following utterance has been recorded (on different occasions) with both a higher and a lower starting point after the utterance-medial juncture. A higher starting point after /+/ is indicated in the example.

/úthì+ùfúndà kákùhlé+ [- - - -] 'He says you read well'

An unusually big downstep after /+/ was found in the following example:

/ndìsìbónà kákùhlé+ísìhlàngú+ / [ - - - - ] 'I see the shoe well'

3.13. Summary of influences. It is now clear that either of the tonemes of Xh may be realized at almost any level within the pitch-range of the speaker. A number of factors, either individually or in combination, determine the level at which a toneme is actually realized and the shape of the allotone. Firstly, there is hardly any toneme which escapes the influence of the five conditioning factors described above. The influence of these five factors is tonemically important as they account for the range of allotonic variation. Secondly, there are various influences which affect complete utterances or portions of utterances.

Differences in pitch level which are significant from the aspect of intonation (see 5.1.), and the emotional background to the utterance, both represent a type of influence which results in the raising or lowering in pitch of whole stretches of speech and usually affects both high and low tonemes equally and in the same way--at least it does not destroy contrasts. Such changes, most of which may be loosely described as changes in "key", do







not disturb contrasts between tonemes or the shape of individual tonemes, and are nonsignificant as far as the tonemic system is concerned.

Other features associated with the production of the speech signal affect the representation of tonemes in a way which cannot be disregarded from the aspect of the functioning of the tonemic system. A rapid rate of utterance, for example, tends to diminish the pitch-interval between H and L and its effect on glide allotones has been discussed above. Rapid rate of utterance, plus the factors of breath-group duration and position within the breath-group, may have the effect of obscuring tonemic contrasts partially or completely. (Contrasts are always most prominent in words uttered in isolation.) The pitch-interval between H and L diminishes as the breath-group is extended and there may, in fact, be no discernible interval between high and low tonemes at the end of a long, quickly-uttered breath-group. However, we regard such reduction and attenuation as factors connected with redundancy present in the speech signal and features of a highly colloquial style which require no consideration in our analysis.

#### 4. The function of tonemes.

4.1. A study of the function of tonemes in the grammatic structure of Xh is largely an examination of tonal morphemes and allomorphs which are associated with morphologic categories and subcategories. There are few examples of a permanent association between tonemes and the segmental constituents of morphs. Rather, the association lies between the tonemes themselves within tonomorphs of different shapes. As far as tonemes are concerned, the unit is that of a group of tonemes arranged in a particular way and associated with a particular grammatic category or subcategory. The association between tonemes and segmental morphs is of the loosest, and only in relatively few instances do our data yield examples of segmental morphemes which consistently bear the same tonemes.

The study of the configuration of the large number of tonomorphs, and their combination and substitution in the processes of the grammar, reveals a most intricate system of tonal grammar which is still largely unexplored. It seems necessary that tonal grammar be described as a system apart from, but correlated with, that involving segmental morphemes. Among the reasons for this is the fact that it seems that description will be facilitated in some cases by aligning a single tonomorpheme with more than one segmental







morpheme. For example, in the verbal conjugation greater simplicity is achieved by associating toneme patterns with stems rather than roots.

4.2. Tonal morphology. Although the immediate concern of this paper is with the identification and description of tonemes, some explanation of the workings of tonal morphology is necessary, if only for the reason that the certain identification of some tonemes distorted by their environments, is sometimes assisted by reference to the shape of the tonomorphemes involved. The data given below are chosen to illustrate the shape of certain important tonal morphemes and the workings of tonal grammar.

4.3. The toneme patterns of disyllabic noun prefixes. The disyllabic prefixes have the patterns HL or HH and the choice between these patterns is determined simply by the initial toneme of the stem. A stem-initial high toneme determines HL, while a stem-initial low toneme determines HH. A simple rule of dissimilation is thus seen to operate across the morpheme boundary.

/ámásélà/ [̄-̄-] 'thieves', cf. /ámádòdà/ [̄-̄-] 'men'

/úkùbèthà/ [̄-̄-] 'to hit', cf. /úkùbàlà/ [̄-̄-] 'to count' and /úkùbônà/ [̄-̄-] 'to see'

/úkúsà/ [̄-̄-] 'to send', cf. /úkùsà/ [̄-̄-] 'to dawn'

/úmzì/ [̄-̄-] 'kraal', cf. /ùmzì/ [̄-̄-] 'thatching grass'

The toneme patterns of disyllabic adjectival concords are, to a large extent, governed by similar considerations to those indicated above, i.e., the rule of dissimilation, e.g.

/ísìthó ésíkhùlù/ [̄-̄-̄-] 'big foot', cf. /ísìthó ésíndzìmà/ [̄-̄-̄-] 'heavy foot'

/ílítýè élíùú/ [̄-̄-̄-] 'warm stone', cf. /ílítýè élílúlà/ [̄-̄-̄-] 'light stone' and /ílítýè élíbàndzì/ [̄-̄-̄-] 'broad stone'

(Concords used with monosyllabic adjectival stems have uniformly the pattern HL, except for the stem /-ñè/ where forms with the HL pattern contrast with those with HH.)

4.4. The tonal behavior of disyllabic verb stems in the conjugation. Most of these verb stems fall into three tonomorphologic groups, viz. (1) HLL, (2) HL, (3) LL (infinitive stem-patterns), but this trichotomy is maintained in only a small percentage of the subcategories of the verbal conjugation. In most conjugational forms two of these groups share a single toneme pattern,







while in a few instances one toneme pattern is shared by all three. The following indicates the allocation of some common disyllabic verb stems among the tonomorphologic groups.

1.  $\bar{H}LL$ 

/-bàlâ/ 'write'  
 /-bônâ/ 'see'  
 /-bûyâ/ 'return'  
 /-fûnâ/ 'want'  
 /-hlôlâ/ 'investigate'  
 /-vûyâ/ 'be joyful'

## 2. HL

/-bèthâ/ 'hit'  
 /-bôlâ/ 'bore a hole'  
 /-bèk'â/ 'place'  
 /-hhâmbâ/ 'walk'  
 /-lâlâ/ 'lie down'  
 /-hlùthâ/ 'become replete'

## 3. LL

/-bâlâ/ 'count'  
 /-cîngâ/ 'think'  
 /-bèkâ/ 'look at'  
 /-gùlâ/ 'be ill'  
 /-zâmâ/ 'strive'  
 /-hlùthâ/ 'plunder'

The behavior of these tonal groups through part of the verbal conjugation is exemplified below. In finite forms the subjectival reference is to the 1st person, plural, in each case, e.g. /sigula/, /asigulŋga/, etc.

	1. $\bar{H}LL$	2. HL	3. LL
Infinitive positive:	HL $\bar{H}LL$	HLHL	HHLL
(These forms occur before /+/. HH substitutes for final $\bar{H}LL$ in other positions.)			
Indicative present positive (long form):	LLHL	LLHL	LLLL
Indicative remote past positive:	$\bar{H}LHL$	$\bar{H}LHL$	$\bar{H}LLH$
Indicative perfect positive (long form):	LHHL	LHLL	LLLL
Participial present positive:	H $\bar{H}LL$	HHL	HHL
Participial perfect positive:	H $\bar{H}HL$	H $\bar{H}HL$	H $\bar{H}HL$
Subjunctive present positive:	HLH	HLH	LHL
Subjunctive past positive:	HHL	HHL	HLL
Potential present positive:	LHHL	LHHL	LHLL
Indicative present negative:	LLHL	LLHL	LHHL
Indicative perfect negative:	LLLHL	LLLHL	LHLHL



Results in the following table. The following table shows the results of the various experiments with some of the more important groups.

Group	Mean	Standard Error
Control	100	5
Group 1	95	4
Group 2	90	3
Group 3	85	2
Group 4	80	1
Group 5	75	1

The results of these tests show that the various groups differ significantly from the control. In this form the subjects performed as well as the control group, in each case, e.g. (Group 1, 2, 3, 4, 5).

Group	Mean	Standard Error
Group 6	70	1
Group 7	65	1
Group 8	60	1
Group 9	55	1
Group 10	50	1
Group 11	45	1
Group 12	40	1
Group 13	35	1
Group 14	30	1
Group 15	25	1
Group 16	20	1
Group 17	15	1
Group 18	10	1
Group 19	5	1
Group 20	0	1



4.5. The tonomorphologic grouping of nouns with disyllabic stems. Nouns of this type fall into five groups, viz. (1) LL, (2) LH, (3)  $\overline{HL}$ L, (4) HL, (5) HH. (Very few nouns occur in group 5. This group does not appear to exist in Z and seems to be missing in the northern dialects of Xh.)

3.  $\overline{HL}$ L

/ithàngà/ 'cattle post'

/ísìthùndzì/ 'shadow'

/úfúò/ 'tortoise'

/i`ṅkábi/ 'ox'

## 4. HL

/úbùfàná/ 'manhood'

/ísìngésì/ 'English'

/i`nhlókò/ 'head'

/ífbélè/ 'breast'

## 5. HH

/ícíci/ 'earring'

/íqáqá/ 'polecat'

When inflected to form locative adverbs, these groups behave thus:

Disyllabic prefix:

1. HHLL &gt; HHHLL

2. HHLH &gt; HHLHL

3. HL $\overline{HL}$ L > HLHLL

4. HLHL &gt; HLHLL

Monosyllabic prefix (a limited number of nouns of group 1, e.g., /índlèlà/ 'route, road' share the pattern HLHL with groups 2 and 3):

1. HLL &gt; HHLL or HLHL

2. HLH &gt; HLHL

3. H $\overline{HL}$ L or H $\overline{HL}$ L > HLHL4. HHL or  $\overline{HL}$ HL > HHLL5. HHH or  $\overline{HL}$ HH > HHHLL

4.6. Morphotonemics. It seems likely that the rule of dissimilation of tonemes across grammatic boundaries, and other examples of the purely mechanical substitution of tonemes illustrated above, will best be handled as morphotonemic changes, but this is a decision to be made in a fuller analysis of tonal grammar. (The following illustrate further the processes referred to and also some of the problems to be encountered:

/ísìlòndà sáyò/ 'his sore', cf. /ísìhlangú sáyó/ 'his shoe'.

Observe, however, the unchanging toneme pattern when the possessive qualificative refers to the 2nd person:

/ísìlòndà sákhò/ 'your sore', cf. /ísìhlangú sákhò/ 'your shoe'.)

One other important example of this type of substitution must be illustrated here, however, for the reasons that: (a) it demonstrates that devices exist within the system to minimize the effects of a concurrence of junctural length and toneme-cluster conditioned length; (b) it brings to notice a point



The following is a list of the names of the persons who have been elected to the office of the President of the United States since the year 1789. The names are given in the order in which they were elected, and the year of their election is given in parentheses. The names are given in the order in which they were elected, and the year of their election is given in parentheses.

George Washington (1789)  
John Adams (1797)  
Thomas Jefferson (1801)  
James Madison (1809)  
James Monroe (1817)  
John Quincy Adams (1825)  
Andrew Jackson (1829)  
Martin Van Buren (1837)  
William Henry Harrison (1841)  
John Tyler (1845)  
Polk (1845)  
Taylor (1850)  
Fillmore (1850)  
Buchanan (1857)  
Pierce (1853)  
Sevier (1853)  
Franklin Pierce (1853)  
Buchanan (1857)  
Lincoln (1861)  
Johnson (1865)  
Grant (1869)  
Ulysses S. Grant (1869)  
Rutherford B. Hayes (1877)  
James A. Garfield (1881)  
Chester A. Arthur (1881)  
Grover Cleveland (1895)  
Benjamin Harrison (1889)  
William McKinley (1897)  
Theodore Roosevelt (1901)  
William Howard Taft (1909)  
Woodrow Wilson (1913)  
Warren G. Harding (1921)  
Calvin Coolidge (1925)  
Herbert Hoover (1929)  
Franklin D. Roosevelt (1933)  
Dwight D. Eisenhower (1953)  
John F. Kennedy (1961)  
Lyndon B. Johnson (1963)  
Richard M. Nixon (1969)  
Gerald R. Ford (1974)  
Jimmy Carter (1977)  
Ronald Reagan (1981)  
George H. W. Bush (1989)  
Bill Clinton (1993)  
George W. Bush (2001)  
Barack Obama (2009)  
Donald Trump (2017)



where step juncture frequently occurs.

The sequence  $\overline{HLL}$  coinciding with the last two syllables of the stems of certain nouns, verbs and qualificatives is substituted by HH when no terminal juncture follows the word. In this way the masking of the length feature representing /+/ located in the word-penultimate syllables, by length conditioned by HL is avoided. When /+/ follows the word, HH gives place to  $\overline{HLL}$ , but the former is restored when "penultimate length" is lifted off. If a high toneme immediately precedes the sequence HH resulting from  $\overline{HLL} > HH$ , then the tonemes of the latter are represented at a lower pitch-level than the former, e.g.

/xá éhlôlàt/ 'when he examines' (participial tense)

/é`hlólá kàkhùlùt/ 'he examining widely' (participial tense)

Note /éhlôlàt/ [-\\_] > /é`hlólá/ [---].

/ùmkhônòt/ 'sleeve'

/ùmkhónó òmdèt/ 'long sleeve'

Note /ùmkhônòt/ [-\\_] > /ùmkhónó/ [---].



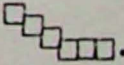
/ú`fúdòt/ 'tortoise'

/ú`fúdó òlùkhùlùt/ 'big tortoise'

/ú`fúdó òlùkhùlú kàkhùlùt/ 'very big tortoise'

Note /ú`fúdòt/ [-\\_] > /ú`fúdó/ [-' ] and /òlùkhùlùt/ [-\\_] > /òlùkhùlú/ [---].

## 5. Intonation.

5.1. In terms of the tonemic system the progressive lowering of tones referred to as tonal stepping has been accepted as predictable and non-contrastive. In the intonation system, however, it is one of several dimensions of contrast that have been observed. Down-step, as opposed to its absence, marks (in broad terms) statement as opposed to question, i.e.:  vs. . It is possible that the following is a third member of the contrast: .

No full analysis of the intonation system has been made but the following contrasts also appear to be significant:

- (a) The pitch interval separating H from L in the final tonal step in an utterance, i.e., wide vs. narrow;
- (b) long vs. extra-long as the length feature located on utterance-penultimate syllables. There is a strong correlation of the former with "question" and the latter with "statement". [Edited by author for SIL April, 1964.]















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