Tone in Manipuri[1]

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1. Introduction

This paper is a description of the tone system of the Tibeto-Burman language Manipuri[2] (also known as Meiteiron or Meithei, hereafter referred to as M). I will present evidence that M exhibits a two way tonal contrast between a lexically marked low (L) tone and a default high (H) tone. From a theoretical point-of-view, I will claim that at both an underlying and a surface level, suffixes have no tone associated to them; instead, the pitch values observed for suffixes are simply the phonetic realization of stem tone to the right edge of the word. The M data will be represented in terms of the framework developed by Pierrehumbert and Beckman (1988) to deal with Japanese tone structure, since this framework expresses the phonetic spread of tone (as opposed to phonologically motivated distribution of tone through rules of tone spreading). Finally, from a typological point-of-view, it will be seen that the M tone system shows characteristics of both a pitch-accent language and regular tone language, falling in the category identified by James McCawley, (1979) as one of those tonal systems that, "come close to being pitch-accent systems but don't quite make it."

2. The data

The data for this study comes from the analysis of minimal tone pairs recorded by my M consultant Thounaojam Harimohon Singh. Each item of the minimal pair was recorded in citation form, in a short phrase and where possible, as part of a compound. From this recording, a total of 284 tokens were selected to be pitch tracked[3] and a trace of the fundamental frequency (F_0) contours of these tokens was obtained. F_0 contours are taken to be phonetic representations of the underlying tone pattern of each token.

2.1 Stems and bound roots

Minimal pairs such as those listed in Table 1, establish the existence of a H and L tone for stems and bound roots (from now on, unless referring to a specific bound root, I will use stem as a short form for stem and bound root). As can be seen by the F_0 values for initial pitch given in this table, the stems in column 1 consistently show a higher initial pitch than the stems in column 2.[4] This difference in initial pitch is the most significant distinguishing characteristic of H and L stems.

Table 1: List of minimal tone pairs

Initial pitch with High stems			Initial pitch with Low stems		
i	'blood'	140 Hz.	i	'thatch'	115 Hz.
khoy	'navel'	110 Hz.	khoy	'bee'	100 Hz.
la	'wide basket'	100 Hz.	la	'banana leaf'	90 Hz.
sing	'firewood'	120 Hz.	sing	'ginger'	100 Hz.
səm	'hair'	105 Hz.	səm	'basket'	90 Hz.

H and L stems consistently differ in two more ways. First, both H and L stems fall after the initial pitch; the lower pitch obtained after this fall is sustained, forming a plateau where the plateau of the H stem occurs at a higher F_0 than for the L stem. Both the H and the L stem fall after the plateau and reach approximately the same final pitch. These facts are illustrated by the pitch curve for the stems ut 'camel' and ut 'ashes' provided in Figure (1). In Figures (1-14), the x-axis refers to time and the y-axis refers to F_0 which is indicated in increments of 50hz; each curve is labelled as (H) or (L) to indicate the tone of the stem of the word.

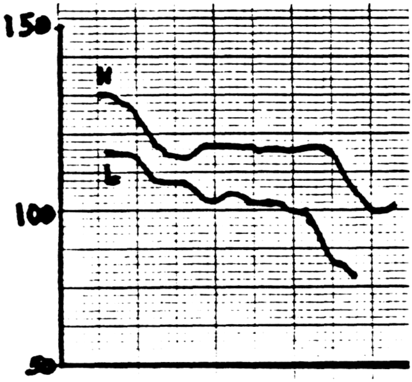

Figure (1): F_0 for <u>ut</u> 'camel' (H) and <u>ut</u> 'ashes'(L).

Since the H stem begins at a higher F_0, the fall from initial pitch for the H stem is significantly steeper than for the L tone stem. When segments such as nasals, which have a F_0 higher than that of other consonants, end a stem the fall from initial pitch is not as steep. See Figure (2).

Figure (2): F_0 for <u>khong</u> 'foot' (H) and <u>khong</u> 'canal' (L).

The facts about H and L stems can be accounted for assuming the tonal inventory and hierarchic prosodic structure given below. First, I assume that there is one lexically specified tone which is L tone. Following a convention set up by Pulleyblank (1986), possible tone bearing units that do not have a tone at the end of the application of all lexical rules are assigned H tone by default.

Second, each tone bearing unit can be defined as constituting and being a member of a hierarchically defined prosodic unit. The minimal prosodic unit (the smallest unit for which a tone pattern can be established) is the accentual phrase (hereafter AP):

```
(1)     [[ L     ]         L%]
           |
           |
           V
```

Each AP is bounded on the right by a phrase final low boundary tone (L%). APs are combined to form major phrases (hereafter MP) which are bounded on the left by a phrasal H (H%) tone and on the right by a L boundary tone (L%) (see (3) below).

The notion of boundary tones and levels of prosodic units are taken from the framework used by Pierrehumbert and Beckman (1988) to account for Japanese tone structure. The final L boundary tones reflect the tendency of the pitch range to lower towards the end of an utterance: as illustrated in Figure (1), regardless of the tone of the tone bearing unit, there is a fall in pitch towards the end of the AP. Boundary tones do not have a predetermined Fo value, instead the pitch of a boundary tone is determined by the pitch of the tone it is adjacent to. Thus a L% that occurs to the right of and adjacent to a lexically specified L tone will be lower than that L tone. Furthermore, it will also be lower than a L% that occurs to the right of and adjacent to a high tone.

Using the structures given in (1-3) and the inventory of tones specified above (i.e. lexically assigned L tone and default H tone), the distinguishing facts about H and L stems can be expressed as shown below. Consider first the representation of H stems which have a lexical entry as in (2).

```
(2)     [       ] L%]                    Lexical entry for
            |                            H tone stem
            |                            ut 'camel' in an AP
            V   C
            |   |
            u   t
```

After all lexical rules have applied, the unspecified values for the tones are filled in.

```
(3)     [H% [ [H] L%] L%]                MP formed from
               |                         AP, unspecified
               |                         tones are filled in
               V C
               | |
               u t
```

The H% boundary tone of the MP is higher than the initial pitch of the first tone bearing unit in the MP. This is dictated by the fact that the F_0 of both the H and L stems falls from an initial pitch to the pitch of a distinguishing plateau. The two L boundary tones, AP final and MP final, reflect the phrase final fall of the H tone.

L stems have a lexical entry as in (4):

```
(4)     [H%   [L       ] L%] L%]          Lexical entry for
               |                          L tone stem ut
               |                          'ashes', in an AP
               V C
               | |
               u t
```

As in the case with H stems, the H% boundary tone reflects the initial artificial heightening of the pitch of the L stem. The two L boundary tones reflect the phrase final fall of the L tone.

2.2. Suffixes

Words in Manipuri can consist of stems (such as the nouns stems given in Table 1), bound roots, suffixes (from one to ten suffixes), prefixes (only one per word) and enclitics. Whereas Manipuri stems have either H or L tone, suffixes are unspecified for tone at both an underlying and surface level. The F_0 patterns exhibited by suffixes are the result of the phonetic transition between lexically specified tones and target boundary tones. I am following Pierrehumbert and Beckman in rejecting other possible sources for tone on syllables that do not carry lexically specified tone. Thus, the missing tones on suffixes are not filled in by a rule of tone mapping (Leben 1978:199), or tone spreading (Goldsmith 1990), or by the default post-lexical rule that fills in unspecified tone values on stems (and as will be seen below, all other morphological processes except suffixation). As discussed below, this phonetic account of suffix tone is more appropriate to account for the facts in M than other available phonologically based accounts. Figures (3-6) give minimal pairs of H and L stems or bound roots with one or two suffixes (the pattern is the same with further suffixation).

Figure (3): F_0 contours for səmdu 'that hair' and səmdu 'that basket' where the stems səm (H) 'hair' and səm (L) 'basket' are suffixed by the determiner -tu.[5]

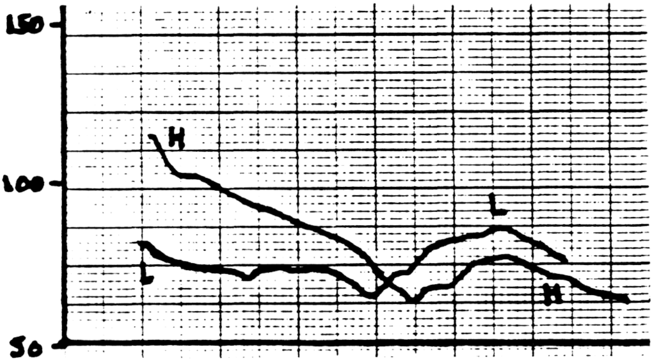

Figure (4): F_0 contour for thibə 'to be ugly' and thibə 'to search' where the roots thi (H) 'ugly' and thi (L) 'search' are suffixed by the infinitive marker -pə.

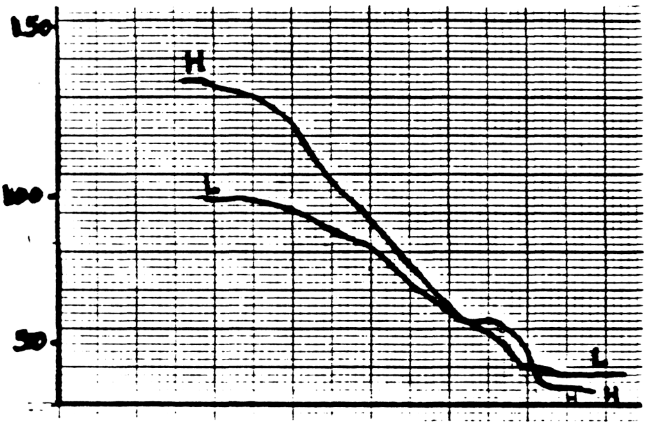

Figure (5): F_0 contour for stems pu 'borrow!' and pu 'carry!' where the stems pu (H) 'carry' and pu (L) 'borrow', are suffixed by the imperative marker -u.[6]

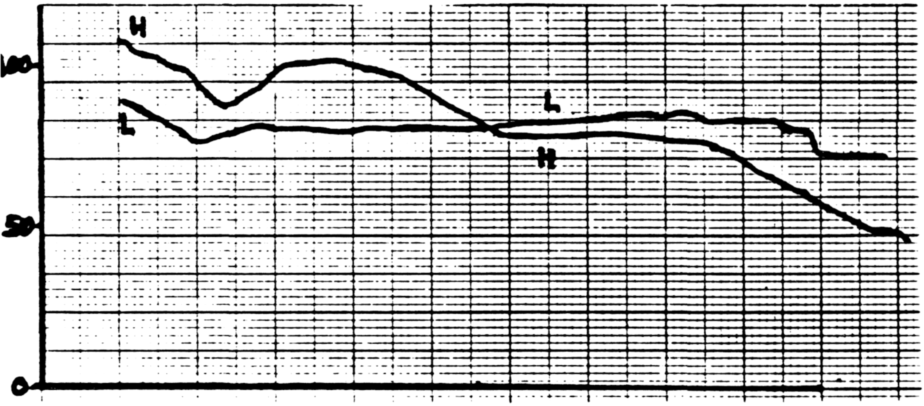

Figure (6) F_0 contour for irəmmi 'is sick' and irəmmi 'is writing', where the root i (H) 'sick' and i (L) 'write' are suffixed by the sequential marker -ləm and the progressive marker -li.[7]

In each case, the initial pitch of the H stem is higher than that of the L stem. The word with the H stem exhibits a steep fall in pitch from the first to the second (and third) syllable whereas the word with the L stem exhibits a more gradual fall in pitch across the word. Both words with H and L stems exhibit a word final fall in pitch.

It is impossible to consistently assign a tone to the suffixes. Clearly, the suffixes do not have H tone, since if this were the case, a level H contour would be obtained for the H stem + suffix sequences and a rising contour for the L stem + suffix sequences. Instead, a falling contours are attested for both H and L stems. Suppose the suffixes were postulated to have L tone: this would predict a level contour for L tone stem + suffix sequences, but this is clearly not the attested contour. Instead, the attested facts can correctly be expressed if it is assumed that it is the tone of the stem which is phonetically stretched across the suffixes which do not bear a tone of their own. The successively lower pitch exhibited by tone bearing units from the left to the right edge of words with both H and L stems, can be attributed to the phenomenon referred to as downdrift (for example Anderson 1978:139) or declination (Pierrehumbert and Beckman 1988:58) which is the natural tendency for pitch to lower from the beginning to the end of an utterance. The AP and MP final L% boundary tones reflect this lowering: in effect, the boundary tones represent phonetic targets for lexically assigned tones. Under this treatment, the representation of irəmmi 'is sick' will be as in (5)

```
(5)    [H% [[H] L%] [[  ] L%] [[  ] L%] L%]
             |          |          |
             |          |          |
             V         CV         CV
             |          |          |
             i         ləm        li
```

The localized drops in pitch, after each AP, are reflected in the AP final L% boundary tones; the overall downward trend of the curve can also be attributed to MP and AP level boundary tones.

2.3. Lexicalized suffix combinations

Taking into consideration the facts concerning stems and suffixes, it would be correct to say that M exhibits the typical characteristics of a pitch-accent system where regardless of the number of possible tone bearing units in a word (i.e. syllables), only one tone bearing unit is assigned lexical tone. Each stem exhibits lexical tone and the F_0 values for the rest of the word are filled in by the phonetic process of declination. Thus with a knowledge of the tone of the stem and the specified phonetic implementation of these tones, the F_0 contour for each word is totally predictable.

However, Manipuri is not a typical pitch accent language since there are instances where a word can have more than one tone. First, there exist a set of clausal subordinators that are lexicalized compositions of verbal suffixes (which are also used productively elsewhere in the morphology). These lexicalized subordinators all exhibit H tone. Thus a bound root that is suffixed by one of these subordinators exhibits either a HH or LH pattern depending on the tone of the bound root. This is illustrated in Figure (7) where the lexical subordinator -tunə (composed of the determiner -tu and the adverbial marker -nə), is suffixed to the H stem pay 'hold' and the L stem pay 'fly'.

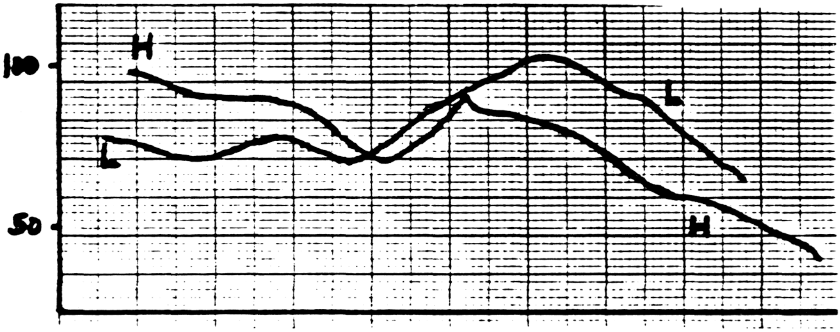

Figure (7): F_0 contour for paydunə 'by holding' and paydunə 'by flying', where the roots pay (H) 'hold' and pay (L) 'fly' are suffixed by the subordinator -tunə 'by Ving'.

Neither the curve with the H or L stem exhibits a lower pitch for the second syllable of the word. Instead, there is a rise in pitch after the stem syllable. This can be explained by assuming the following structure:

```
(6) [H%  [ [H] L%]   [ [H] L%]      [ [  ] L%]   L%]
             |            |             |
             |            |             |
            CVC           CV            CV
             |            |             |
            pay           tu            nə
```

The initial H pitch of the first syllable falls because of the AP final L% boundary tone. The pitch then rises because of the H tone of the following syllable. The H tone of the lexical subordinator is phonetically implemented across both its syllables. Thus, when a lexical subordinator is suffixed to a H or L tone stem, the pitch is maintained at a higher F_0 for a longer duration than with suffixation of productive suffix combinations to the same stems. This results in a number of minimal pairs. For example, compare the F_0 contours given in Figures (8-10) where productive suffix combinations are opposed to homophonous lexicalized subordinators. Table 2 gives a list of these homophonous pairs.

Table 2: Lexicalized suffixes

Subordinator	Productive morphology
-təna 'by Ving', (composed of dative marker -tə and the adverbial marker -nə)	V-tə-nə 'due to not the Ving' where -tə is the negative marker and -nə is the adverbial marker.
-nəbə 'in order to V', (composed of the adverbial marker -nə and the infinitive marker -pə)	V-nə-pə 'to V together' where -nə is the reciprocal marker and -pə is the infinitive marker
-ləbə 'having Ved', (composed of the perfect marker -lə and the infinitive marker -pə)	V-lə-pə 'has Ved there' where -lə marks an action which takes place towards the speaker and -pə is the infinitive marker

In Figure (8) the initial suffix of the subordinator (as seen in curve (a)), has a higher pitch than that of the homophonous negative suffix in curve (b). Also, the curve with the subordinator exhibits a more moderate fall than the curve in (b); the lexically specified H of the subordinator sustains this higher pitch.

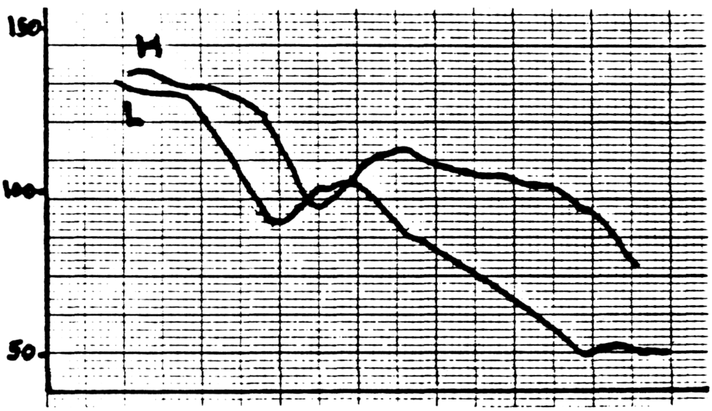

Figure (8): F_0 contours for the root thi (H) 'ugly' where (a) is thidənə 'not being ugly' and (b) is thidənə 'due to being ugly'.

Figure (9) also illustrates this point. In contour (a), the H tone of the stem is sustained through the first syllable of the subordinator whereas curve (b) exhibits a marked fall after the H tone of stem.

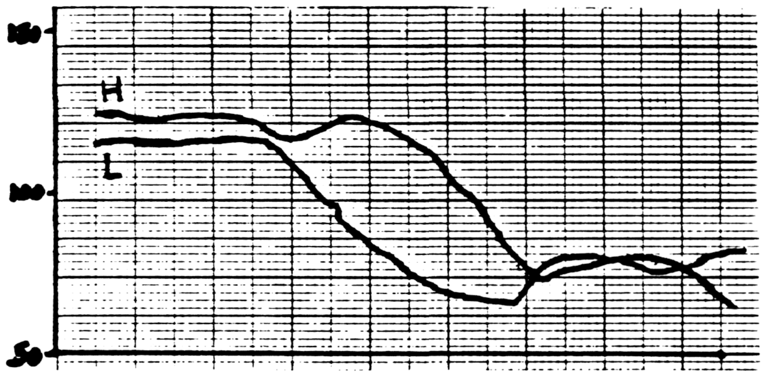

Figure (9): F_0 contour for the root pu (H) 'borrow' where (a) is punəbə 'to borrow together' and (b) is punəbə 'in order to borrow'.

Finally, Figure (10), provides an interesting example of this type of minimal pair. The initial pitch of the word with the subordinator (curve (b)) is significantly lower than that of curve (a). Curve (b) exhibits a relatively level pitch whereas curve (a) exhibits a steep fall from initial pitch. Thus, the distinguishing characteristic between these two words is not a quantitative one (height of the pitch) but the fact that one curve has a falling pattern where the other does not.

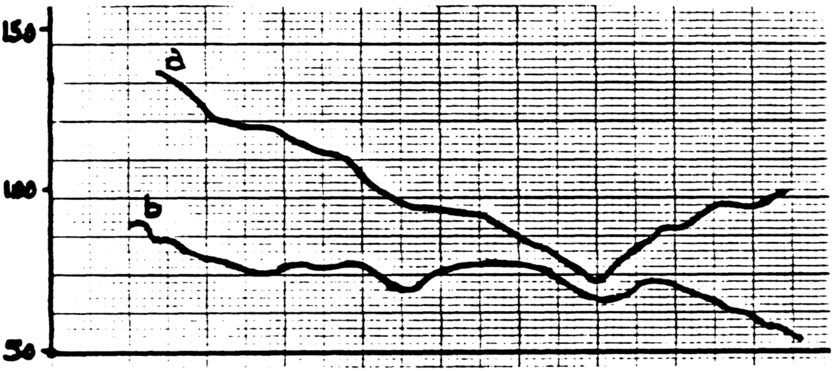

Figure (10): F_0 contour for the root i (L) 'write' where (a) is irəbə 'that has written' and (b) is irəbə 'has written there'.

These minimal pairs have been noted by Ningthoujam (1982:33) who differentiates these pairs by postulating a pause juncture associated with the subordinating suffix sequence. The pause perceived between a given root and one of the subordinating sequences listed in Table 2, might be attributed to the transition from HL% to the high of the subordinator or to the transition from L stem or root to the H of subordinator as opposed to the smooth declination curve as seen with productive suffixation.

2.4. Enclitics and prefixes

Both prefixes and enclitics exhibit H tone. Evidence for the H tone of prefixes can be found in Mahabir (1988) and Ningthoujam (1986). See also Figure (14) for the F_0 of the attributive prefix ə-.

Evidence for the H tone of enclitics is given in Figure (11) which gives the pitch curve for the word iri 'was sick' (composed of the H stem i 'sick' suffixed by the perfect marker -lə and the nonhypothetical enclitic -i.) Note that opposed to the predicted falling pattern for suffixation, the right edge of the word exhibits a slight rise in pitch. This is because of the H tone of the enclitic. The tone difference between the nonhypothetical enclitic and other suffixation has been noted indirectly in Bhat and Ningomba (1986), who oppose -li 'past' (which, as shown above, I analyze as a combination of the perfect marker -lə and the nonhypothetical enclitic -i) and -li 'progressive'. Their analysis indicates that the progressive marker can be distinguished from the 'past' tense marker because it has low tone. It is clear what motivates such an analysis: the nonhypothetical enclitic causes the stem + perfect marker + enclitic sequence to exhibit a non-falling pattern whereas the stem + progressive suffix sequence exhibits a falling pattern (see Figure (6)). So, the F_0 of the progressive -li is much lower than that of its counterpart and is interpreted as a L tone.

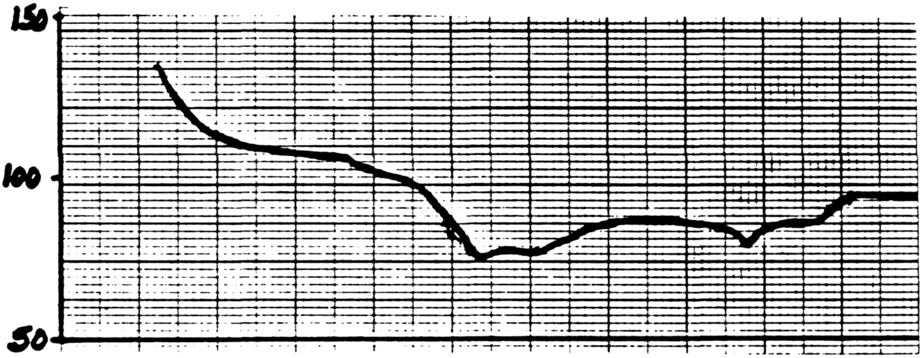

Figure (11): F_0 contour for the root iri 'was sick' (H).

2.5. Compounds

In this section, I describe the phonetic effects obtained when two stem tones appear adjacently within the same MP. In Figure (12), in curve (a), the high stem khong 'foot' is compounded with a high root up 'wear'.

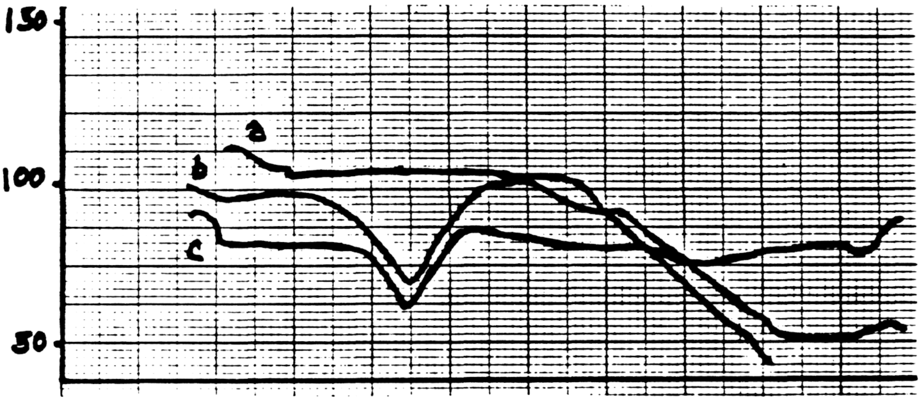

Figure (12): F_0 contour for the compounds khongup 'footwear' (a), khongjəw 'large foot' (b) and khongjəw 'large canal' (c).

In a compound such as khongup 'footwear', Figure (12) shows that when two H stems are contiguous, the pitch curve for each stem is the same as in isolation. When the pitch curve of khong in isolation (see Figure (2)), is compared to what is obtained in this compound, it is apparent that the uncharacteristically small drop in pitch exhibited at the end of the first stem is due, not to the following H stem, but to the final nasal which sustains the high tone of the stem in spite of the phonetic attraction of the L%. Given these facts, khongup is appropriately represented as (7).

```
(7)     H% [  [ H     ]L%    [H]L%] L%
               |              |
               |              |
              CVC             VC
              | | |           | |
              khong           up
```

Anderson (1978:138) notes that for languages which exhibit downdrift, a high tone may not have the same value at every instance since, "a high tone following a low tone will have a pitch level lower than a high tone occurring before the low tone: furthermore, subsequent high tones will be at or below this level." The pitch tracks in Figure (12) give support to this observation for both H and L tones. Curve (c) gives the Fo contour for khongjəw 'large canal' which is composed of khong 'canal' (L) compounded with the root cəw 'big' (L). Here, the pitch of the compounded stems patterns in way expected of L stems. Compare this with curve (b) which gives the Fo contour for khongjəw 'large foot' (composed of the stem khong 'foot' (H) compounded with the root cəw 'big' (L)). Note that in this curve, the L root does not exhibit the characteristic low pitch since the previous H stem restricts a lower pitch than the one observed. Similarly, consider the pitch curve of the compound thangpengnung[8] 'whetting stone' (composed of thang 'knife' (L), peng 'sharp' (H) and nung 'stone' (H)) given in Figure (13):

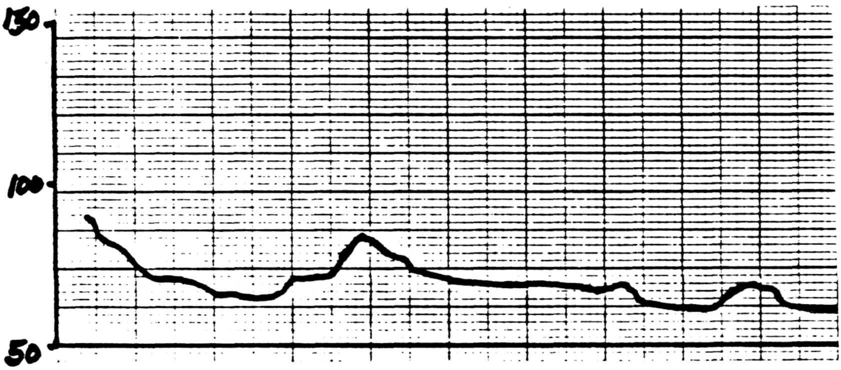

Figure (13): F_0 contour for the compound thangpengnung 'whetting stone'.

In this sequence of a L tone followed by two H tones, neither the H tone stem or root attains the same height in this environment as in isolation: whereas peng and nung peak at a little over 100hz and 110hz in isolation respectively, in the environment of the L tone of thang, they peak at only 85hz and 70hz respectively.

Declination functions across MPs; even though each MP begins with a H%, an MP which occurs after a L tone begins at a lower pitch than in isolation. Compare for example the pitch peak (140hz) of ut 'camel' (H) in isolation (see Figure (1)), with the pitch peak (110hz) for this same stem in the phrase əcawbə ut 'big camel'. In Figure (14), the presence of a H% before the stem is clearly observable: note the high initial pitch which trails to the actual distinguishing plateau of the H stem.

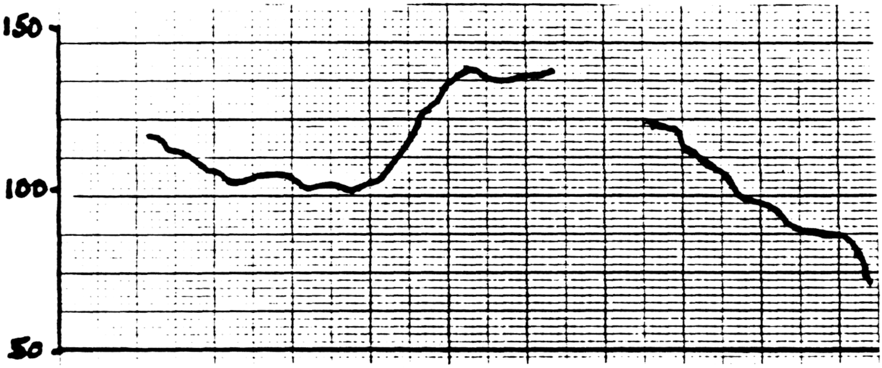

Figure (14): Fo contour for the phrase əcawbə ut 'big camel'.

The representation of this phrase given in (8) specifies the tone of the remaining syllables in the phrase.

```
(8) [H% [H]L%  [L]L%  [   ]L% ]L%]  [H%  [ H]L% ]L%]
         |       |      |                  |
         |       |      |                  |
         V      CVC     CV                 VC
         |       |      |                  |
         ə      cəw     pə                 ut
```

3. Conclusion

In the available literature there appears to be no consensus on how many or what tones there are in M. Pettigrew (1912) describes two tones, high and low; P. Devi (1979), Thoudam (1980) and Mahabir (1988) argue for two tones, falling and level; Inder Singh (1975) describes three tones, falling, rising and level; and W. Tomchou Singh (1986) argues for three tones described as light, medium, and heavy. However, if we look past the labels we can see that each investigator is in basic agreement with the facts and their description as presented in this paper.

Those investigators who describe two tones for M use the same minimal pairs to establish these tones as I do here. For example, Mahabir (1988:3)[9], describes i 'blood' as having a fall(ing) tone and i 'write' as having a level tone which correspond to my H and L tone, respectively. Given the F_0 contours seen for H tone stems in isolation (see the steep fall in F_0 from initial pitch in Figure (1)), it is apparent what prompted investigators such as Mahabir to label this a falling tone. However, as we have seen above, when this fall in pitch is associated to L%, it makes it possible to account for adjacent H tones that are part of the same MP (prefix-stem and stem-lexicalized subordinator sequences) where there is no significant fall in pitch between H segments.

I suspect that Inder Singh's (1975) description of a three tone system is influenced largely by the traditional notion, recorded in pedagogical works such as Tomchou Singh (1986:102-111), that posit three stress distinctions: light, medium, and heavy. Heavy and light correspond to what I label as H and L respectively: thus, puba 'to borrow' is given as an example of a heavy stem and puba 'to carry' is given as an example of a light stem. Apparently, medium tone refers to the rise in pitch of L tone when it occurs after a H: thus kiba 'to fear' is listed as light and akiba is listed as medium (recall that the attributive prefix a- is H, so the L root ki 'fear' has a higher F_0 here than when no prefix precedes it).

The description of M tone that I have presented here goes two steps forward of the existing literature. First, I have tried to show the behavior of tone, not only within bimorphemic words but also within polymorphemic words, compounds and to a limited extent in phrases. Second, I have presented a framework that correctly describes the manifestation of tone in M words.

One final issue is I will address is the representation of tone in M orthography and in phonemic transcription. Currently, the official orthography used for M is the Bengali script. Ningthoujam (1986) has noted that the spelling system in use is meant to characterize every phonetic variation obtained by adjacent tones. She notes that since there are not enough symbols to represent each phonetic variant, characters are used in combination or have multiple uses. This results in lists of rules of usage to be memorized which in turn inevitably results in inconsistencies in usage when these rules are disregarded. I would like to suggest that in both M orthography and in phonemic transcriptions of M, it is only necessary to mark lexically assigned L tone since if we assume that (a) all other morphological operations have H tone, (b) suffixes do not have tone and (3) recognize declination as the overriding phonetic rule present in implementing these tones, the phonetics of tone will are adequately represented.

Notes

1. I would like to thank my Manipuri consultants Thounaojam Harimohon Singh, Thongram Birjit Singh, Takhelhambam Geetarani, Pravabati Chingangbam and Mangala Ningomba. Thanks especially to Thounaojam Harimohon Singh for his participation in the preliminary lab work that went into this study. Thanks to Anthony Woodbury and Willem J de Reuse for helpful discussion and suggestions concerning this work. I take responsibility for all errors. I am extremely grateful to Anthony Woodbury of the University of Texas, Austin for allowing me to use his pitch tracking equipment. I am thankful for the financial support from the American Institute of Indian Studies which funded the initial part of this study.
2. Manipuri, also know as Meithei or Meithlei, is a Tibeto-Burman language of the Naga Kuki-Chin group. The dominant Manipuri speaking population is concentrated in the central valley of Manipur state which is located in Northeastern India.
3. The pitch tracking protocol that was used was developed by Ken Whistler of Dr. LST Software.
4. The average pitch range for this speaker is around 135Hz. By comparing the initial pitch of each of the stems in Table 1, it is apparent that the value for initial pitch is effected by syllable shape and the actual segments. Thus a high vowel (as in the stem i 'blood') has a higher F_0 value than an aspirated consonant or a lateral (such as the stems khoy 'navel' or la 'wide basket').
5. By a lexical phonological rule, the syllable initial voiceless unaspirated stop of a suffix is voiced between voiced

segments. This rule fails to apply between prefixes and stems and in compounds were the tone of the second stem is H. See Chelliah, (1990) and Chelliah, (in press) for details.
6. The imperative suffix coalesces with the final (homogenous) vowel of the verb.
7. In intervocalic position l becomes r.
8. This example was pitch tracked from a recording of compounds made by Mangla Ningomba in 1986
9. Mahabir has also undertaken instrumentation of tone minimal pairs, noting Fo, amplitude and duration to see which of these contribute to the perceptual distinction of the two tones. Unfortunately, I am unable to report his findings in full since I have in my possession only an abbreviated report (Mahabir 1988) of his full Master's thesis (Mahabir 1982) where the results are given. It would be interesting in particular to see what results he obtained with words that contain more than one suffix or in compounds, since it is these cases which motivate me to label the tones H and L as opposed to fall and level.

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