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0. INTRODUCTION

In the associative NP in many tone languages, the associative morpheme (henceforth AM) is marked at times by a floating tone.[1] In output forms, the patterns of realization of these tonal morphemes differ in very interesting ways. Generally, the low tonal morpheme surfaces as a floating tone causing following high tones to downstep. A H tonal morpheme, on the other hand, associates to a Tone Bearing Unit (TBU). In some languages (e.g. Bafut) the host TBU is the final syllable of the first noun of the associative NP (N1) while in others (e.g. Gwari) it is the first syllable of the second noun of the associative NP (N2). In very peculiar cases (e.g. in Makaa) the host TBU is found at times in N1 and at times in N2. What determines the different patterns of realization of the tonal associative morpheme is a significant question for phonological theory.

In this paper I intend to propose an analysis that will both generate and explain the range of patterns of floating tone association in the associative NP. Focusing on Bafut[2] I

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[1] In the phonological literature (see Kenstowicz 1994) the term floating tone is used in three distinct ways: (a). a grammatical morpheme whose lexical entry consists only of a tonal specification, without any inherent segmental material; (b). an underlying tone which is part of certain lexical morphemes but does not usually associate with any of these morphemes; (c). in derivational models, a tone which was linked at one stage but is delinked by some phonological rule.
In this paper, except otherwise indicated, the expression 'floating tone' refers to the definition in (c).

[2] Bafut is a non-narrow Grassfields Bantu Language spoken in the North West Province of the Republic of Cameroon by about 85,000 people.

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argue that four principal conditions regulate the realization of the tonal associative morphemes. These conditions are:

a. A condition requiring the obligatory presence of some phonological reflex of grammatical morphemes in surface representations;
b. A requirement for the identity of a tone that is linked to the initial syllable of a prosodic word to be preserved;
c. The need to maintain the linear order of input segments in surface representations;
d. A'ban on certain tone and register sequences within a prosodic word.

The paper concludes with the observation that the account developed for Bafut can be extended to explain other patterns of floating tone association in related Bantu languages and to resolve complex processes in Bantu tonology.

This paper is organized as follows. In section 1, I present a brief overview of the theoretical framework adopted for the study. Section 2 presents the tone system of Bafut as background information. Section 3 analyses the syntactic structure of the associative NP in Bafut and describes the manner in which the constituents of this NP are organized into an autonomous prosodic structure. In section 4 it is shown that the H associative morpheme is realized on N1 and not N2 because of the need to preserve the identity of a tone that is linked to the initial syllable of a prosodic word (henceforth pwd) and also because of a requirement to maintain the linear order of input segments in surface representations. Section 5 examines the realization of the L associative tonal morpheme demonstrating that it surfaces as a floating tone in order to satisfy (maximally) wellformedness conditions on the pwd. Section 6 concludes the paper.

1. Theoretical Background

The theoretical framework employed for this study is Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993a). In Optimality Theory (henceforth OT) emphasis is not on the derivational sequence by which an input is transformed into a surface form, but rather on a set of violable constraints which determine the wellformedness of output forms. OT consists of the following components: a set of violable constraints, ranked on a language particular basis, against which the wellformedness of output candidates is evaluated; a function, Gen, which associates an input form with a potentially infinite set of output candidates; and a function, Eval, which assesses output candidates and orders them according to how well they satisfy the constraint system of the language in question. The actually occurring output form is that candidate which best satisfies the constraint system (i.e. passes the highest ranked constraint(s).

Departing slightly from earlier work in OT, I will adopt the Positional Faithfulness Theory outlined in Beckman (1998), and the model of tone representation proposed by Snider (1988, 1990).

1.1. Positional Faithfulness

Positional Faithfulness Theory (Beckman 1998) identifies privileged linguistic positions which play a central role in the phonological systems of the world's languages. These positions include: Root-initial syllables, Stressed syllables, Syllable onsets and Roots. These are positions which enjoy some perceptual advantage in the processing system via either psycholinguistic or phonetic prominence. Positional privilege is manifested in three distinct, but closely related, patterns of phonological asymmetry, namely;

a. Positional maintenance of contrasts which are neutralized elsewhere,
b. Positional triggering of phonological processes,
c. Positional resistance to processes which apply elsewhere.

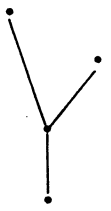
According to the theory, each of these phonological asymmetries arises from a single pattern of constraint interaction in Optimality Theoretic Grammar; one in which Positional Faithfulness constraints crucially dominate Context-free Faithfulness and Markedness constraints.

This study adopts the notion of 'patterns of phonological asymmetries' and demonstrates that tones which are linked to the initial syllable of a pwd resist processes that apply to tones elsewhere in the pwd.

1.2. Model of Tone Representation

In the analysis, I will assume a simplified version of Snider's (1988, 1990) model of tone representation generally referred to in the literature as the Register Tier Model. In broad terms, the model recognizes a tonal (or Modal) Tier and a Register Tier. Features from both tiers are associated with structural nodes on a Tonal Node Tier which is in turn associated with a TBU tier.

1.



Tonal Tier

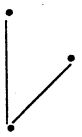
Register Tier

Tonal Node Tier

TBU Tier

To Simplify the discussion, I will make use of the Tonal Tier and the Register Tier, both of which are directly associated to the TBU Tier.

2.



According to this representation, a TBU is realized within a certain register which is defined as the "frequency band internal to the speaker's range which determines the highest and lowest frequency within which tones can be realized at a given point in an utterance" (Clements 1990:59).

The register Tier Model generally recognizes two distinct registers – High (h) and Low (l). I will, however, depart slightly from this and assume, following a suggestion from Lisa Selkirk, a potentially finite number of registers. Specifically, I will assume that there is a frequency range which the speaker can manipulate to realize different tones. Within this range, there is an upper, a middle and a lower limit within which the three distinct tones of Bafut – H, M, and L – are realized (respectively).

3.

R	H
A	
N	M
G	
E	L

The entire range can be shifted up and down one level at a time. We will call this frequency range the register and assume that the difference between one level and the next has a phonetic value of 1 degree.[3]

2. Bafut Tone System

In this section I present a brief overview of the tone system of Bafut. The presentation is essentially descriptive. However, detailed explanations will be provided for tonal phenomena that relate to the discussion on the floating tone association in subsequent sections. In such explanations the notion of a prosodic word will be assumed pending a more detailed discussion in section 3.2.

Bafut has three level (register) phonemic tones; H (high), M (mid) and L (low). In addition to the three phonemic tones there is a downsteped high tone (!H) and a raised L which are different from the phonemic mid tone. The data in (4) illustrates the phonemic contrast between the three level tones.

[3] The idea of multiple register levels has the advantage that it can provide a satisfactory treatment of the cumulative nature of register shifts such as in downdrift and in cases of multiple downstep.

4.

H	M	L
báá	bāā	bàà
'measure of oil'	'question particle'	'type of tree'
káá	kāā	àkàà
'crab'	'negative particle'	'oath'
bʊ́ʔʊ́	àbʊ̄ʔʊ̄	àbʊ̀ʔʊ̀
'chimpanzee'	'baton'	'slave'

In a language with a three-way tone contrast, the following 9 tone patterns are possible on disyllabic roots:

5 a. H H
b. H M
c. H L
d. M H
e. M M
f. M L
g. L L
h. L M
i. L H

Eight of these patterns occur on disyllabic noun roots in Bafut as illustrated in (6).

6 a. tʃtá 'pepper'
b. fálā 'father'
c. mánə̀ 'step sister'
d. à-kɨ́kʊ́ŋ 'owl'
e. bāʔā 'bowl (made out of calabash)'
f. nì-ɣɨɣə̀ 'praying mantis'
g. ŋ̀-gɔ̀ʔɔ̀ 'stone'
h. à-kwɛ̀ʔɛ̄ 'cough'

The only pattern that does not occur is the LH pattern. Its absence is accounted for in 2.1 below.

2.1. High Tone Lowering

The absence of the LH pattern in the examples in (6) is attributed to the fact that a high tone is generally lowered to mid after a low in the language (see Mfonyam 1989). This general lowering shows up in nouns with a high tone root and a low tone prefix. For instance, if a low tone prefix is affixed to the high tone roots in column I below, the root high tone is lowered to mid as in column II:

7.

I	II	
ø-tʃtá	bɨ̀-tʃtā	'pepper(s)'
ø-lʊ́ʔʊ́	bɨ̀-lʊ̄ʔʊ̄	'spoon(s)'
ø-lʃŋɔ́	bɨ̀-lʃŋɔ̄	'horse(s)'

Assuming, (see further evidence in section 3.2.), that the domain of H lowering is the prosodic word, I propose the following markedness constraint to account for the absence of the LH sequence in Bafut:

8. *$*(...L_{Ri}\ H_{Ri}...)_{pwd}$*
A LH tone sequence in the same register is banned within a prosodic word.

The examples in (6) and the constraint in (8), as pointed out above, indicate that Bafut generally avoids having a sequence of a L tone followed by a H tone in the same register within a pwd. As the examples show, this offending sequence is avoided by lowering the following H tones to M. It is however obvious that there are many alternative ways of avoiding the LH sequence. One alternative would be to simply delete either the initial L or the following H. This would, however, result in a toneless syllable in surface representation.

Another alternative way of avoiding the LH sequence would be to raise the initial L to H or M so that the words surface with either a HH or MH sequence. This alternative seems quite natural as examples of words with HH or MH tonal sequences are attested in the language alongside tonal processes which change input L tones to M and H. The fact that the initial L in the words in (6) is not raised to M or H suggests to me that the initial syllable of a pwd (the syllable to which the L is linked) is a privileged position; a position that resists tonal processes which would otherwise apply elsewhere in the pwd. We return to this important observation in more detail in sections 4 and 5 where we discuss floating tone association. For the time being, let us assume that the initial L does not raise to M or H because of a condition which requires the faithful realization of input segments found in certain positions of a word. Let us call this condition for now simply as the Positional Faithfulness Condition (PFC).

2.2. H, ꜜH and M Contrast

The phonetic contrast among high, downsteped high and mid tones is illustrated in the following constructions. Compare the tones on the nouns in isolation with the patterns observed when the nouns are used in N2 position in the associative construction. The diacritic ꜜ before a syllable/morpheme represents downstep of a following H as in the (b) examples in (10), (11), (12) and (13).

9.	fórɔ́	'mouse'	lúʔú	'spoon'
	sɨ́ŋ	'bird'	búʔú	'chimpanzee'
	lɨ́ŋɔ́	'horse'	tɔ́ʔɔ́	'tin'

10 a. kɔ́ fórɔ́ 'catch a mouse'
b. sɨ́ŋ ꜜfórɔ́ 'a mouse's bird'
c. sɨ́ŋ bɨ̀-fórɔ́ 'mice's bird'

11 a. fá sɨ́ŋ 'give a bird'
b. fórɔ́ ꜜsɨ́ŋ 'bird's mouse'
c. fórə bɨ̀-sɨ̀ŋ 'birds's mouse'

12 a. tá bʊ́ʔʊ́ 'kick a chimpanzee'
b. lɪ́ŋɔ́ ˡbʊ́ʔʊ́ 'chimpanzee's horse'
c. lɪ́ŋɔ́ bì-bʊ̄ʔʊ́ 'chimpanzees's horse'

13 a. té lɪ́ŋɔ́ 'pick a horse'
b. bʊ́ʔʊ́ ˡlɪ́ŋɔ́ 'horse's chimpanzee'
c. bʊ́ʔʊ́ bì-lɪ̄ŋɔ́ 'horses' chimpanzee'

In their citation forms (9) the nouns all bear high tones. In context, when preceded by a H-tone verb the noun retains its basic H tone. In N2 position the basic tone of the noun however changes depending on the tone which precedes it. In the (b) examples the N2 noun is preceded by another noun with an identical tone pattern. In this context the H on N2 is downsteped. In the (c) examples the N2 class prefix[4] bears a low-tone and in this case the H on N2 lowers to level of M. Bafut therefore has two types of H tone lowering; (a) ˡH which is just slightly lower (about 1/2 step) than a normal H and (b) M which is one step lower than H. Two questions arise: (a) what triggers lowering in both cases, (b) why does the H lower to M in one case but to a level higher than M in the other? To answer the first question, information from the structures in which both processes occur suggests that both are triggered by a preceding L tone. However, whereas the L which triggers downstep is floating, that which triggers H lowering to M is linked to a TBU. (Henceforth I use 'H lowering' to distinguish lowering to M from downstep). To have a clearer picture of the status of the conditioning L tones, compare the underlying representations of the associative NPs in column I to their corresponding surface forms in column II below:

14. I II
a. /fɔ́rɔ́ ᵛ-ø-sɪ́ŋ/ ---> [fɔ́rɔ́ ˡsɪ́ŋ]
mouse AssV bird ' bird's mouse'

b. /fɔ́rɔ́ ᵛ-bì-sɪ́ŋ/ ---> [fɔ́rɔ́ bì-sɪ̀ŋ]
mouse AssV+pref+bird 'birds's mouse'

The associative NP has an associative vowel (AssV) which is a pre-prefix (Pref$_1$) of N2. In the underlying representations, V represents the associative vowel slot. The features of this vowel, as well as evidence for its presence will be presented in section 4. In both (a) and (b) the associative vowel is deleted in the output representation but their underlying low tones are retained as floating tones. In (a) the floating L triggers downstep of the following H but in (b) it does not due to the intervening linked L on the prefix bì-. Lowering of the following H to M in (b) is rather caused by the linked L. The important point to note here is that lowering of the target H to either downstep or M is triggered by a preceding L tone.

Based on this, one may suggest, by way of an answer to the second question that the reason why the target H lowers to M in one case but to a level higher than M in the

[4] See section 4 for an outline of the noun class prefixes in Bafut.

other follows from the fact that the status of the trigger is different (floating in downstep but linked in H lowering). This suggestion invites another question, namely; what is so special about the linked versus floating status of a L tone that one triggers downstep while the other triggers H lowering? This question is particularly interesting as it puts to question previous accounts of downstep in Bantu tonology. Scholars of Bantu tonology have often assumed, without explaining why, that downstep is triggered by a floating tone (as opposed to a linked tone). The proposal that I intend to develop in this paper (see section 4) considers the position of the affected H within the pwd to be the crucial factor in determining whether the target H is downsteped or lowered to M. I will however put aside a detailed discussion of this issue for the time being. Suffice it to note here that the difference between downstep and H lowering is due, not to the status of the triggering L tone, but to the position of the affected H tone within a pwd.

2.3. Phonetic Raising

Bafut also has a phonetic raised low tone ↑L which contrasts phonetically with ordinary low tones. The following examples show the phonetic difference between L and ↑L.

15 a. â-lā?â 'wound' c. nì-bɔ̀?ɔ̀ 'pumpkin'
b. ↑â-lā?á 'village/country' d. n↑ì-bɔ́?ɔ́ 'fear'

The occurrence of the raised L tone is restricted to noun class prefixes of non-low root nouns. The data suggests that Bafut has a tonal assimilation process in which a non-low tone raises preceding L tones. This raising can be explained phonetically in terms of anticipatory articulation. While articulating the initial syllable bearing the L, the relevant organs of speech (in this case the larynx) start anticipating the articulation of the non-low tone in the next syllable. As a result, the initial L is raised. The L cannot however raise as high as the level of M or H for two reasons. First, at the outset of the articulation of the initial syllable the configuration of the larynx was not set for the production of a M or H tone. Secondly, raising to M or H would affect the identity of a tone that is linked to the initial syllable of a pwd; an issue which we return to in more detail in section 4.

2.4. Contour Tones

There is a very limited number of contour tones in Bafut and their occurrence is very restricted. The only contour tone pattern allowed is the falling pattern. This pattern arises from a combination of an intonational boundary tone and the underlying tone of the final syllable of an utterance.[5] Because of this limited distribution we will not treat contour tones as part of the tonal inventory of Bafut.

Having presented a broad overview of the tone system of Bafut as background information the next section examines the structure of the associative NP. The discussion

[5] The existence of intonational phrase boundary tones in Bafut is argued for in Tamanji (1998a). In this manuscript, it is argued that the declarative mood in Bafut is marked by a floating L tone which generally associates to the underlying tone of the final syllable of the sentence giving rise to a falling contour tone.

in this section will contribute to an understanding of what determines the constituent on which the floating associative tone is realized

3. The Structure of the Bafut Associative NP

3.1. Morphosyntactic Structure

The associative NP in Bafut is made up basically of two nouns: N1 (the head of the phrase) and N2 (the dependent noun). The dependent noun comprises a root and two prefixes: $Pref_1$ and $Pref_2$. What I call $Pref_1$ here is the element that is traditionally referred to in the literature as the associative morpheme. The form of this prefix (i.e. $Pref_1$) is determined by the noun class of the Head noun (N1). Thus, for example, in an associative NP in which the Head noun is a class 2 noun with the class prefix bi- the form of $Pref_1$ is bi. For a class 5 noun with the prefix ni- the form of $Pref_1$ is ni. For some noun classes $Pref_1$ is marked by a floating tone. Class 1 nouns with a zero prefix and class 9 nouns with a homorganic nasal prefix employ a low floating tone. Classes 3, 7 and 8 nouns with a vowel prefix and class 10 nouns with a homorganic nasal consonant use a high floating tone. The examples below illustrate the linear order of the constituents that make up the associative NP. Subscript numbers on N1 represent the noun class. For our present purposes the floating tonal associative morpheme is represented as occupying the same syntactic position as the segmental associative morpheme (i.e. $Pref_1$). In output forms these tonal morphemes are realized on N1 as will be shown in section 4.

16 a. ø-fórə́$_1$ `-ŋ-kàà
mouse $Pref_1$+$Pref_2$+monkey
'The monkey's mouse'

b. bɨ́-fórə$_2$ bɨ́-ŋ-ká́á́
mice $Pref_1$+$Pref_2$+monkey
'The monkey's mice'

c. ɨ́-bɔ́ʔɔ$_3$ ´-m-û
mushroom $Pref_1$+$Pref_2$+child
'The child's mushroom'

d. nɨ́-ŋgɔ̀ɔ$_5$ nɨ́-ŋ-ká́á́
plantain $Pref_1$+$Pref_2$+monkey
'The monkey's banana'

e. mɨ́-lùʔù$_6$ mɨ́-n-dɨ́mə́
drink $Pref_1$+$Pref_2$+friend
'A friend's drink'

f. â-bâʔâ$_7$ ´-n-dā
door $Pref_1$+$Pref_2$+house
'The door of the house'

g. ì-bâʔâ$_8$ ´-n-dā
doors $Pref_1$+$Pref_2$+house
'The doors of the house'

h. mì-bà$_9$ `-m-ân̄gyè
meat $Pref_1$+$Pref_2$+woman
'The woman's meat'

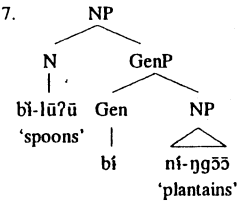
i. n̂-dā$_{10}$ ´-m-ân̄gyè
house $Pref_1$+$Pref_2$+woman
'The woman's house'

j. fɨ́-dzɔ̀ŋ$_{19}$ fɨ́-b-ə́
star $Pref_1$+$Pref_2$+people
'The people's star'

In these examples $Pref_1$ marks agreement between N1 and N2 and establishes an associative relation between the two nouns. The inner prefix ($Pref_2$), on the other hand, is the nominal prefix denoting the morphological class of N2.

For the purpose of this study, I will adopt the traditional analysis of the associative NP as comprising a head noun modified by a genitive phrase (GenP). As such the Bafut associative NP would be assigned the structure below:

17.



The constituents of the associative NP can be organized into the simplified morphosyntactic structure in (18).

18. N1 N2

$[\text{Pref} + \text{Root}]_{Lex}$ $[\text{Gen}^0 + [\text{Pref} + \text{Root}]_{Lex}]_{Lex}$

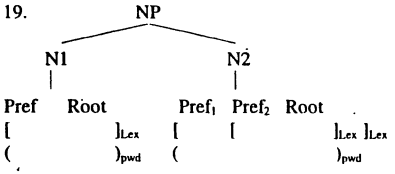
For ease of exposition and reference, I will henceforth refer to Gen^0 as Pref_1 and to the noun class prefix of N2 as Pref_2. In the section that follows I show how this morphosyntactic structure is organized into a prosodic structure.

3.2. The Prosodic Structure of the Associative NP

Having determined the morphosyntactic structure of the associative NP, we are now in a position to examine the manner in which the constituents that make up this NP are organized into prosodic units. I will propose a prosodic structure for the associative NP and then, using tone rules which are sensitive to prosodic domains as a basis for argumentation, demonstrate that the edges of the lexical word established in the preceding section partially coincide with the edges of the prosodic domains which the tone rules are sensitive to.

The associative NP in Bafut is organized into the following prosodic structure (Square brackets mark morphosyntactic units while parenthesis mark prosodic categories)

19.



As the structure shows, the prefix + root of N1 form a pwd while $Pref_1$ and prefix + root of N2 make up another pwd. Evidence for this organization derives from two tonal processes; namely, H tone lowering and H tone spreading.

In high tone lowering, as discussed earlier in section 2, a L lowers following Hs to M. For instance, if a low-tone prefix is affixed to a high-tone noun root, the root H is lowered to M.

20 a. ø-sín 'bird'
b. bì-sìn 'birds'

This lowering is however restricted to the lexical/morphosyntactic word domain as we notice from the ungrammaticality of (21b) compared to the wellformedness of (21a) that the influence of the initial L on N1 does not extend to the H on $Pref_1$ of N2.

21 a. bì-sìŋ bǐ-ŋ-káá
birds $Pref_1$-$Pref_2$- monkey
'A monkey's birds'

b. * bì-sìŋ bi ŋkáá

Failure to lower the H on $Pref_1$ cannot be attributed to the distance separating the trigger (the L on the prefix of N1) from the target (the H on $Pref_1$). Evidence from the verbal complex shows that the distance (i.e. the fact that the H on $Pref_1$ is separated from the L by a H linked to a separate morpheme) is not the main impediment. The linear order of elements in the verbal complex is the following:

22. Tense - Aspect - Negation - Verb

Tense, Aspect, and Negation are independent morphemes (as opposed to bound morphemes) as witnessed by the fact that adverbs can readily be inserted in between them. In a construction containing a low-tone tense morpheme, a high-tone aspect morpheme and a high-tone verb, the low tone on the tense morpheme lowers all the following high tones. Compare the tones on the aspect morpheme and the verb in (22a) with those in (22b) in which a low tone on the tense morpheme now follows the high tones.

22 a. káŋ kyá tɨ́tá!
Asp harvest pepper
'Continue harvesting pepper!'

b. mə̀ kɨ̀ káŋ kyá tɨ́tá
I Pl Asp harvest pepper
'I was harvesting pepper'

In this example the trigger (L on the tense morpheme) is separated from each of the target high tones by at least a morpheme boundary yet all the following high tones are lowered to mid.[6] I recognize the fact that conditions in the verbal complex may be totally different from those in the noun phrase but the H lowering in these examples seems to be strong corroborative evidence against the claim that in (21a) the H on $Pref_1$ fails to lower because it is separated from the trigger by a morpheme boundary. It is most likely that H tone lowering in (21a) is blocked by something else other than distance.

Another example in which a H on $Pref_1$ is immediately preceded by a L on the noun will strengthen the claim that H lowering is not blocked by the distance separating trigger from target. Consider the example below in which $Pref_1$ follows a low-tone noun root.

23. bì-bàà bɨ́ ŋkáá
type of tree $Pref_1$ monkey
'The monkey's tree'

The immediately preceding L on the final syllable of 'tree' still fails to lower the H on $Pref_1$. Therefore failure to lower the H on $Pref_1$ in (21a) must be attributed to a factor other than the distance between trigger and target.

My hypothesis is that lowering the H on $Pref_1$ is blocked by the fact that the trigger (L on N1) and the target (H on $Pref_1$) are in separate prosodic domains. More simply put, the H on $Pref_1$ does not lower in spite of the presence of the preceding L on N1 because it is associated to a different pwd. This gives us reason to argue that in the associative NP N1 and $Pref_1$ are in separate prosodic words.

Before we conclude the discussion on the prosodic organization of the associative NP, we need to establish whether the morphemes which form each of the nouns (N1 and N2) constitute a prosodic unit or not. Up to this point, we have shown that the boundary

[6] It is hard to account for multiple lowering in this example. In a case where such lowering occurs in a single lexical element, one could account for it by assuming there is a single H which is multiply linked. However, it is hard to extend this to cases like (30b) where each of the morphemes has an independent tone. It is possible to claim that lowering the second H is attributable to a condition against a MH sequence. This is, however, not very plausible given the presence of words with this sequence in the language. As a temporary analysis, I will first assume that the tense morpheme, the aspect marker and the verb belong in the same pwd. Having lowered the range (register) within which the first H is realized, it is hard to reset (raise) it within the same pwd. This suggests a constraint in the language which disallows multiple changes of register within the same pwd. Just how many times the register can be changed and in what direction is an issue to be studied closely.

between N1 and N2 is the boundary of a prosodic domain. Thus the last syllable of N1 coincides with the right edge of the first prosodic unit while the left edge of $Pref_1$ coincides with the left edge of the second prosodic unit. What we have not yet shown is whether the morphemes to the left of the boundary (Pref + Root) on the one hand and those to the right ($Pref_1$ + $Pref_2$ + Root) constitute prosodic units. Deciding on the status of the morphemes that make up N1 (the morphemes to the left of the boundary) is straightforward. The fact that the influence of a L on the prefix extends into the root (a prefix L tone lowers a root H) as in examples (7) and (21) indicates that the prefix and rôot form a pwd. A difficulty concerns the status of $Pref_1$. Above in section 3.1, this morpheme was analyzed as a combination of an agreement morpheme and an associative vowel which forms a unit (lexical word) with N2. The question then is whether treating it as a pre-prefix attached to N2 predicts that it forms a prosodic unit with the prefix and root of N2. Evidence from H tone spreading shows that this is indeed the case.

High tones in Bafut generally spread onto following syllables. In the associative NP the high tone on $Pref_1$ spreads onto the prefix ($Pref_2$) and root of the following noun. This is illustrated below.

24 a. / mɨ-ntsù mɨ-fɨ-tɔ́ə̀/ -----> [mɨntsù mɨfɨtɔ́ə̀]
mouths $Pref_1$+$Pref_2$+calabash 'openings of calabash'

b. /nɨ-ŋgɔ̀ɔ̀ nɨ-ŋ̀-kâà/ -------> [nɨŋgɔ̀ɔ̀ nɨŋkáá]
banana $Pref_1$+$Pref_2$+monkey 'monkey's banana'

c. /mɨ-ntsù mɨ-ø-sâŋ/ -------> [mɨntsù mɨsáŋ]
mouths $Pref_1$+$Pref_2$+moon 'faces of the moon'

In these examples the H on $Pref_1$ spreads onto $Pref_2$ and the root affecting both M and L tones. Notice that H spreading does not occur within a lexical word such as mánə̀ 'step sister'. I assume that spreading is limited to derived environments. Why it occurs in the first place is difficult to say given that the morphemes to which the H spreads all have independent tones. I will simply point out here that it could be the case that L and M tones are generally marked in Bafut and so whenever conditions permit, a H spreads and replaces the L or M tone. This is however an issue requiring further investigation. For the time being, the point of interest to this discussion is the observation that a H on $Pref_1$ spreads onto prefix and root of N2. Given that tonal processes are sensitive to prosodic boundaries, the nature of high tone spreading in the examples above shows that there is no such boundary between $Pref_1$ and $Pref_2$ + Root. Therefore, the three morphemes $Pref_1$ + $Pref_2$ + Root are in the same prosodic word. We can therefore conclude that the associative NP comprises two prosodic words N1 = Prefix + Root and N2 = $Pref_1$ + $Pref_2$ + Root.

The organization of the morphosyntactic structure into the prosodic structure in (19) and the evidence that led to this phrasing is corroborated by similar facts in genetically related languages.

In Kom, Hyman (pc) reports that though the language commonly spreads a lexical tone to a following grammatical element, in the associative NP, the tone of the final syllable of N1 does not spread onto the following AM.

25 a. mə̀-tə́m mə̀ fì-kə̀?
fruits AM tree
'fruits of a tree'

b. *mə̀-tə́m mə́ fì-kə̀?

Failure of the H on the final syllable of 'fruits' to spread to the AM is attributed to the fact that N1 and the AM are in different prosodic words. Based on this property of tone spreading in Kom Hyman proposes that in the associative NP the AM and N2 constitute a clitic group as schematized in (26).

26. $((\text{mətə́m})_{\text{pwd}}(\text{mə fìkə̀?})_{\text{pwd}})_{\text{p-phrase}}$

Similar facts are reported in Bamilike-Dschang (Hyman 1985) though the prosodic organization is different from that in Kom and Bafut. The examples from Kom strengthen our claim for Bafut that the morphosynatctic structure of the associative NP is generally organized into an independent prosodic structure.

Having established the morphosyntactic and prosodic structures of the Bafut associative NP, in the next section I show that the surface realization of the tonal associative morphemes is, to a large extent, influenced by the prosodic organization of the associative NP.

4. Patterns of Floating Tone Association

In section 3.1 we discussed the linear order of constituents that make up the associative NP. In this construction, the form of Pref_1 is determined by the morphological class of N1.

27. Noun Class	Associative Tone
1	(L)[7]
2	bf
3	(H)
5	nf
6	mf
7	(H)
8	(H)
9	(L)
10	(H)
19	ff

[7] Floating tones are enclosed within brackets to distinguish them from linked tones.

Classes 2, 5, 6 and 9 nouns take the prefixes bɨ̰-, nɨ̰-, mɨ̰- and fɨ̰- respectively. These class markers are segmentally identical to $Pref_1$ (the agreement/associative morpheme). Classes 1, 3, 7, 8, 9 and 10 nouns take the prefixes ø-, ɨ̀-, à-, ɨ̀-, Ǹ- and ǹ- respectively. When a noun from any of these classes is used as the head of the associative NP (i.e. in N1 position). $Pref_1$ in this case is marked simply by a floating tone. One may wonder why $Pref_1$ has segmental content when the head noun is a class 2, 5, 6 or 19 noun but is simply tonal when the head noun is from another class. My hypothesis is that underlyingly $Pref_1$ has segmental content irrespective of the class to which the head noun belongs. In every case this segmental prefix is identical in form to the prefix of the head noun. This implies that in cases where the head noun is from classes 1, 3, 7, 8, 9 or 10 $Pref_1$ is underlyingly a vowel or a nasal consonant since the head nouns from these classes have vowel or nasal prefixes (vowel for classes 1, 3, 7, and 8 and nasal for classes 9 and 10). In the output representation, the vowel or nasal consonant marking $Pref_1$ is deleted by the general Bantu vowel deletion rule (see Lovins 1971a) but their underlying tones are retained as floating tones. The examples below illustrate this vowel/nasal deletion process:

28 a. / ɨ̀-bɔ̀ʔɔ̀ ɨ́-m-ū / ⇨ ɨ̀bɔ̀ʔɔ́ mū
Pref-mushroom Pref1-Pref2-child 'child's mushroom'

b. / à-bàʔà á-bɨ̰-tāā / ⇨ àbàʔá bɨ̰tāā
Pref-door Pref1-Pref2-fathers 'fathers's door'

c. / m̀-bà ḿ-ø-bílíbá / ⇨ m̀bá bílíbá
Pref-meat Pref1-Pref2-smith 'the smith's meat'

d. / ǹ-tāʔā ń-ø-sɪ́ŋ / ⇨ ǹtāʔā !sɪ́ŋ
Pref-hill Pref1-Pref2-bird 'a hill full of birds.'

In the output forms, the patterns of association of the floating tones (i.e. the tones derived from the deletion of the segmental material of $Pref_1$) differ depending on whether the tone is H or L. If the tone is H, it associates to the final syllable of N1 delinking the underlying tone of this syllable. This is illustrated in (45).

29. I II

a. / ɨ̀-bɔ̀ʔɔ̀$_3$ (H) mʊ́ŋkhɪ̌ / ⇨ [ɨ̀bɔ̀ʔɔ́ mʊ́ŋkhɪ̂]
mushroom $Pref_1$ child 'a child's mushroom'

b. / à-bàʔà$_7$ (H) àlɔ̀ɔ̀/ ⇨ [àbàʔá lɔ̀ɔ̀]
door $Pref_1$ dry season 'door of dry season'

c. / ɨ̀-sɔ̄$_3$ (H) māŋgyɛ́ / ⇨ [ɨ̀sɔ́ māŋgyɛ̂]
hoes $Pref_1$ of twin mother 'twin mother's hoes'

d. /mbū$_{10}$ (H) tākɔ̄bà/ ⇨ [mbū tākɔ̄bà]
dogs Pref$_1$ plantain 'dogs of plantains'
(species of dogs)

If the associative tone is L, on the other hand, it remains floating and instead provokes downstep in following H tones as illustrated in (30).

30. I II

a. /fɔ́rɔ̀$_1$ (L) mì-wúrɔ̀ / ---------> [fɔ́rɔ̀ ꜜmìwúrɔ̀]
rat Pref$_1$ oil 'rat of oil (rat that feeds on oil)'

b. /ǹ-tām$_9$ (L) fɔ́rɔ̀ / ----------> [ntām ꜜfɔ́rɔ̀]
shoe Pref$_1$ rat 'rat's shoe'

The focus of this paper is explaining why the floating H consistently associates to the final syllable of N1 and not say to the initial syllable of N2 (its pwd of origin) and why the floating L fails to associate to a TBU. In order to provide a comprehensive analysis of these tonal phenomena, this paper will need to address the following questions:

a. Why the associative tones do not delete along with the segmental content of Pref$_1$;
b. What determines the TBU to which the floating H associates;
c. Why the associative H tone systematically delinks input tones of the host TBU to which it associates and why it does not lower to M when preceded by a L as other Hs.
d. Why the associative L surfaces as a floating tone and why it causes following H tones to downstep instead of lowering to M as L tones do elsewhere in the language.

Let us begin with the prerequisite question why the associative tones fail to delete along with the segmental material of Pref$_1$.

4.1. Why Associative Tones Resist Deletion

To answer the first question regarding the obligatory projection of the floating tonal morphemes in the output, one could adopt one of two constraints proposed in the literature to capture similar facts. Akinlabi (1995) for instance proposes the constraint *Parse Assoc-H* to account for the realization of a high tonal morpheme in Etsako and Bini. Although this constraint adequately handles the specific cases of Etsako and Bini, it is too restrictive as it excludes cases like those of Bafut where the associative morpheme for some noun classes is a low floating tone. A more general constraint that includes all possible tone levels would be more appropriate. A possible candidate is *MaxTone* which ensures that an input tone has an output correspondent. Though quite general, *MaxTone* is not the ideal constraint to use in the case of associative tones as it tends to treat lexical and grammatical tones alike. Associative tones and lexical tones differ in many respects. Whereas an associative tone is part of a grammatical morpheme, a lexical tone is not. Secondly, as Akinlabi (1995:229) argues, whereas the domain of lexical tones is just a mora to which it is underlyingly linked, the domain of a grammatical tone is a prosodic word. These differences suggest that a theory of constraints needs to recognize the

distinction between lexical and associative tones and also to explain why grammatical tones are favored over lexical tones.

My hypothesis is that the associative tones fail to delete along with the segmental content of $Pref_1$ because they are the only reflex of a grammatical morpheme remaining. $Pref_1$ which comprises a vowel and the associative tone is a grammatical morpheme marking agreement and association between N1 and N2. When the vowel deletes, the tone is the only reflex of this grammatical morpheme that remains. Were the tone to delete along with the vowel, the associative NP would surface without a grammatical morpheme marking agreement/association between the two nouns. It is therefore plausible to claim that the grammar of Bafut requires the obligatory presence of some phonological reflex of a grammatical morpheme in output representation.

Independent motivation for this view (i.e. the view that the grammar requires the presence of a grammatical morpheme in output representation) derives from vowel deletion. Bafut generally disallows a sequence of two vowels across morpheme boundary.

When this offending sequence arises, the general tendency is to delete the second vowel. in the sequence. This is illustrated below:

31a. / àtū + àlā?ā / ⇨ [àtúlā?ā]

b. / má + ɬlhī / ⇨ [málhī]
big ant 'mother ant'

However, when the second vowel in the sequence is a grammatical morpheme, the first vowel is deleted while the second (the grammatical morpheme) is retained. In the examples below, the grammatical morpheme (Focus Marker) which is the second vowel in the tautosyllabic vowel sequence is preserved while the first is deleted. The tautosyllabic vowel sequence is underlined.

32 a. / mə kǐ tù?ù á ŋkǐ / ⇨ [mə kǐ tù? á ŋkǐ]
I P2 fetch Foc water 'I fetched **water**'

b. / Sùù kǐ bǐ?ǐ á nǐlòŋ / ⇨ [Sùù kǐ bǐ? á nǐlòŋ]
Suh P2 carry Foc radio 'Suh carried a **Radio**'

It is interesting to ask, at this point, why the focus marker resists deletion while in the associative NP, the associative vowel, which is equally a grammatical morpheme, gets deleted in similar contexts. I propose that the reason why the associative vowel deletes but the focus vowel does not is attributable to a difference in the syntactic positions of the two. Whereas the focus vowel occupies the initial position of a syntactic phrase (a Focus Phrase), the associative vowel does not. One may therefore make the general claim that the initial position of a syntactic phrase, just like that of a pwd, is more resistant to phonological processes than any other position.

In order to capture the fact that the associative tones (grammatical morphemes) fail to delete along with the segmental material of $Pref_1$, I propose the following constraint which is, in essence, an adaptation from earlier work by Samek-Lodovici ((1992).

33. *MORPH.REAL*
A grammatical morpheme must be given phonological expression in output representation.(Samek-Lodovici 1992. Also Selkirk 1997 and Gnanadessikan1997).

In this paper, expressing a morpheme phonologically means that the morpheme must be demonstrably present in output or show up by virtue of secondary effects on neighboring segments. The constraint in (33) requires the H and L associative tones to show up (in one form or the other) in the output representation since they are reflexes of a grammatical morpheme that marks agreement/association between N1 and N2.[8]

4.2. Realization of Floating H on N1

We now turn to the crucial question why the floating H associative tone is realized exclusively on N1 despite the fact that it originates from a segment that is in the pwd containing N2. We noted earlier with regard to H tone lowering and H tone spreading (section 3.1) that a H tone or its effects do not extend beyond a morphosyntactic word. This suggests that there is a general tendency to preserve a H tone within the morphosyntactic word to which it is underlyingly associated. Let us assume that this is so because of a constraint in the grammar of Bafut which tends to 'keep' a H tone within its morphosyntactic word of origin. This constraint is formalized in (34) below.

34. *No Move(T)*
Movement of a tone out of its morphosyntactic word is banned.

To return to the question of the realization of the associative H, one wonders then why it associates to N1 and not to N2 where it would have remained within its morphosyntactic word of origin (recall from the discussion above that the associative tones result from the deletion of a vowel that forms a morphosyntactic word with the prefix and root of N2). The explanation which I develop in this paper hinges crucially on the notion of positional faithfulness (Beckman 1998). If the associative H were to be preserved in its morphosyntactic word of origin, one of three things would result; namely,

a. It may associate to the initial syllable of the pwd which, in this case, is $Pref_2$ (N2 prefix);
b. It may associate to a syllable of N2 other than the initial syllable;
c. It could remain a floating tone.

Let us examine each of these options in turn and see why the associative H 'rejects' them.

[8] It is also necessary to ensure that in the grammar of Bafut agreement/association is expressed tonally rather than by blocking the segmental (vowel) deletion process. I will not discuss this in detail in this paper but simply note that ranking both MORPH.REAL and a constraint against tautosyllabic vowels above a faithfulness constraint which favors deletion will take care of this.

4.2.1. Association to Initial Syllable of N2

If the associative H associates to the initial syllable of N2, this will give rise to a contour tone or result in the substitution of the input tone of this syllable. The fact that it does not associate to the initial syllable of the pwd causing either of these effects suggests to me that the initial syllable of the pwd is a privileged position of the pwd; a position that is resistant to tonal processes that would otherwise apply elsewhere in the pwd. This position therefore resists a tonal process that would change its input tonal features. Put another way, the grammar of Bafut requires that the identity of an input tone that is linked to the initial syllable of a pwd be preserved.

Independent motivation for the claim that there is need to preserve the identity of a tone that is associated to the initial syllable of a pwd derives from H tone lowering discussed earlier in section 2. Recall from examples like these in (35) below that a L on a nominal prefix lowers a root H to M.

35a. ø-sín 'bird'
b. bì-sín 'birds'

I proposed that this lowering occurs to avoid a LH tonal register sequence in the same pwd. The question then arose why the initial L could not be raised to M or H since raising would equally avoid the offending LH sequence. As suggested, raising does not occur because this would affect the identity of a tone that is linked to the initial syllable of a pwd.

Based on the above, it is plausible to make the general claim that in the grammar of Bafut there is the need to preserve the identity of a tone that is linked to the initial syllable of a pwd. The associative H therefore fails to associate to the initial syllable of N2 due to this requirement which we capture formally in the constraint in (36).

36. *Ident-Tone σ1*
An output segment in the initial position of a pwd is associated with the same specification for tonal features as its input correspondent.

The interaction between this constraint and that which tends to 'keep' a tone within its pwd is illustrated in Tableau I below.

Tableau I

MORPH.REAL, Ident-Tone σ1 >> No Move(T)

[a-ba?a]$_{Lex}$ [a-m-aŋgye]$_{Lex}$ L H M	MORPH.REAL	Ident-Tone σ1	No Move(T)
a. ☞ (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M			
b. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M		*!	
c. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M		*!	
d. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L M	*!		

The optimal candidate (a) satisfies the high ranked *MORPH.REAL* and *Ident-Tone σ1* since the grammatical associative tone is realized but not on the initial syllable of a pwd. The identity of the input tone of the initial syllable of the pwd is therefore preserved. This candidate violates *No Move(T)* since the floating H is not maintained within its morphosyntactic word. *No Move(T)* is however low ranked and as such its violation has no effect on the optimality of candidate (a). The runners up (b) and (c) are ruled out by *Ident-Tone σ1*. In these candidates the grammatical morpheme is realized but is associated to the initial syllable of a pwd thereby affecting the identity of the input tone of this syllable. Candidate (d) incurs a fatal violation of *MORPH.REAL* since the grammatical associative H deletes along with the segmental content of Pref$_1$.

4.2.2. Association to Second or Third Syllable

The second option, if the associative H tone were to remain in its morphosyntactic word, would be for it to associate to the second or third syllable of the pwd. To do this it will either have to undergo some form of metathesis[9] or skip over input tones linked to the prefix and root of N2 against constraints on Linearity (McCarthy and Prince 1995) and/or the Welformedness Condition on phonological representations (Goldsmith 1976). The associative H does not metathesize or skip over linked tones suggesting the existence of a condition on linearity which requires segments in input representation to be consistent with the precedence structure of the input correspondent. This condition is captured in the following constraint which is an adaptation of McCarthy and Prince's (1993:371) *LINEARITY* constraint:

[9] It is interesting to note that segmental metathesis as a phonological process is not, to the best of my knowledge, attested anywhere in the phonology of Bafut.

37. *LINEARITY (Tone)*
Tones in output representation are consistent with the precedence structure of the corresponding input form.

LINEARITY interacts with the constraint requiring tones to remain within their morphosyntactic words of origin in the manner illustrated in the Tableau II below.

Tableau II: *MORPH.REAL, LINEARITY >> No Move(T)*

[a-ba?a]$_{Lex}$ [a-m-aŋgye]$_{Lex}$ L H M	MORPH.REAL	LINEARITY	No Move(T)
a. ☞ (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M			
b. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M		*!	
c. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L M	*!		

In the optimal candidate (a) the grammatical associative H is realized on the final syllable of N1. *MORPH.REAL* and *LINEARITY* are satisfied since the associative H associates to a TBU and does not skip over linked tones. This candidate incurs only a violation of the low ranked *No Move(T)*. Candidate (b) satisfies the low ranked *No Move(T)* but at the expense of the higher ranked *LINEARITY*. In candidate (c), the grammatical associative H is deleted along with the segmental content of Pref$_1$. This incurs a fatal violation of *MORPH.REAL*.

4.2.3. A Surface Floating H

The third option, were the associative H to remain within its morphosyntactic word of origin, would be for it to surface as a floating tone. It, however, does not; an indication of the presence of a constraint in the grammar of Bafut which disfavors floating H tones in output representations. This constraint is formalized in (38).

38. **FLOAT (H)*
A floating H tone is banned in output representation.

The interaction between this constraint and *No Move(T)* is illustrated in Tableau III.

Tableau III: *MORPH.REAL*, **FLOAT(H) >> No Move(T)*

[a-ba?a]$_{Lex}$ [a-m-aŋgye]$_{Lex}$ L H M	MORPH.REAL	*FLOAT(H)	No Move(T)
a. ☞ (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M			
b. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M		*!	
c. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L M	*!		

The optimal candidate (a) satisfies both *MORPH.REAL* and **FLOAT(H)* incurring only a violation of the low ranked *No Move(T)*. Candidate (b) is ruled out by **FLOAT(H)* since the associative H does not attach to a TBU but remains floating. Candidate (c) is ruled out by *MORPH.REAL* as the grammatical morpheme (the associative H) is deleted along with the segmental content of Pref$_1$.

Thus far, we have provided an explanation for why the associative H moves out of its morphosyntactic word of origin and associates to the final syllable of N1. Before we round off this discussion regarding the realization of the associative H, let us address a related question: why the associative H systematically delinks the input tone of the syllable to which it attaches and why it fails to lower to M when preceded by a L. First, why it delinks input tones.

Recall from the relevant illustrations above that any time the floating associative H associates to the final syllable of N1, it delinks the input tone of this syllable. Some examples are given below:

39 a. / à-bà?à$_7$ (H) àlòò / ⇒ [àbà?á lòò]
door Pref$_1$ dry season 'door of dry season'

b. / ɨ-sɔ̀$_3$ (H) máŋgyɛ̀ / ⇒ [ìsɔ́ máŋgyɛ̀]
hoes Pref$_1$ of twin mother 'twin mother's hoes'

c. /à-kwɛ̀?ɛ̄$_7$ (H) múŋkhî / ⇒ [à-kwɛ̀?ɛ́ múŋkhî]
cough Pref$_1$ child 'a child's cough'

One would have expected it to associate to the input tone of the host syllable giving rise to a complex/contour tone. The behavior of the floating associative H vis-à-vis the tone of the host syllable leads me to claim that contour tones are marked in the language. One could capture this fact using the general **Contour* constraint but facts relating to the tone

system of Bafut indicate that this would be inappropriate. In section 2 of this paper, it was pointed out that Bafut allows contour tones, though in very restricted contexts: only falling contour tones and exceptionally at utterance final position. The occurrence of only falling contours and in very restricted contexts shows that contour tones are generally marked in the language. However, the total absence of a rising contour indicates that rising contours are more marked than falling contours. To account for the fact that the associative H systematically delinks tones of host syllables, we can therefore, posit the following constraint which militates against rising contours:

40. ***RISE***
Rising contours are marked.[10]

The associative H therefore delinks the underlying tone of the host TBU in order to avoid violating the high ranked *Rise. We discern from this that the grammar of Bafut would rather express a grammatical morpheme (the floating associative H) and avoid having a rising contour at the same time than preserving an input lexical tone in output representation. Therefore *MORPH.REAL* and ***Rise*** are ranked above *Ident:Tone* in the grammar. This constraint interaction is illustrated in Tableau VI

Tableau IV: *MORPH.REAL, *RISE >>Ident:Tone*

/[aba?a]$_{Lex}$ [a-m-aŋgye]$_{Lex}$ / L H M	MORPH.REAL	*RISE	Ident:Tone
a. ☞ (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M			
b. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M		*!	
c. (aba?a)$_{pwd}$ (maŋgye)$_{pwd}$ L H M	*!		

Candidate (a) satisfies both *MORPH.REAL* and ***Rise*** incurring only a violation of the low ranked *Ident:Tone*. Candidate (b) fatally violates ***Rise*** while (c) is ruled out by *MORPH.REAL*.

Let us now answer the second part of the question: why the associative H does not lower to M in the context of a preceding L. We have observed in the various illustrations presented above, that when the associative H docks onto the final syllable of a N1 and is preceded by a L tone, the H fails to lower to M. Some examples are repeated below for convenience.

[10] In a contour markedness hierarchy in Bafut ***Rise*** is ranked above ***Fall***.

41a. /ì-bɔ̀ʔɔ̀ (H) mʊ́ŋkhî/ → [ìbɔ̀ʔɔ́ mʊ́ŋkhî]
mushroom $Pref_1$ child 'a child's mushroom'

b. /à-bàʔâ$_7$ (H) àlòò/ → [àbàʔá̰ lòò]
door $Pref_1$ dry season 'door of dry season'

c. /ì-sɔ̃ (H) mãŋgyɛ̃/ → [ìsɔ́ mãŋgyɛ̃]
hoes $Pref_1$ of twin mother 'twin mother's hoes'

d. /à-kwɛ̀ʔɛ̃$_7$ (H) mʊ́ŋkhî/ → [à-kwɛ̀ʔɛ́ mʊ́ŋkhî]
cough $Pref_1$ child 'a child's cough'

Failure of the associative H to lower in these examples is surprising given the general H tone lowering process discussed in section 2.1 in which a L tone lowers a following H to M. If the H tone lowering rule is fairly general in Bafut, and in other Bantu languages (See van der Hulst and Snider 1992), but fails to apply only in these contexts involving the associative H, then failure to apply must be attributable to a characteristic specific to the associative tone. My hypothesis is that failure to lower is due to the grammatical status of the associative H. Along these lines, I propose a faithfulness constraint, closely related to *MORPH.REAL* which requires the identity of input grammatical tones to be preserved in output representations.

42. *Ident:Tone$_G$*
The identity of an input grammatical tone is preserved in output representations.
Ident:Tone$_G$ and *MORPH.REAL* are ranked above **(...$L_{Ri}H_{Ri}$...)* which militates against having the LH tone register sequence in output representations as illustrated below:

Tableau V: *MORPH.REAL, Ident:Tone$_G$ >> *(...$L_{Ri}H_{Ri}$...)*

[i-bɔʔɔ]$_{lex}$ [i-mfɔ]$_{lex}$ L H M	*MORPH.REAL*	*Ident:Tone$_G$*
a. ☞ (i-bɔʔɔ)$_{pwd}$ (mfɔ)$_{pwd}$ L H M		
b. (i-bɔʔɔ)$_{pwd}$ (mfɔ)$_{pwd}$ L M M		*!
c. (i-bɔʔɔ)$_{pwd}$ (mfɔ)$_{pwd}$ L H M	*!	
d. (i-bɔʔɔ)$_{pwd}$ (mfɔ)$_{pwd}$ L M	*!	

The winning candidate (a) satisfies the high ranked *MORPH.REAL* and *Ident:Tone*$_G$ incurring only a violation of the low ranked *$(...L_{Ri}H_{Ri}...)$. The runner up (b) incurs a fatal violation of *Ident:Tone*$_G$ since the associative H has lowered to M (thereby changing the identity of an input grammatical tone). Candidates (c) and (d) are ruled out by *MORPH.REAL* since the associative H is not expressed phonologically.

To summarize the discussion thus far, we have shown, in section 3, that the associative NP in Bafut contains two pwds: one comprising the lexical N1 and the other comprising an agreement/associative morpheme plus N2. In this structure, a floating associative H tone is realized on the final syllable of N1 as a consequence of four high ranked constraints. Concretely, the associative H resists deletion because it is the only reflex of a grammatical morpheme remaining (after deletion of an associative vowel/nasal) and the grammar of Bafut requires the obligatory presence of some phonological reflex of a grammatical morpheme in output representation. This phonological reflex of the grammatical morpheme (i.e. the floating associative H) has the option of remaining within its morphosyntactic word of origin where it can associate to the initial, medial or final syllable of the pwd. It, however, prefers to move out of its morphosyntactic word and associate to the final syllable of N1 in order not to affect the identity of the input tone of the initial syllable of the pwd, change the precedence order of input segments in the output representation or surface as a floating tone. To complete the picture of the patterns of floating tone association in Bafut, in the next section, we examine the realization of the L associative tone.

4.3. Why Floating L Fails to Associate to a TBU

In the introduction to this section, it was pointed out that a H floating associative tone always associates to a TBU in output but a L does not. The fact that the L remains floating is rather surprising given the undominated *MORPH.REAL* constraint in the language. In this section I intend to show that by remaining floating, the L does not violate *MORPH.REAL* and that the difference in the patterns of behavior of H and L in this situation can be accounted for by assuming two ways of giving a tonal grammatical morpheme phonological expression in output.[11] I will also address the related question why the floating associative L provokes downstep in following H tones whereas other L (linked) tones lower following H tones to M.

As observed in section 4.1, the overriding condition which regulates the realization of floating tones in the grammar of Bafut is the requirement that grammatical morphemes be given phonological expression in output. This condition was formalized in the *MORPH.REAL* constraint. Both H and L associative tones are grammatical morphemes which, according to *MORPH.REAL*, must be given phonological expression in output representation. The associative H satisfies this requirement by associating to a TBU. In so doing, it delinks the input tone of the host syllable violating a faithfulness constraint (*Max:Tone*) which favors the realization of input tones in output representation. The ideal would have been for it to remain floating since, in this way, no input tone will be delinked. However, a floating H tone, unlike a L, cannot transfer any of its properties onto an

[11] This section builds on suggestions from Larry M. Hyman, Scott Myers and John McCarthy.

adjacent tone. Therefore, if the associative H were to remain floating, it would not be given phonological expression in the output representation since its presence cannot be felt. It is therefore obliged to associate to a TBU with the attendant effects (delinking of the input tone of the host syllable). The associative L, on the other hand, can achieve phonological expression by transferring some of its properties onto adjacent tones without delinking an input tone. This transfer of properties is via downstep. In downstep, the floating L transfers its register (low) to the following H tone such that the latter remains a H tone but is realized within a lower register. This way, the associative L tone ensures that it is given phonological expression in output since its presence (i.e. its effect on the following H tone) is felt in the output representation. The associative L satisfies *MORPH.REAL* through downstep and can therefore remain floating. We conclude therefore that the associative L tone can remain floating because it has an alternative means of satisfying *MORPH.REAL*. The associative H, on the other hand, lacks this alternative means and cannot therefore remain floating.

Given this observation, how do the constraints developed so far capture the facts? I suggest that *MORPH.REAL* accounts for both patterns of realization; the H associates to a TBU in order to be expressed and the L remains floating provoking downstep as another way of achieving phonological expression. The technical reason why the H cannot achieve phonological expression by remaining floating and affecting neighboring tones as a consequence is because **FLOAT(H)* is high ranked in the grammar of Bafut. **FLOAT(L)* on the other hand is low ranked and as such the associative L can surface as a floating tone.

The interaction between *MORPH.REAL* and the markedness constraints against floating tones will account for why the associative H associates to a TBU but the L remains floating. Before we illustrate the interaction between these constraints lets us address the last issue relating to the effect of the floating L on neighboring tones.

4.3.1. The Why of Downstep

The floating L tone affects adjacent tones by provoking downstep of following H tones. The question we are interested in is why this L tone does not lower the following H to M. This question arises because, as we have noted in previous sections of the paper (see section 2 for example), L tones generally lower following H tones to M. Recall from the discussion in section 2 that Bafut disallows a LH tonal register sequence in the same pwd and so when a L tone nominal prefix is attached to a H tone root, the general tendency is to lower the following H to M in order to avoid the offending sequence. A few examples are repeated here for convenience.

43 a.	ø-líŋɔ́	bì-lìŋɔ̄	'horse(s)'
b.	ø-fɔ́rí	bì-fɔ̄rì	'rat(s)'
c.	ø-tɔ́ʔɔ́	bì-tɔ̄ʔɔ̄	'tin(s)'

In the associative NP, when the associative L precedes a H tone, the latter is downsteped but not lowered to M.

44 a. /fórɔ́$_1$ (L) mì-wúrɔ́ / ----------> [fórɔ́ ˈmìwúrɔ́]
rat Pref$_1$ oil 'rat of oil (rat that feeds on oil)'

b. /ń-tām$_9$ (L) fórɔ́ / ---------> [ntām ˈfórɔ́]
shoe Pref$_1$ rat 'rat's shoe'

One would have logically expected, following from the behavior of the L and H tones on the examples in (43), that the associative L in (44) would equally lower the following H to M. Contrary to expectations, this does not happen. The explanation for this follows from the notion of positional faithfulness developed in section 4.1. When the associative vowel/nasal deletes, the initial syllable of N2 becomes the initial syllable of the pwd. This initial syllable which bears the H tone is in a privileged position which resists processes that would otherwise apply elsewhere in the pwd. If the associative L were to lower the H tone of this syllable to M it would change the identity of a tone that is linked to the initial syllable of the pwd in violation of *Ident-Tone* σ^1. In order to avoid a violation of this high ranked constraint, the associative L rather downsteps a following H. In downstep, the identity of the H tone per se is not affected. It remains a H tone and what changes is simply its register; the downsteped H is realized within a lower register.

Having resolved the issue of why the associative L downsteps following H tones instead of lowering them to M, we can now illustrate the interaction between the constraints that regulate the realization of the associative L tone. The relevant constraints are: *MORPH.REAL*, *Ident-Tone* σ^1, **(...$L_{Ri}H_{Ri}$...)*, and **FLOAT(L)*. The interaction between these constraints is illustrated in the Tableau below.

Tableau VI: *MORPH.REAL, Ident-Tone* σ^1, **(...$L_{Ri}H_{Ri}$...) >> *Float (L)*

/[m-bu]$_{Lex}$[m-ø-fori]$_{Lex}$ / L M L H	MORPH.REAL	Ident-Tone σ^1	*(...$L_{Ri}H_{Ri}$...)	*Float (L)
a. ☞ (m-bu)$_{pwd}$ (fori)$_{pwd}$ L M L !H				
b. (m-bu)$_{pwd}$ (fori)$_{pwd}$ L M L M		*!		
c. (m-bu)$_{pwd}$ (fori)$_{pwd}$ L M L H		*!	*	
d. (m-bu)$_{pwd}$ (fori)$_{pwd}$ L M H	*!			

The winning candidate (a) satisfies the high ranked constraints *MORPH.REAL*, *Ident-Tone* σ^1 and **(...$L_{Ri}H_{Ri}$...)$_{pwd}$* incurring only a violation of the low ranked **Float (L)*. In

this candidate, the associative L remains floating and provokes downstep in the following H tone. This way, it satisfies *MORPH.REAL* since the grammatical morpheme is given phonological expression. It also satisfies *Ident-Tone* σ^1 since the identity of the H on the initial syllable of the pwd is not affected. At the same time $*(...L_{Ri}H_{Ri}...)_{pwd}$ is satisfied since the register of the H tone is changed. Candidate (b) violates the high ranked *Ident-Tone* σ^1 since the H on the initial syllable of the pwd has been lowered to M (thereby changing the identity of the input H). Candidate (c) is ruled out by both *Ident-Tone* σ^1 and $*(...L_{Ri}H_{Ri}...)_{pwd}$ since the associative L attaches directly to the following H changing the identity of the tone of the initial syllable of a pwd and producing a LH tonal register sequence. Candidate (d) incurs a fatal violation of *MORPH.REAL*. In this candidate, the associative L is deleted and as such the associative NP surfaces without the phonological reflex of the grammatical morpheme.

5. Conclusion

This paper set out to analyze the patterns of floating tone association in the associative NP in Bafut with a view to establishing the conditions that regulate the surface realization of floating associative tones. Concretely, the paper addressed the following issues:

a. Why associative tones do not delete along with the segmental content of an agreement/associative morpheme;
b. What determines the TBU to which a floating associative H attaches;
c. Why an associative H tone systematically delinks input tones of the host TBU to which it associates;
d. Why an associative L surfaces as a floating tone and why it causes following H tones to downstep instead of lowering them to M as L tones do elsewhere in the language.

The analysis revealed that the overriding condition which regulates the surface realization of both H and L associative tones is a requirement in the grammar of Bafut for the phonological reflex of a grammatical morpheme to be present in output representations. Because the H and L associative tones constitute the only phonological reflex of a grammatical morpheme left after a segmental deletion process, they must surface in one form or the other in the output representation in order to satisfy this requirement. The associative L therefore surfaces as a floating tone showing up via secondary effects (downstep) on adjacent tones. This is technically possible because a constraint militating against L floating tones in the language is low ranked. The associative H tone, on the other hand, obligatorily associates to a TBU because it cannot show up via secondary effects on adjacent tones and a similar constraint disfavoring H floating tones is high ranked. Both associative tones cannot associate to the initial syllable of their morphosyntactic words of origin because of positional faithfulness conditions. Specific in the case of Bafut is a condition which requires the identity of a tone that is linked to the initial syllable of a pwd to be preserved. Because of this condition and because of the need to preserve the input precedence order of segments in the output, the associative H is obliged to move out of its pwd and associate to the final syllable of N1 delinking the input tone of this syllable in order to satisfy a constraint against rising contour tones.

In all, the analysis demonstrates that some tonal processes in the grammar of Bafut are sensitive to prosodic domains. This boosts arguments already advanced in the literature which favor considering prosodic domains in the analyses of tonal phenomena in Bantu languages. Hyman (1985) and Myers and Troi (1996) have demonstrated the promise that this approach holds in the analysis of Kom, Bamilike Dschang and Chichewa. The analysis in this paper, which combines positional faithfulness conditions and prosodic domains, is yet another step towards seeking solutions to some of the complex tonal phenomena in Bantu tonology.

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