Transparent Low Tone in Tuki
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1. Introduction

Since the earliest work in autosegmental tonology, it has been assumed that tonal association lines may not cross. As one consequence of this prohibition, a rule would be impossible such as (1a), where a H tone spreads rightwards across a L tone and onto the following non-adjacent tone-bearing unit (henceforth, mora):

(1) a. * μ μ μ
H L

b. * μ μ μ
[+H] [-H]

However, (1) is ruled out by the line-crossing constraint only if H and L represent two values of the same feature on the same tier (say [±H]), as in (1b). The problem is that most researchers on tone do not assume that H and L tones are distinguished by the two values of a single binary feature as in (1b). Instead, two different tone features are generally assumed. Following Pulleyblank's (1986) use of features originally proposed by Yip (1980), the same process can be expressed as in (2).

(2) [-raised]
μ μ μ
[+upper]

As now generally assumed for almost all features, [upper] and [raised] are on separate tiers, as shown.[1] As a result, H (=[+upper]) can spread to the third mora in (2) without creating a violation of the line-crossing constraint.

Assuming still that the process in (2) is an impossible one, it is necessary to look elsewhere for an explanation. The typical response has been to develop adjacency constraints such that certain elements cannot be skipped over (i.e. they cannot be "transparent") to the relevant processes (see especially Archangeli and Pulleyblank 1986). Logically, there are two possibilities in this case: (a) structural: a tone may not skip over a mora, i.e. the trigger and target moras must be adjacent; or (b) featural: a H may not skip over a L—even though no line-crossing results in the formulation in (2). The structural account is inadequate, at best. There are numerous Bantu languages in which a tone is drawn to a designated mora (generally identified as carrying an accent). This may result in a H spreading to the penult over several intervening moras. Thus, if moraic adjacency is ruling out (2), it must be because there is no "accent" on the third mora to attract the H. On the other hand, it would be sufficient to derive (2) if one were to stipulate that any mora following a H-L sequence is accented—followed by a rule spreading a H to the accented mora. Could such a rule "go through" a L tone mora?

If not, then there must be some other reason why a L can block a H from spreading—if in fact this is the case. The problem is that relevant examples of this sort appear to be quite limited.[2] In this paper we shall argue that the L tone feature CANNOT by itself block spreading of H tone to the right. The example we shall

discuss comes from the Kombe dialect of Tuki, a Bantu language spoken in Cameroon (and classified as A.64 by Guthrie 1967-1971).[3] We shall show that in a very specific environment in Tuki, a H may spread to the right even though it crosses the L tone of the first person singular nasal prefix N-. The paper is organized as follows. In §2 we present the basic tone system of Tuki, particularly as manifested in verbs. In §3 we present the problem of the first person singular prefix N-. In §4 we provide a fuller presentation of the morphophonemics surrounding N-, and in §5 we discuss alternative solutions to the non-transparency of L tone. We conclude in §6 by discussing the relevance of these findings to autosegmental theory as well as to the study of Bantu tone.

2. Tuki tonology

In this section we present the basic properties of tone in the Kombe dialect of Tuki. [4] Most of our discussion centers around the verbal tonology, which in many respects resembles that of the Tiv system, as described by Pulleyblank (1985).

On the surface, Tuki has H, L and (downstepped) !H tone. While HL falling tones do occur, LH rising tones are much rarer and appear never to occur on a single mora. As we shall discuss below, only vowels (henceforth "moras") can carry tone in Tuki. Since there is a vowel length contrast in Tuki, CVV syllables count as two moras, while CV syllables count as one. There are no consonant clusters in Tuki other than the NC sequence we will be treating below.

We begin by establishing that there are two tonal classes of infinitives in Tuki:

(3) a.	ò-mwà	'to shave'	b.	ò-nyá	'to eat'
	ò-byà	'to bring'		ò-fá	'to give'
	ò-dìngà	'to love'		ò-túmâ	'to send'
	ò-gùrà	'to crush'		ò-dángâ	'to lose'
	ò-ryàmànà	'to dream'		ò-bángénà	'to break'
	ò-fùnùnà	'to wake up (tr.)'		ò-báráfyà	'to forget'

The forms in (3) begin with an infinitive prefix o- and contain one, two or three stem syllables. They all end in an inflectional final vowel morpheme -a which we shall not separate from the base by a hyphen. All tones are L in (3a). By contrast, there are up to two H tones in the forms in (3b). To account for this opposition, we recognize an underlying L vs. H opposition on verb roots, as in (4).[5]

(4) a.	-mw-	-by-	-ding-	-gur-	-ryaman-	-funun-
	L	L	L	L	L	L
b.	-ny-	-f-	-tum-	-dang-	-bangen-	-barafy-
	H	H	H	H	H	H

In the case of the L tone roots in (4a), the L links to the first vowel of the verb stem. Both the infinitive prefix o- and any subsequent stem vowels receive L by default. In the case of the H tone roots in (4b), the stem tones are derived as in (5).

(5) a.	-nya	-tuma	-bangena	
	H	H	H	UNDERLYING
b.	-nya	-tuma	-bangena	
	|	|	|	
	H	H	H	TONE LINKING

c. -tuma -bangena

H H H TONE SPREADING

d. -bangena

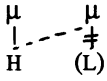
H L DEFAULT L TONE

e. -tuma

H L BOUNDARY L% TONE

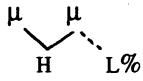
As seen in (5a), these verb stems begin with an unlinked H tone attributable to their verb root. The unlinked H links to the first vowel of each verb stem in (5b), followed by the application in (5c) of the H tone spreading (HTS) rule in (6).

(6)



A H spreads onto a following mora.[6] In (5d) default L tone is assigned in the one case where a mora remains toneless. Finally, in (5e), a L boundary tone (L%) links to a prepausal mora whose H tone is also linked to the penultimate mora, as in (7).[7]

(7)



In all other cases the prepausal L% is assumed to be present, but unable to link.

In Tuki, different verb forms may have either no tone other than on their root, as in the infinitive, or they may in addition have a H suffixal tone. A tense which falls into the latter category is the distant past (P3), exemplified in (8).

(8) a.	à-mà-mwă	'he shaved'	b.	à-mà-nyá	'he ate'
	à-mà-byă	'he brought'		à-mà-fá	'he gave'
	à-mà-dìngá	'he loved'		à-mà-túmá	'he sent'
	à-mà-gùrá	'he crushed'		à-mà-dángá	'he lost'
	à-mà-ryàmánâ	'he dreamed'		à-mà-bángénâ	'he broke'
	à-mà-fùnúnâ	'he woke up (tr.)'		à-mà-báráfyâ	'he forgot'

In (8a) we see that the L tone verb stems acquire a H on their second mora (M2). In the case of monosyllabic verb stems, the assignment of an M2 H tone creates a rising tone. If the underlying stems are /mu-a/ and /bi-a/, the M2 assignment simply precedes vowel coalescence. If, on the other hand, vowel coalescence applies first (with shortening), the M2 H is assigned to the one L tone mora that remains. The remaining forms in (8a) straightforwardly receive an M2 H tone which by HTS will spread to the following mora, if there is one. In the forms in (8b), there is already a H on the first mora of the verb root. A second H is assigned to the M2, which HTS will spread to the following mora, if there is one. Again, the monosyllabic forms are unclear: either the suffixal H has been assigned to the M2 prior to vowel coalescence; or, if vowel coalescence applies first (along with vowel shortening), the suffixal H is simply assigned to the one mora that remains. Sample derivations are given in (9).

(9)

	dinga	ryamana	tuma	bangena	
a.	L	L	H	H	UNDERLYING
b.	L	L	H	H	TONE LINKING
c.	L H	L H	H H	H H	H ASSIGNMENT
d	L H	L H	H H	H H	M2 TONE LINKING
e.		L H		H H	HTS
f.		L H L		H H L	L% TONE

We have thus far established the rule of HTS which applies pervasively in Tuki. One additional feature of the Tuki tone system which frequently interacts with HTS is the downstepping of H tones. To illustrate downstep, we turn to the present tense, exemplified with the L tone subject prefix à- '3rd person sg. human' in (10).

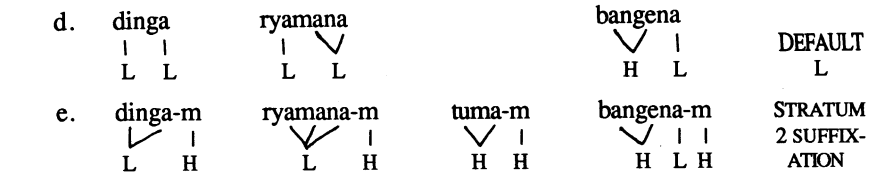
(10)

a.			b.		
	à-mwà-ḿ	's/he shaves'		à-nyá-ḿ	's/he eats'
	à-byà-ḿ	's/he brings'		à-fá-ḿ	's/he gives'
	à-dìngà-ḿ	's/he loves'		à-túmá-ḿ	's/he sends'
	à-gùrà-ḿ	's/he crushes'		à-dángá-ḿ	's/he loses'
	à-ryàmànà-ḿ	's/he dreams'		à-bángénà-ḿ	's/he breaks'
	à-fùnùnà-ḿ	's/he wakes up (tr.)'		à-báráfyà-ḿ	's/he forgets'

This tense is marked by a suffix -ḿ, which is the only case of a tone prelinked to a consonant in the language. In (10a) all of the verb tones are L except for the H tone of -ḿ. In (10b), the H of the verb root spreads to the right as we have already seen in the infinitive and past tense forms in (3) and (8), respectively. This is followed by the assignment of default L tone.[8] Sample derivations are given in (11).

(11)

	dinga	ryamana	tuma	bangena	
a.	L	L	H	H	UNDER-LYING
b.	L	L	H	H	TONE LINKING
c.			H	H	HTS



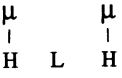
As seen, default L is assigned to all forms except for bimoraic -tuma-, where HTS has filled the only underspecified mora.

Now consider the corresponding present tense forms with the H tone subject prefix vá- 'they':

(12) a.	vá-mwá-!m	'they shave'	b.	vá-nyá-m	'they eat'
	vá-byá-!m	'they bring'		vá-fá-m	'they give'
	vá-díngà-m	'they love'		vá-túmá-m	'they send'
	vá-gúrà-m	'they crush'		vá-dángá-m	'they lose'
	vá-ryámànà-m	'they dream'		vá-bángénà-m	'they break'
	vá-fúnùnà-m	'they wake up (tr.)'		vá-báráfyà-m	'they forget'

The H verb stems in (12b) have exactly the same tone as those seen in (11b). In (12a), however, the H of the subject prefix vá- spreads onto the initial L mora of the L tone verb stems. In all forms the L is delinked. It thus should be clear that HTS can apply in one of the two ways indicated in (6): (i) within the stem, the H spreads onto a following toneless mora; (ii) outside the stem, the H spreads onto a following L mora, delinking that L. When the delinked L is immediately followed by a L, it has no effect. Where, however, the delinked L is immediately followed by a H, deriving the configuration in (13), the result is a H-!H sequence, i.e. a H followed by a downstepped H, as attested in many African languages.

(13)

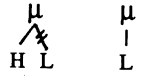


Before moving on to discuss the problem of L tone transparency in Tuki, it is worth defending our view that the HTS is accompanied by the delinking of L. The alternative, that a HL contour automatically decontours when followed by another tone is falsified by data such as those from the near future (F1) tense in (14).

(14) a.	à-nú-mwà-m	'he will shave'	b.	à-nû-nyá-m	'he will eat'
	à-nú-bya-m	'he will bring'		à-nû-fá-m	'he will give'
	à-nú-dìngà-m	'he will love'		à-nû-túmá-m	'he will send'
	à-nú-gùrà-m	'he will crush'		à-nû-dángá-m	'he will lose'
	à-nú-ryàmànà-m	'he will dream'		à-nû-bángénà-m	'he will break'
	à-nú-fùnùnà-m	'he will wake up'		à-nû-báráfyà-m	'he will forget'

This tense is marked by the prefix -nû-, which is underlyingly linked to a HL sequence. As seen in (14a), the L is "absorbed" into the following L by the contour simplification process in (15).

(15)



On the other hand, contour simplification does not take place in (14b), where -nû- is followed by a H tone. We thus assume that contour simplification is not automatic in Tuki, but rather should be built into the HTS rule, as we have done.

This completes the presentation of the basic properties of the Tuki tone system. We are now ready to examine the central problem of this study.

3. The Problem

In this section we present some totally unexpected facts concerning the tonology of the first person singular object prefix N-. To begin, all six object prefixes are illustrated in the infinitive forms in (16).[9]

(16) a.			b.	
	ò-n-dìngà	'to love me'	ò-n-dángâ	'to lose me'
	ò-ò-dìngà	'to love you sg.'	ò-ò-dángâ	'to lose you sg.'
	ò-mù-dìngà	'to love him'	ò-mù-dángâ	'to lose him/her'
	ò-sú-díngà	'to love us'	ò-sú-dángâ	'to lose us'
	ò-nú-díngà	'to love you pl.'	ò-nú-dángâ	'to lose you pl.'
	ò-wú-díngà	'to love them'	ò-wú-dángâ	'to lose them'

From the above examples it would appear that the singular object prefixes have a L tone, while the plural object prefixes have a H, which spreads onto the following L verb root in (16a). The homorganic nasal prefix N- 'me' is non-syllabic, although, as we shall see, clearly associated with the same L tone as -ò- 'you (sg.)' and -mù- 'him/her'. But first, as seen in the present tense forms in (17) and (18), more is needed than a H on the plural object prefixes:

(17) a.		b.	
à-n-dìngà-ḿ	'he loves me'	à-n-dángá-ḿ	'he loses me'
ò-ò-dìngà-ḿ	'he loves you sg.'	ò-ò-dángá-ḿ	'he loses you sg.
à-mù-dìngà-ḿ	'he loves him'	à-mù-dángá-ḿ	'he loses him'
à-sú-díngà-ḿ	'he loves us'	à-sú-dángá-ḿ	'he loses us'
à-nú-díngà-ḿ	'he loves you pl.'	à-nú-dángá-ḿ	'he loses you pl.'
à-wú-díngà-ḿ	'he loves them'	à-wú-dángá-ḿ	'he loses them'

(18) a.		b.	
vá-n!-díngà-ḿ	'they love me'	vá-n!-dángá-ḿ	'they lose me'
vó-ò-dìngà-ḿ	'they love you sg.'	vó-ò-dángá-ḿ	'they lose you sg.'
vá-mú-dìngà-ḿ	'they love him'	vá-mú-!dángá-ḿ	'they lose him'
vá-!sú-díngà-ḿ	'they love us'	vá-!sú-dángá-ḿ	'they lose us'
vá-!nú-díngà-ḿ	'they love you pl.'	vá-!nú-dángá-ḿ	'they lose you pl.'
vá-!wú-díngà-ḿ	'they love them'	vá-!wú-dángá-ḿ	'they lose them'

There are no surprises in (17), although we note there that the sequence /à-ò-/ 'he + you sg.' is realized [ò-ò-]. In (18), however, a number of issues arise. To take the easiest one first, the H of the subject prefix vá- 'they' has clearly spread onto the object prefix -mù- 'him'. As expected, when followed by a L tone root in (18a), the

delinked L has no effect. When followed by a H tone verb root in (18b), the delinked L produces a downstep.

Totally unexpected in (18) is the downstep that occurs between the subject prefix vá- and all three H tone plural object prefixes. There must therefore be an unlinked L tone between vá- and -sú-, -nú- and -wú-. But where does it come from? Since we have seen that the H of vá- can spread onto the L of -mù-, we conclude that vá- is underlyingly H. If it were underlyingly HL, we would expect the L to block HTS and thus to obtain forms such as *vá-mù-dìngà-ḿ and *vá-mù-dángá-ḿ. The unlinked L must therefore be a property of the H tone object prefixes. We therefore propose the following underlying representations in (19).

(19) a. -N- -o- -mu- b. -su- -nu- -wu-
L L L L H L H L H

The L that precedes each of the object prefixes in (19b) is thus responsible for the downstep that is regularly observed in the verbal paradigm whenever they are preceded by a H tone morpheme (whether a subject prefix or a prefix marking tense, aspect or polarity.

The first of two remaining complications from (18) concerns the second person singular object prefix -ò-. As seen, the H of vá- does not spread onto it, i.e. we do not obtain forms such as *vó-ó-dìngà-ḿ or *vó-ó-!dángá-ḿ. We offer two possible explanations. First, assuming that the sequence vó-ò- constitutes a single syllable at the relevant stage of the derivation, we could require that the HTS rule in (6) must involve two separate syllables. On the other hand, it should be noted that in most cases where two vowels come together in Tuki, the first DELETES, leaving a short vowel, e.g. /vá-ùba-ḿ/ → [vúbàḿ] 'they fail'. This raises the possibility that the second person singular object prefix is underlyingly -òò-, i.e. with a long L tone vowel. In this case it would be possible for HTS to apply, deriving vá-óò-, which then could coalesce as [vóò-].

This leaves one remaining problem in (18): the first person singular object prefix -N-. As seen in (19a), we consider that it has the same underlying L tone as the other two singular object prefixes. This L is straightforwardly responsible for the downstep in (20b).

(20) a. va-N-dinga-m → vá-n!-díngà-ḿ 'they love me'
H L L H H L H L H

b. va-N-danga-m → vá-n!-dángá-ḿ 'they lose me'
H L H H H L H H

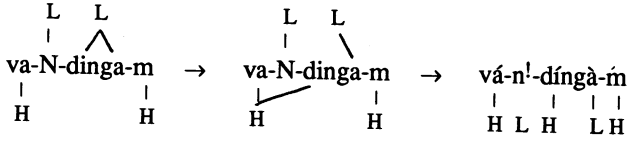
As we saw in several of the above derivations, the H of the verb stem -dánga spreads to the second mora by the HTS rule in (6). The unlinked L of -N- is then directly responsible for the downstep on the verb stem. The L either could have started as linked—or, just as likely, it could have failed to link because the nasal is non-syllabic, i.e. not a TBU. This doesn't explain the downstep in (20a), however. If we assume that the -N- prefix provides an unlinked L tone as in (20b), then one of two outcomes would have been expected: (i) In the vast majority of African tone languages a rightward HTS rule would have been BLOCKED by the unlinked L tone. This would have produced the output *vá-n-dìngà-ḿ. (ii) Assuming the much more

rare situation where an unlinked L does not block HTS (as found, for example, in Dagbani (Hyman, in press)), the output should have been *vá-n-díngà-ḿ, i.e. WITHOUT a downstep.[10] In other words, the observed tones of vá-n-ꜜdíngà-ḿ pose two problems which require an explanation:

(21) a. How do we get a H to spread across the L tone nasal prefix?
b. How do we get the L to cause downstep?

What is singularly odd about the output in (20a) is that HTS appears to have applied across a L tone which subsequently conditions downstep on the following mora to which the H tone has spread! This is somewhat obscured in the auto-segmentalized representation, since we have provided a separate H tone both before and after the unlinked L. As should be clear from the preceding discussion, there is but one H tone: that of the subject prefix vá-. In order to visualize the derivation, we present a multitiered representation with H's and L's on separate planes in (22).

(22)



We start in (22) by making the assumption that the L of the object prefix is underlyingly linked to -N-. As shown, HTS applies, spreading the H of the subject prefix vá- onto the initial L mora of the verb stem -dìnga, which delinks. To derive the output, we "conflate" the tiers à la McCarthy (1986), and assign a default L to the second mora of the verb stem. As a result of this "tier conflation", the L that failed to block HTS, now causes fission of the doubly linked H tone feature, as McCarthy (1986) independently argued, based on segmental processes in various Afro-Asiatic languages. As a final step, the L delinks from the nasal which, recall, is non-syllabic (and not a TBU). In fact, we shall ultimately argue that it is its non-TBU status that allows the L to be transparent to the HTS rule in (6).

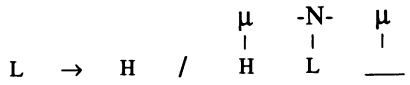
It is clear that a multitiered representation can allow HTS to apply across a L tone. By placing the H's and L's on separate tiers, there is no violation of the line-crossing constraint. The question we would like now to raise is what sanctions the tier segregation of H and L tones that makes this derivation possible? In the introduction we pointed out that many tonologists consider H and L to be two separate features, e.g. [+upper] and [-raised]. If correct, this could in itself provide the basis for H/L tonal segregation. Or, given the "morphemic tier hypothesis", it could be that the tones are segregated because they belong to different morphemes, in which case each of the tones in (22) is on a separate tier. In either case we seek an analysis that would not open the floodgates for rampant non-local tone rules, i.e. processes whereby one tone can skip over one or more other tones with impunity.

We know of only two cases where tonal "planes" have been invoked to capture non-local tonal processes. The first is Pulleyblank's (1988) analysis of Tiv, in which a prefixal L skips over a stem H to link to a subsequent mora of a verb stem. The second is Bickmore and Broadwell's (1992) account of Sierra Juarez Zapotec, in which tones skip over other tones to link to underspecified positions to their left. Since tonal infixing and other forms of internal modification are virtually unheard of in tone systems, we would hope that these cases will not hold up.[11] In the Tiv case, for instance, the price for rejecting Pulleyblank's analysis would be a stipulated rule

of downstep (or unlinked L) deletion, which is sensitive to the number of syllables. (We have not attempted to reanalyze Bickmore and Broadwell's case.) Let us then consider—but reject—two alternative accounts of (22).

The first alternative would be to deny that HTS occurs across a L tone nasal. Instead, as seen in (23), a special rule could convert L to H when preceded by a L tone nasal that in turn is preceded by a H:

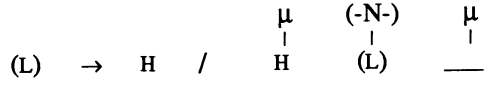
(23)



This analysis would avoid both of the two problems: (i) the H gets to the other side of the L tone nasal prefix by direct assignment; and (ii) the L causes downstep only of the H tone mora that follows it. Besides the ad hoc nature of this rule, it poses a technical problem: In this language where H tone spreads to the right, why doesn't the H that results from this rule spread? Ordering (23) after HTS at best does not follow from any principle. At worst, it fails to capture the complementarity (or 'elsewhere' relation) between the specific rule (23) and the general HTS rule (6). The consequences are thus quite undesirable.

The second alternative, based on a suggestion made to us by Charles Kisseberth, reanalyzes all applications of HTS as the COPYING of a H feature onto a following toneless or L tone mora. As seen in (24), this copying rule would apply whether a L tone nasal intervenes or not:

(24)



In (24) the parenthesized (L) in the input indicates that the mora that receives the copied H tone may or may not already have a L tone of its own. The first problem in (21), the transparency of the 1ps prefix -N-, is directly incorporated into the formulation of the rule: if present, it is skipped over. The second problem in (21) is also directly handled, since the L can cause downstep only on the copied H tone that follows it. In (24) there is only the question as to why the L tone nasal is transparent to the normal H assimilation rule, which has been stated as one of feature copying. The major theoretical disadvantage is that the "assimilation as spreading" generalization is violated: It has long been seen as an advantage of the autosegmental approach that assimilation "extends" the domain of a feature by spreading—and crucially, that spreading is automatically subject to certain constraints, especially the prohibition against line-crossing. As we have just seen, copying is not subject to such an constraint. In the copying approach it is not clear which other "interveners" may occur between trigger and target. Could the parenthetical nasal in (24) instead have been itself a mora (i.e. a L tone vowel)? As in Archangeli and Pulleyblank (1986), it may be necessary to refer directly to constraints on adjacency, i.e. the inability of a tone rule to skip over an arbitrarily specified number of TBU's. If line-crossing does not play a role here, what then is the empirical consequence of insisting that assimilation be expressed as spreading?

In §5 we address a third alternative, namely that the L of the 1ps nasal prefix is not present in underlying representations at all. But first we consider in §4 the segmental phonology of the N- prefix.

4. Segmental Properties of the 1ps Nasal Prefix

In this section we first establish that the few forms cited thus far with a 1ps nasal prefix are not isolated, but rather characterize the entire verbal paradigm in Tuki. We then consider the segmental alternations conditioned by the nasal prefix.

In order to establish the generality of the special L tone properties of the 1ps nasal summarized in (21), we cite verb forms in the major affirmative and negative tenses involving this prefix followed by the L tone verb -dìnga 'love':

(25)	a.	à-n-dìngà-ḿ	'he loves me'	Pr [present]
		à-mú-n-ǃdíngà	'he loved me'	P1 [recent past]
		à-má-n-ǃdíngá	'he loved me'	P2 [general past]
		à-mà-n-dìngá	'he loved me'	P3 [remote past]
		à-nû-n-dìngà-ḿ	'he will love me'	F1 [near future]
		à-mú-n-ǃdíngà-ḿ	'he will love me'	F2 [general future]
	b.	à-tà-n-dìngá	'he doesn't love me'	Pr
		à-tòó-n-ǃdíngà	'he didn't love me'	P1
		à-tàá-n-ǃdíngá	'he didn't love me'	P2
		à-tà-má-n-ǃdíngà	'he didn't love me'	P3
		à-tà-nû-n-dìngà	'he won't love me'	F1
		à-tà-mû-n-dìngà	'he won't love me'	F2

In all of the tenses where the morpheme that precedes the 1ps nasal prefix ends in a H tone, HTS applies—and in all of these tenses a downstep is conditioned by the nasal's L tone. This includes the affirmative P1, P2 and F2, as well as the negative P1, P2, and P3. In addition, when the affirmative Pr has a H subject prefix, the same downstep is also observed: vá-n-ǃdíngà-ḿ 'they love me'.[12] Finally, note the HL contour on the tense marker in the affirmative and negative F1, as well as in the negative F2. If -nû- and -mû- were directly followed by a L tone mora, the contour simplification in (15) would have applied, incorrectly deriving *à-nú-n-dìngà-ḿ, *à-tà-nú-n-dìngà, and *à-tà-mú-n-dìngà. We attribute the non-application of (15) to the L tone of the nasal prefix which, in this case, breaks the adjacency between the HL contour and the following L tone mora.

The L tone effect of the 1ps nasal is thus widely attested in the verbal paradigm. It remains for us to see how it is realized when the following verb begins with different initials. The full set of initial consonants and vowels that we have attested from a corpus of 125 common verbs is given in (26).

(26)	a.	p	[3]	t	[15]	ts	[4]	č	[2]	k	[3]	kp	[1]
		b	[22]	d	[2]	dz	[4]			g	[3]	gb	[1]
		f	[13]	s	[6]								
		v	[1]	r	[7]			y	[2]			w	[6]
		m	[5]	n	[6]								
				nd	[1]							ŋgb	[1]
	b.	i	[2]	u	[5]	e	[2]	o	[4]	a	[3]		

As seen, we have also indicated how many examples are found of each initial consonant or vowel in our corpus.

Let us consider how the 1ps nasal prefix is realized before each row of consonants in (26a), then before the vowels in (26b). Since all of the examples cited thus far with a 1ps nasal prefix involve the verbs dìnga 'love' or dánga 'lose', we begin by citing voiced stop initials in (27).

(27)	a.	vá-byónò-ḿ	vá-m!-byónò-ḿ	'they follow (me)'
		vá-díngà-ḿ	vá-n!-díngà-ḿ	'they love (me)'
		vá-dzódzènà-ḿ	vá-n!-dzódzènà-ḿ	'they play for (me)'
		vá-gúrà-ḿ	vá-ŋ!-gúrà-ḿ	'they crush (me)'
	b.	vá-byáráfyà-ḿ	vá-m!-byáráfyà-ḿ	'they forget (me)'
		vá-dángá-ḿ	vá-n!-dángá-ḿ	'they lose (me)'
		vá-dzúnà-ḿ	vá-n!-dzúnà-ḿ	'they subtract (me)'
		vá-gírá-ḿ	vá-ŋ!-gírá-ḿ	'they wait for (me)'
		í-gbóménà-ḿ	í-ŋ!-gbóménà-ḿ	'they bark at (me)'

As we saw above, the H tone of the subject prefix vá 'they' (or í- for class 10, e.g. animals) spreads onto the L of the verb stem in (27a)). As also seen, HTS is not blocked by the 1ps nasal prefix which, in turn, conditions downstep. In (27b) the verb stem is already H. The L of the 1ps prefix again conditions downstep, this time between the H of the subject prefix and the H of the verb.

Going down to the next row in (26), we see that the nasal of the 1ps object prefix does not surface when the verb begins with a voiceless fricative:

(28)	a.	vá-fúnùnà-ḿ	vá-!-púnùnà-ḿ	'they wake (me) up'
		vá-fórènà-ḿ	vá-!-pórènà-ḿ	'they untie (me)'
		vá-séyà-ḿ	vá-!-tséyà-ḿ	'they abuse (me)'
		vá-súwà-ḿ	vá-!-tsúwà-ḿ	'they wash (me)'
	b.	vá-fá-ḿ	vá-!-pá-ḿ	'they give (me)'
		vá-fwá-ḿ	vá-!-pwá-ḿ	'they extinguish (me)'
		vá-súmbá-ḿ	vá-!-tsúmbá-ḿ	'they cut (me)'
		vá-síyá-ḿ	vá-!-tsíyá-ḿ	'they rub (me)'

Instead, the corresponding non-continuant is found: /f/ becomes [p], while /s/ becomes [ts]. Although not present on the surface, the nasal prefix continues to condition downstep in all cases.

Continuing to the next row of (26), voiced continuants are also subject to "hardening" when preceded by the 1ps nasal prefix. As seen in (29), /r/ and /y/ harden to [d] and [j], respectively, although the nasal does not drop out:[13]

(29)	a.	vá-rátènà-ḿ	vá-n!-dátènà-ḿ	'they sew for (me)'
		vá-rámà-ḿ	vá-n!-dámà-ḿ	'they pull (me)'

b.	vá-ráméyà-ḿ	vá-n!-dáméyà-ḿ	'they lick (me)'
	vá-rábénà-ḿ	vá-n!-dábénà-ḿ	'they insist (on me)'
	vá-yáánà-ḿ	vá-n!-jáánà-ḿ	'they pay (me)'
	vá-yéérè-ḿ	vá-n!-jéérè-ḿ	'they teach (me)'

When the initial continuant is /v/ or /w/, however, it mutates to [k] (in one case [kw]), and the nasal drops out:[14]

(30) a.	vá-vángénà-ḿ	vá-!-kángénà-ḿ	'they fry for (me)'
b.	vá-wúbá-ḿ	vá-!-kúbá-ḿ	'they hit (me)'
	vá-wútá-ḿ	vá-!-kútá-ḿ	'they tie (me) up'
	vá-wóró-ḿ	vá-!-kóró-ḿ	'they take (me)'
	vá-wáá-ḿ	vá-!-kwáá-ḿ	'they put (me)'

The loss of the nasal in this case is clearly due to the voicelessness of the [k]. As seen now in (31), the 1ps nasal prefix regularly drops out when the verb stem begins with a voiceless stop:

(31) a.	vá-púmìyà-ḿ	vá-!-púmìyà-ḿ	'they whiten (me)'
	vá-tírìnà-ḿ	vá-!-tírìnà-ḿ	'they write to (me)'
	vá-tsórà-ḿ	vá-!-tsórà-ḿ	'they pull (me)'
	vá-kósènà-ḿ	vá-!-kósènà-ḿ	'they buy for (me)'
b.	vá-pímbínà-ḿ	vá-!-pímbínà-ḿ	'they sweep for (me)'
	vá-tóménà-ḿ	vá-!-tóménà-ḿ	'they send to (me)'
	vá-tsómá-ḿ	vá-!-tsómá-ḿ	'they stick (me)'
	vá-céndé-ḿ	vá-!-céndé-ḿ	'they alter (me)'
	vá-kásínì-ḿ	vá-!-kásínì-ḿ	'they begin for (me)'
	vá-kpétá-ḿ	vá-!-kpétá-ḿ	'they shoot at (me)'

In (30), we have thus only to get /v/ or /w/ to harden to [k], and the nasal will drop out by a general rule.

Finally, the data in (32) show that the nasal also drops out when the verb begins with a nasal—either simple, or itself a NC sequence:

(32) a.	vá-mwá!-ḿ	vá-!-mwá!-ḿ	'they shave (me)'
	vá-ndéndènà-ḿ	vá-!-ndéndènà-ḿ	'they walk for (me)'
	vá-ŋgbáàtì-ḿ	vá-!-ŋgbáàtì-ḿ	'they disdain (me)'
b.	vá-númá-ḿ	vá-!-númá-ḿ	'they bite (me)'
	vá-nyéná-ḿ	vá-!-nyéná-ḿ	'they eat for (me)'

The data in (27) through (32) reflect the fact that the only NC "clusters" permitted on the surface in Tuki are [mb], [nd], [ndz], [nǰ], [ŋg] and [ŋgb], i.e. a preconsonantal nasal is found when the following consonant is an oral voiced non-continuant. We place the term "clusters" in quotation marks, since it would be

entirely possible to view these are prenasalized consonants. All preconsonantal nasals are non-syllabic in Tuki. The 1ps nasal prefix consists at least of a separate [+nasal] feature, if not a full consonant. Whether the nasality surfaces or not, the data in (27)-(32) reveal a L tone that causes downstep whenever the 1ps prefix is preceded by a H tone. In cases where it is preceded by a L tone, e.g. the subject prefix à- 'he' or ì- 'it' (class 9), there is no tonal effect:

(33) a.	à-byònò-ḿ	à-m-byònò-ḿ	'he follows (me)'
	à-dìngà-ḿ	à-n-dìngà-ḿ	'he loves (me)'
	à-dzòdzènà-ḿ	à-n-dzòdzènà-ḿ	'he plays for (me)'
	à-gùrà-ḿ	à-ŋ-gùrà-ḿ	'he crushes (me)'
b.	à-byáráfyà-ḿ	à-m-byáráfyà-ḿ	'he forgets (me)'
	à-dángá-ḿ	à-n-dángá-ḿ	'he loses (me)'
	à-dzúnà-ḿ	à-n-dzúnà-ḿ	'he subtracts (me)'
	à-gírá-ḿ	à-ŋ-gírá-ḿ	'he waits for (me)'
	ì-gbóménà-ḿ	ì-ŋ-gbóménà-ḿ	'it barks at (me)'
(34) a.	à-fùnùnà-ḿ	à--pùnùnà-ḿ	'he wakes (me) up'
	à-fòrènà-ḿ	à--pòrènà-ḿ	'he unties (me)'
	à-sèyà-ḿ	à--tsèyà-ḿ	'he abuses (me)'
	à-sùwà-ḿ	à--tsùwà-ḿ	'he washes (me)'
b.	à-fá-ḿ	à--pá-ḿ	'he gives (me)'
	à-fwá-ḿ	à--pwá-ḿ	'he extinguishes (me)'
	à-súmbá-ḿ	à--tsúmbá-ḿ	'he cuts (me)'
	à-síyá-ḿ	à--tsíyá-ḿ	'he rubs (me)'
(35) a.	à-ràtènà-ḿ	à-n-dàtènà-ḿ	'he sews for (me)'
	à-ràmà-ḿ	à-n-dàmà-ḿ	'he pulls (me)'
b.	à-ráméyà-ḿ	à-n-dáméyà-ḿ	'he licks (me)'
	à-rábénà-ḿ	à-n-dábénà-ḿ	'he insists (on me)'
	à-yáánà-ḿ	à-n-jáánà-ḿ	'he pays (me)'
	à-yéérè-ḿ	à-n-jéérè-ḿ	'he teaches (me)'
(36) a.	à-vángénà-ḿ	à--kángénà-ḿ	'he fries for (me)'
b.	à-wúbá-ḿ	à--kúbá-ḿ	'he hits (me)'
	à-wútá-ḿ	à--kútá-ḿ	'he ties (me) up'
	à-wóró-ḿ	à--kóró-ḿ	'he takes (me)'
	à-wá-ḿ	à--kwá-ḿ	'he puts (me)'
(37) a.	à-pùmìyà-ḿ	à--pùmìyà-ḿ	'he whitens (me)'
	à-tìrìnà-ḿ	à--tìrìnà-ḿ	'he writes to (me)'
	à-tsòrà-ḿ	à--tsòrà-ḿ	'he pulls (me)'
	à-kòsènà-ḿ	à--kòsènà-ḿ	'he buys for (me)'

	b.	à-pímbínà-ḿ	à--pímbínà-ḿ	'he sweeps for (me)'
		à-tóménà-ḿ	à--tóménà-ḿ	'he sends to (me)'
		à-tsómá-ḿ	à--tsómá-ḿ	'he sticks (me)'
		à-céndé-ḿ	à--céndé-ḿ	'he alters (me)'
		à-kásínì-ḿ	à--kásínì-ḿ	'he begins for (me)'
		à-kpétá-ḿ	à--kpétá-ḿ	'he shoots at (me)'
(38)	a.	à-mwà-ḿ	à--mwà-ḿ	'he shaves (me)'
		à-ndèndènà-ḿ	à--ndèndènà-ḿ	'he walks for (me)'
		à-ŋgbààtû-ḿ	à--ŋgbààtû-ḿ	'he disdains (me)'
	b.	à-númá-ḿ	à--númá-ḿ	'he bites (me)'
		à-nyéná-ḿ	à--nyéná-ḿ	'he eats for (me)'

In most cases the 1ps object prefix continues to manifest itself in terms of nasality and/or consonant hardening. In (37) and (38), however, we see that the 1ps prefix has no surface realization at all. In (37), a nasal + voiceless stop sequence is not permitted, nor may a voiceless stop harden. In (38), a geminate NN sequence is also ruled out. Since the L tone does not surface either, there is no way to explicitly indicate that a 1ps object prefix is present. The double hyphen (--) shows the deletion of the nasal morpheme.

One final set of data needs to be considered. We have not yet shown what happens when the 1ps prefix precedes a vowel-initial verb stem. The relevant data are provided in (39).

(39)	a.	v-éndènà-ḿ	vá-ŋ!g-éndènà-ḿ	'they go for (me)'
		v-ónò-ḿ	vá-ŋ!g-ónò-ḿ	'they laugh (at me)'
		v-ófà-ḿ	vá-ŋ!g-ófà-ḿ	'they throw (me)'
		v-ákà-ḿ	vá-ŋ!g-ákà-ḿ	'they help (me)'
	b.	v-ídzímà-ḿ	vá-ŋ!g-ízímà-ḿ	'they know (me)'
		v-íbínà-ḿ	vá-ŋ!g-íbínà-ḿ	'they steal for (me)'
		v-éná-ḿ	vá-ŋ!g-éná-ḿ	'they see (me)'
		v-úná-ḿ	vá-ŋ!g-úná-ḿ	'they kill (me)'
		v-úbá-ḿ	vá-ŋ!g-úbá-ḿ	'they hear (me)'
		v-ótéènà-ḿ	vá-ŋ!g-ótéènà-ḿ	'they agree with (me)'
		v-áténà-ḿ	vá-ŋ!g-áténà-ḿ	'they break for (me)'

As seen, vowel-initial verbs acquire a [g] when preceded by the 1ps nasal prefix.[15] The major question is to determine which morpheme this [g] belongs to. There are three logical possibilities. First, this [g] may be part of the verb stem. Since there are three verbs in our corpus whose initial [g] is present in all cases (e.g. ò-gùrà 'to crush'), one could not simply say that the verbs in (39) have an underlying /g/ which deletes whenever not preceded by the 1ps nasal. One would therefore either have to say that the featural representation of this /g/ is different from the /g/ in -gùra 'crush' (etc.) or that some verbs have two different allomorphs: g-initial when preceded by the 1ps nasal prefix, Ø-initial otherwise. A second option is to say that

the [g] is epenthetic, hence not belonging to either the verb or the object prefix.[16] The final option, which we adopt in the segmentation in (39), is to say that the [g] belongs to the 1ps prefix itself.This is supported by evidence from the Tuki subject prefixes, illustrated in (40).

(40) a.

n-dìngà-ḿ	'I love'
ò-dìngà-ḿ	'you sg. love'
à-dìngà-ḿ	'he loves'
tù-dìngà-ḿ	'we love'
nù-dìngà-ḿ	'you pl. love'
vá-díngà-ḿ	'they love'

b.

n-dángá-ḿ	'I lose'
ò-dángá-ḿ	'you sg. lose'
à-dángá-ḿ	'he loses'
tù-dángá-ḿ	'we lose'
nù-dángá-ḿ	'you pl. lose'
vá-dángá-ḿ	'they lose'

As seen from the above table of personal subject prefixes, the 1ps form again involves a nasal. In fact, the following forms show the same realization of the 1ps subject prefix as was observed with the 1ps object prefix:

(41) a.

m-byònò-ḿ	'I follow'
n-dìngà-ḿ	'I love'
n-dzòdzènà-ḿ	'I play for'
ŋ-gùrà-ḿ	'I crush'

b.

m-byáráfyà-ḿ	'I forget'
n-dángá-ḿ	'I lose'
n-dzúná-ḿ	'I subtract'
ŋ-gírá-ḿ	'I wait for'
ŋ-gbóménà-ḿ	'I bark at'

(42) a.

pùnùnà-ḿ	'I wake'	(-fùnuna)
pòrènà-ḿ	'I untie'	(-fòrena)
tsèyà-ḿ	'I abuse'	(-sèya)
tsùwà-ḿ	'I wash'	(-sùwa)

b.

pá-ḿ	'I give'	(-fá)
pwá-ḿ	'I extinguish'	(-fwá)
tsúmbá-ḿ	'I cut'	(-súmba)
tsíyá-ḿ	'I rub'	(-síya)

(43) a.

n-dàtènà-ḿ	'I sew'	(-ràtena)
n-dàmà-ḿ	'I pull'	(-ràma)

b.

n-dáméyà-ḿ	'I lick'	(-rámeya)
n-dábénà-ḿ	'I insist'	(-rábena)
n-jáánà-ḿ	'I pay'	(-yáana)
n-jéérè-ḿ	'I teach'	(-yéere)

(44) a. kángénà-ḿ 'I fry for' (-vángena)

b.

kúbá-ḿ	'I hit'	(-wúba)
kútá-ḿ	'I tie up'	(-wúta)

kóró-ḿ	'I take'	(-wóro)
kwáá-ḿ	'I put'	(-wáa)

(45) a.

pùmìyà-ḿ	'I whiten'
tìrìnà-ḿ	'I write to'
tsòrà-ḿ	'I pull'
kòsènà-ḿ	'I buy for'

b.

pímbínà-ḿ	'I sweep for'
tóménà-ḿ	'I send to'
tsómá-ḿ	'I stick'
céndé-ḿ	'I alter'
kásínì-ḿ	'I begin for'
kpétá-ḿ	'I shoot at'

(46) a.	mwà-ḿ	'I shave'	b.	númá-ḿ	'I bite'
	ndèndènà-ḿ	'I walk for'		nyéná-ḿ	'I eat for'
	ŋgbààtì-ḿ	'I disdain'			

And as before, a [g] shows up when the 1ps subject prefix precedes a vowel-initial verb:

(47) a.	ŋg-èndènà-ḿ	'I go for'	b.	ŋg-ízímà-ḿ	'I know'
	ŋg-ònò-ḿ	'I laugh'		ŋg-íbínà-ḿ	'I steal for'
	ŋg-òfà-ḿ	'I throw'		ŋg-éná-ḿ	'I see'
	ŋg-àkà-ḿ	'I help'		ŋg-úná-ḿ	'I kill'
	ŋg-ùmbàànà-ḿ[17]	'I seize'		ŋg-úbá-ḿ	'I hear'
				ŋg-ótéènà-ḿ	'I agree with'
				ŋg-áténà-ḿ	'I break for'

What is different about the 1ps subject prefix, however, is that it shows these realizations only if it is DIRECTLY followed by the verb stem. While this is always the case for the 1ps object prefix (since nothing can intervene between it and the following verb stem), subject prefixes may be followed by an object prefix or by a prefix that marks tense, aspect or polarity. Thus, consider the realization of the 1ps subject prefix when followed by an object prefix in (48).

(48) a.	ŋg-òò-dìngà-ḿ	b.	ŋg-òò-dángá-ḿ	'I love/lose you sg.'
	ŋgù-mù-dìngà-ḿ		ŋgù-mù-dángá-ḿ	'I love/lose him'
	ŋgù-sú-díngà-ḿ		ŋgù-sú-dángá-ḿ	'I love/lose us'
	ŋgù-nú-díngà-ḿ		ŋgù-nú-dángá-ḿ	'I love/lose you pl.'
	ŋgù-wú-díngà-ḿ		ŋgù-wú-dángá-ḿ	'I love/lose them'
	ŋg-á-díngà-ḿ		ŋg-á-dángá-ḿ	'I love/lose myself'

In the first and last forms, the object prefix consists of a vowel, and so it is not surprising to find the 1ps subject prefix realized as ŋg-. (It is less obvious whether the difference in vowel length is significant.) In the middle four cases it is surprising to find that the prefix is pronounced [ŋgù]. A similar form is observed when the subject prefix is directly followed by either a tense prefix or a negative prefix:

(49) a.	n-dìngà-ḿ	n-dángá-ḿ	'I love/lose'	Pr
	ŋgù-mú-díngà	ŋgù-mú-dángâ	'I loved/lost'	P1
	ŋgà-má-díngà	ŋgà-má-dángá	'I loved/lost'	P2
	ŋgà-mà-dìngá	ŋgà-mà-dángá	'I loved/lost'	P3
	ŋgù-nú-dìngà-ḿ	ŋgù-nû-dángá-ḿ	'I will love/lose'	F1
	ŋgù-mú-díngà-ḿ	ŋgù-mú-dángá-ḿ	'I will love/lose'	F2

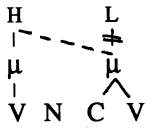
b.	ŋgà-tà-dìngá	ŋgà-tà-dángá	'I don't love/lose'	Pr
	ŋgà-tàá-díngà	ŋgà-tàá-dángâ	'I didn't love/lose'	P1
	ŋgà-tàá!-díngá	ŋgà-tàá!-dángá	'I didn't love/lose'	P2
	ŋgà-tà-má-díngà	ŋgà-tà-má-dángâ	'I didn't love/lose'	P3
	ŋgà-tà-nú-dìngà	ŋgà-tà-nû-dángâ	'I won't love/lose'	F1
	ŋgà-tà-mú-dìngà	ŋgà-tà-mû-dángâ	'I won't love/lose'	F2

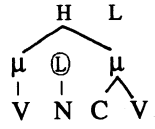
In the affirmative tenses in (49a) the 1ps subject prefix has the shape ŋgV-, with the V agreeing in quality with the vowel of the following tense marker. (In the present affirmative, the 1ps subject prefix is n-, since it is directly followed by the verb stem.) In (49b), the 1ps subject prefix is uniformly ŋga-, since it is followed in all cases by the negative prefix tà(á)-.[18]

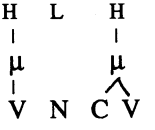
On the basis of the 1ps subject prefix forms in (48) and (49), we conclude that the [g] found before vowel-initial verb stems is part of the prefix, not part of the verb stem itself and not epenthetic. In order to derive the surface forms in (48) and (49), we assume that the [u] or [a] that follows [ŋg] is epenthetic. Of course, we must not derive [ŋgu-] or [ŋga-] immediately before a consonant-initial verb stem. This derivation can be blocked by either assuming that /g/ deletes before a consonant-initial verb stem or that there is an allomorphy in the 1ps prefix: N- before consonant-initial verb stems, Ng- elsewhere. The 1ps subject prefix is of course irrelevant for the study of transparent L tone, since it is the first prefix in any verb form. However, where we have obtained the object prefix ŋg- (before a vowel-initial verb stem), it is clear from the placement of the downstep that the L has to be associated with the nasal, not with the vowel that follows it. That is, there is no evidence that a form such as vá-ŋ!-ákà-ḿ 'they help me' derives from va + ŋgV + aka + m. If it did, the V would have truncated by the normal rules of the language which derive a short vowel in such contexts. However, it would be necessary to ask what its tone is. It is clear from the output tones that the L of the 1ps object prefix cannot be affiliated with this V. Rather, it comes in somehow with the nasal part of the prefix in one of the ways we shall now discuss.

5. NC = a Depressor Consonant?

Having now examined the segmental properties of the 1ps prefix, we return to the tonal problem at hand. In §3 we considered three accounts of the transparent L tone: (i) a H simply spreads through a L tone nasal, presumably allowed because the H and L are on separate tiers; (ii) a second H tone is inserted to the right of the L nasal prefix, when the latter is preceded by a H tone; (iii) rather than HTS, the assimilation is described as a H tone copying rule which does not mind an intervening L tone nasal. In this section we consider—but reject—the possibility that the L of the nasal prefix is not present in the underlying representation at all. In this alternative, the L is inserted after HTS has applied, as in the derivation in (50).

(50) a. 

b. 

c. 

Starting with a schematic VNCV sequence, HTS applies in (50a), delinking the L of the second mora. A (circled) L feature is inserted in (50b), induced by the nasality of the N prefix (whose moraic affiliation is not addressed in (50)). In (50c) the L acquires full tonal status, and must be linearized to both precede and follow the doubly linked H. As a result, the latter undergoes fission, as shown in (50c). The relevance of §4 to this analysis is that the nasal often deletes, but always leaves behind its L tone as a (potential) downstepper. Thus, if the insertion of L tone is induced by the preconsonantal nasal, it will be necessary for the appropriate insertion rule to apply before the nasal is effaced.

The idea behind this third alternative, then, is that the L is inserted later, much as Cassimjee and Kisseberth (1992) have proposed for the depressor consonant phenomenon in Mijikenda and Nguni Bantu languages. In these and other languages, certain consonants (e.g. voiced obstruents) are affiliated with L tone. They are, however, not TBU's in the normal sense, just as preconsonantal nasals are not TBU's in Tuki. We saw in (19) that a morphological symmetry would be achieved if we assumed all singular object prefixes to have an underlying L (i.e. including the 1ps nasal prefix). However, a number of phonological facts lend initial credence to the view that the L of the 1ps prefix is not underlying: (i) Whether preceded by a vowel or occurring postpausally, preconsonantal nasals are not syllabic. (ii) Preconsonantal nasals do not cause lengthening of a preceding vowel, as in other Bantu languages—nor do they condition compensatory lengthening when they drop out (see §4). (iii) Preconsonantal nasals never figure in tone linking or tone spreading. Thus, as we have seen, when a L tone verb such as -dìnga 'love' receives a suffixal H, the H goes on the FV -a, not on the nasal (cf. (8b)). Or, when the H of a verb stem such as /dáng-a/ 'lose' spreads to the right, it goes onto the FV -a, not onto the nasal, e.g. ò-dángâ 'to lose' (cf. (3b)). The situation is quite different in other Bantu languages, where the nasal frequently conditions compensatory lengthening and/or counts as a TBU (see Hyman 1992 for a recent discussion of some of the variation found in Bantu).

In further support of this hypothesis, it should also be noted that a number of Western Grassfields Bantu languages clearly show that preconsonantal nasals correlate with L tone. Although spoken also in Cameroon, these languages do not have object prefixes, and hence do not have a 1ps nasal object prefix. (In addition, the general 1ps subject prefix is mə-, whose tone is not necessarily L.) It is in the noun class system that the L tone effects are seen. Asongwed and Hyman (1976) and Hyman (1986) have shown for Ngamambo, for example, that tone is predictable on noun class prefixes in the following way: CV- prefixes are H, V- prefixes are M(id), and N- prefixes are L. In addition, in Kom, where prefixes are generally M on the surface, a preconsonantal nasal will condition a M to L contour tone (cf. a-kém 'pliers' vs. a-ŋ̀kém 'crab'). Can the induced L of the 1ps prefix in Tuki be part of a general phenomenon—or Cameroonian areal feature—according to which a preconsonantal nasal acts as a tone depressor?

The major obstacle in the way of this approach is that it is only the 1ps nasal that has this property in Tuki. While never a TBU, other preconsonantal nasals have different tonal properties, as follows:

(i) Tautomorphemic preconsonantal nasals do not acquire a L tone. This includes two sets of examples, already seen, but repeated in (51).

(51) a.	vá-dángá-ḿ	'they lose'	*vá-dá!ngá-ḿ
	vá-vángénà-ḿ	'they fry for'	*vá-vá!ngénà-ḿ

b.	vá-ndéndènà-ḿ	'they walk for'	*vá-n$^{!}$déndènà-ḿ
	vá-ŋgbáàtì-ḿ	'they disdain'	*vá-ŋ$^{!}$gbáàtì-ḿ

In (51a) a H spreads from the first mora of the verb stem onto the second. The same HTS takes place in (51b), this time from the H subject prefix vá- onto the first mora of the two verbs that have been found to begin with a preconsonantal nasal. Although having a NC cluster, the following in the resulting output is not downstepped. This shows, minimally, that a tautomorphemic preconsonantal nasal does not automatically induce L tone.

(ii) Other nasal prefixes such as those found in the noun class system show no evidence for an inserted L tone. The forms in (50) clearly show that a verb-final H tone such as in the P2 will spread onto a following noun object:

(52)	a.	à-má-túmá mú-tù	'he sent a person'	(mù-tù)
		à-má-túmá námà	'he sent an animal'	(nàmà)
	b.	à-má-túmá má$^{!}$-nyá	'he sent food'	(mà-nyá)
		à-má-túmá mw-á$^{!}$ná	'he sent a child'	(mw-àná)
	c.	à-má-túmá sám$^{!}$bê	'he sent God'	(sàmbê)
		à-má-túmá tó$^{!}$-nê	'he sent a leaf'	(tò-nê)
	d.	à-má-túmá ví-kòngá	'he sent letters'	(vì-kòngá)
		à-má-túmá wélètê	'he sent a tree'	(wèlètê)
	e.	à-má-túmá sá$^{!}$pákà	'he sent fish'	(sàpákà)
		à-má-túmá vá$^{!}$-síyà	'he sent chairs'	(và-síyà)
	f.	à-má-túmá káná	'he sent a crab'	(káná)
		à-má-túmá kónó	'he sent a tortoise'	(kónó)

Each pair of examples in (52) shows postlexical spreading of H tone onto a noun object of a different tone pattern. As seen, HTS may result in the delinking of a L tone, which triggers downstep on an immediately following H. The examples in (52f) show that when an object noun begins with a H tone, there is no tone change.

Now consider in (53) comparable noun objects that begin with a class 9 nasal prefix:

(53)	a.	à-má-túmá ŋ-gô	'he sent a leopard'	(ŋ-gò)
		à-má-túmá m-búŋgù	'he sent cassava'	(m-bùngù)
		à-má-túmá n-dónè	'he sent a cow'	(n-dònè)
	b.	à-má-túmá ŋ-gbá$^{!}$tí	'he sent magic'	(ŋ-gbàtí)
	c.	à-má-túmá m-bwá	'he sent a dog'	(m-bwá)
		à-má-túmá ŋ-gárè	'he sent a gun'	(ŋ-gárè)
		à-má-túmá m-béré	'he sent a friend'	(m-béré)

In (53a) the H of the final vowel of the verb spreads across the nasal prefix, delinking the L of the first stem syllable of the noun object. As seen, there is no downstep effect. The same occurs in the example in (53b), where the noun stem is underlying L-H. In this case when the L is delinked, a downstep is created. Finally, in (53c), where the first syllable of the noun stem is H, there is no tonal change. While noun class prefixes otherwise carry L tone in Tuki (cf. the relevant examples in (52)), the class 9 nasal prefix shows no L tone effect at all in (53).

Instead, as seen in the following sample derivations in (54), the correct output is obtained even if no L tone is assigned to the nasal prefix:

(54) a. -tuma m-buŋgu -tuma ŋ-gbati -tuma m-bere

H H L H H L H H H UNDERLYING

b. -tuma m-buŋgu -tuma ŋ-gbati -tuma m-bere

H H L H H L H H H HTS

[-túmá m-búngù] [-túmá ŋ-gbá!tí] [-túmá m-béré]

If the class 9 prefix had a L tone—and crucially, if it were to follow the same tonal patterns as we saw for the 1ps object prefix, the outputs of (54) would have been *à-mà-túmá m!-búŋgù, à-mà-túmá ŋ!gbá!tí, and *à-mà-túmá m!-béré, i.e. with a downstep immediately after the nasal prefix.

However, there ARE reasons to believe that the nasal has a L tone. First, there is the fact that all other noun class prefixes have a L tone, as mentioned. Second, however, there is the fact that nouns that begin with L tone vowel prefixes (with or without a following nasal) show the patterns in (55).

(55)	a.	à-mà-túmá í-bwánà	'he sent a key'	(ì-bwànà)
		à-mà-túmá í-díŋgà	'he sent a concubine'	(ì-dìŋgà)
	b.	à-mà-túmá í-bá!nú	'he sent a kolanut'	(ì-bànú)
		à-mà-túmá óŋ-gáŋ!gá	'he sent a root'	(òŋ-gàŋgá)
		à-mà-túmá ón-dzí!í	'he sent a seat'	(òn-dzìí)

In examples such as these we see the H of the verb spreading through the vowel (+nasal) prefix onto the first stem syllable of the following noun. In (55a) we see that L-L-L nouns thus become H-H-L, while in (55b), L-L-H nouns become H-H-!H. It would appear that HTS is applying twice—or is it?

A clue as to what is behind the "double spreading" of H tone in (55) is seen from a comparison of the singular and plural noun forms in (56).

(56)	a.	à-mà-túmá í-nyó	'he sent a yam'	(ì-nyó)
		à-mà-túmá ví!-nyó	'he sent yams'	(vì-nyó)
	b.	à-mà-túmá í-gwá	'he sent a cadavre'	(ì-gwá)
		à-mà-túmá ví!-gwá	'he sent cadavres'	(vì-gwá)
	c.	à-mà-túmá í-támbû	'he sent a trap'	(ì-tàmbû)
		à-mà-túmá ví!-támbû	'he sent traps'	(vì-tàmbû)

In each case the noun stem begins H. In the singular the prefix is class 7 ì-, and the plural is class 8 vì-. Both are underlyingly L. In the singulars the prefix ì- assimilates to the preceding H without conditioning a following downstep. In the plurals, however, the prefix vì- assimilates to the preceding H, and there IS a downstep on the following H. The hypothesis we would like to advance is that when L tone V(N)- prefixes are preceded by a H tone, their L tone assimilates to the preceding H without a trace. A CV- prefix, on the other does not undergo this

special rule, but rather the normal HTS rule that delinks its L, which is then freed up to condition a downstep on the following H.

What we would like to suggest is that the N- prefix of classes 9 and 10 undergoes this same special rule. This would explain why there is no downstep in the forms in (53c). In order to account for the double spreading in (53a) and (55), we would say that the special rule PRECEDES the regular HTS rule, such that the H of the verb spreads to both of the following two TBU's of the noun.[19] In the case of (53a) one doesn't see the double effect because the nasal is non-syllabic, i.e. not a TBU.[20] As a result of this special rule, there is of course no chance of seeing if HTS can cross the L of the noun prefix in such examples.

Since it is only the 1ps object prefix that shows the L tone effect under examination, it is unlikely that we would want to insert the L. To do so would require that we specifically target the 1ps morpheme, and not other preconsonantal nasals such as those seen in (51). This means that the L insertion rule should in principle be lexical—though presumably must follow HTS (to avoid "line crossing"), which also applies postlexically. This last fact indirectly suggests that L tone insertion should not apply to the class 9/10 nasal prefix whose tonal properties we have just investigated. Recall that L tone insertion must also apply prior to the deletion of the preconsonantal nasal before a voiceless stop or nasal. Given the highly morphologized nature of this putative rule of L tone insertion, it makes as much sense to include the information with the 1ps prefix itself. How this is to be done is the topic of our final section.

5. Conclusion

We conclude from the preceding that the 1ps object prefix has its own underlying L tone. This L is exactly identical to the L found in the other two singular object prefixes (recall (19a)), which allows us to draw the generalization that singular personal object prefixes are L tone, while the plural personal object prefixes are H (preceded by a floating L).[21] This means that a verb form such as vá-n!-díngà-ḿ 'they love me' has the representation in (57a) just after tone linking:

(57) a. va-n-dinga-m
H L L H

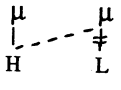
b. va-n-dinga-m
H L L H

The question is how can we apply HTS as in (57b) without the L causing the indicated line-crossing? Or, put slightly differently: if (57b) is OK, why don't we find HTS regularly applying across linked L tones in other languages?

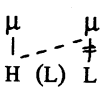
The answer, we believe, is that the L on the 1ps prefix is not the same kind of tone as the L that is linked to a vowel. As we have repeatedly said, a preconsonantal nasal is not a TBU. The HTS rule says that a H spreads onto the next TBU. Stated this way, the nasal is irrelevant to the rule. Although it has a tone, the nasal is skipped over because of its non-moraic status. At first blush this may seem surprising. In their classic study on opaque segments, Clements and Sezer (1982) show that some consonants have prelinked values of features that normally link to vowels and are involved in the familiar vowel harmony of Turkish. As a consequence, a consonant-linked [-back] feature can block the spreading [+back] from the preceding vowel onto the next. Why doesn't the L of the nasal have this opaque or blocking property?

As mentioned in the introduction—and unlike the Turkish case—H and L involve two different tone features, say [+upper] and [-raised], in Tuki and most African tone languages. Consequently, they are on separate tiers. Being on separate tiers, they can in principle cross each other without this resulting in a violation of the line-crossing constraint. However, this rarely happens. The reason is that tone rules are typically local, i.e. the most common tone rules involve the (possibly iterative) spreading of a tone one TBU to the right or left. In languages where a H tone spreads long distance to a predesignated position (e.g. the penult), there typically are no intervening L tones anyway. We would claim that it would be possible to skip over such L's just in case the targeted position is identified on some basis other than adjacency. As a case in point, in Luganda there is a phrasal rule that spreads a H tone leftward just in case it can cross onto one or more toneless moras in the preceding word. While in most cases all of the preceding, affected moras are toneless, Hyman and Katamba (1990-91) show that there are constructions where one or more L moras precede the spreading H. In this case leftward HTS successfully applies across these TBU's, eradicating their L tone.

What this suggests is that line-crossing, if still valid in segmental phonology, has less of a role to play in tonology than previously suspected. Instead, the "line-crossing effects" frequently observed in tonology seem to have to do with the adjacency conditions that are placed on the tone rules themselves. In a crucial sense this is not surprising and fits right into the recent vogue of reinterpreting phonological features as privative or monovalent. If features such as H and L have only one value (with M being a fusion of the two, as say, in Hyman 1986), then they are free to spread right or left without being blocked by one another. Where there is blocking, the rule would have to be formulated accordingly. For example, where HTS is blocked by a floating L, the rule could be written as in (58a).

(58) a. 

b. 

c. 

In (58a) a H will spread onto a following L mora, delinking that L. If a free L tone intervenes between the H and L, the structural description of the rule is not met, and hence the rule does not apply. If it is acceptable for a H to spread across a free L, then either the rule is written neutrally, as in (58b), or explicitly mentions the possibility of an intervening free L tone, as in (58c).

In either case the conditions should be clear under which it is possible to get a "line-crossing effect": only if the mora targeted by tone feature A is on the other side of a different tone feature B, will spreading of A be allowed to cross tone feature B. In this paper we have seen that a L feature linked to a non-TBU can be "crossed" by a H feature as it spreads across it to reach the next TBU.

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[1]In a typical African tone system, I assume that each tone feature links to a separate tonal node and that a tonal node is dominated in turn by a tonal root node. It is the tonal root node that then links to the TBU, here the mora. With the two tonal features on separate tiers, line-crossing will not prevent spreading rules such as in (2), independent of other details of tonal geometry.

[2]In addition to the case we shall discuss in this paper, we are aware of one other situation, in Luganda, where a H may spread (leftwards) through a L tone (see Hyman and Katamba 1990-91).

[3]The data are based on the speech of the second author. Previous work on Tuki includes Essono (1980) and Hyman (1980). See Biloa (1992) for recent work on Tuki syntax.

[4]These data differ from those reported for other dialects by Essono (1980) and Hyman (1980). For instance, while the Kombe dialect has a terrace-level system with downstepped H tones, the Bacenga dialect described by Hyman (1980) has a discrete level tone system with H, M and L.

[5]We assume that CGV sequences are underlying CVV in all cases, and that the cited verb roots might more abstractly be represented as -mu- 'shave', -bi- 'bring', -ni- 'eat' and -fa- 'give'. Although Tuki allows long vowels, in most morphological contexts in which vowel coalesence occurs, the result is a short vowel, not a long one.

[6]Below we shall see that this TBU may be either toneless or may have L tone, as indicated in (6).

[7]Other alternatives were considered—and rejected. These included assigning default L before HTS to create the HL contour, or conflating default L assignment with prepausal L%. These and other attempts led to complications. It is worth noting that the L in utterance final H-HL sequences is not observed except before pause. In all other cases, the sequence is realized H-H. As will be seen, if we were to delink the L of H-HL at the word level, a H-HL # H sequence would be incorrectly realized as H-H-ꜜH (with downstep), rather than the observed H-H-H.

[8]Which we show as separate L features for clarity—notwithstanding the OCP.

[9]A seventh object prefix, reflexive -á-, also exists in the language: w-àá-díngà 'to love onself', w-àá-dángâ 'to lose oneself'.

[10]Assume that the H of vá- in (20a) spreads to the L TBU of -dînga. The unlinked L tone of the 1ps prefix N- will now be temporally sequenced after the doubly linked H tone. As a result, it is followed by a L TBU, not a H, and there should be no downstep.

[11]A third candidate, which we would also reject, concerns Meeussen's (1967) "law of initials and finals". In many Bantu languages there is a tonal difference between different prefixes such as the one we have seen for Tuki. Unlike Tuki, however, there are tenses in which the final vowel of the verb stem acquires the same tone as the initial (subject prefix) tone. One could imagine placing this tone on a separate plane and spreading it from the subject prefix directly to the final vowel—potentially skipping over numerous intervening tones.

[12]Object prefixes may not cooccur or we would have attempted to place one of the (L)H tone plural object prefixes before the 1ps prefix.

[13]Unfortunately, both of the two verbs with initial /y/ in our corpus are underlyingly H, i.e.. ò-yáánà 'to pay', ò-yéérè 'to teach, learn'. We do not know if it is a coincidence that they both are followed by a long vowel.

[14]Again, all of the examples we have of initial /v/ or /w/ occur on H tone verbs. Note that where proto-Bantu reflexes of the items in (30) can be identified, they have been reconstructed with initial *k, e.g. *-kúb- 'hit', *-káng- 'fry', *-kút- 'tie'.

[15]One exception was found in the data: v-úmbàànà-ḿ 'they seize' vs. vá-ꜜ-kúmbàànà-ḿ 'they seize me'. Here the vowel-initial verb instead shows up with an initial [k], which conditions deletion of the preceding 1ps nasal.

[16]Also within the realm of logical possibilities would be for the /g/ to be a separate morpheme unto itself. There is no evidence for this—cf. however the discussion below of 1ps subject prefixes having a [ŋgV] realization.

[17]This time the verb -ùmbaana is regular (vs. its realization with the 1ps object prefix.)

[18]This includes the curious change of the negative marker when the 1sg is present vs. absent in the P2: à-tòó-díngà 's/he didn't love' vs. ngà-tàá-díngà 'I didn't love'.

[19]A similar situation obtains in Basaá, another Bantu language in Cameroon.

[20]The assimilation of V- prefixes to a preceding H tone may actually be in a state of flux. We have found that the vowel prefix a- tends not to undergo the special rule, while the prefixes i- and o- do. In addition, the second author allows for a certain amount of variation, e.g. à-mà-túmá ví-túmbá ~ à-mà-túmá ví-ꜜtúmbá 's/he sent goats' (< vì-túmbá).

[21]Among the non-personal noun classes, 4 and 9 have a L tone object prefix, while the remaining classes have a H object prefix.

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