

CHILCOTIN TONE: AN AUTOSEGMENTAL ANALYSIS*

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1.0 Introduction

Chilcotin is an Amerindian language belonging to the Athabaskan family. Athabaskan languages are characterized as prefixing languages with rich morphological agreement. They are also categorized as tone languages, although historically they were not. Contrastive tone has evolved as a diachronic change from a stem final glottal stop. Tone in Athabaskan has received little analytical attention. This is likely due to the fact that tone is difficult to analyze when the morpheme to which the tone is lexically paired cannot always be identified, as is the case in Athabaskan generally. Phonological processes often alter the form of a morpheme so drastically that it is not recognizable. Only by comparing different words inflected and derived in a similar pattern can such a morpheme be located and even then it is not always conclusive.

There are a few morphemes within the Chilcotin verb which consistently appear with a high marked tone. The first person duoplural prefix /id-/ always has a high tone. The presence of the /id-/ prefix causes alternations of the stem tone. In most cases /id-/ causes the stem tone to reverse; that is, if the stem has a high tone then affixation of /id-/ would reverse it to a low tone. Alternately, affixation of /id-/ to a low stem tone would reverse it to a high tone. However, there are some cases in which affixation of /id-/ to a high stem tone does not reverse the high tone to a low tone, instead it forms a falling contour tone. I propose that by using an autosegmental framework to analyze tone in Chilcotin the stem tone alternations will become predictable. Two basic autosegmental rules: spreading and tone deletion, can account for the stem tone alternations.

In section 2.0, I introduce the basic morphology and phonology in Chilcotin. Section 3.0 will outline the autosegmental theory in relation to tone. The basic problem of stem tone alternation is explained in 4.0. Finally, in section 5.0 the application of autosegmental theory is applied to Chilcotin to account for the variance in stem tone alternation.

2.0 ATHABASKAN VERB MORPHOLOGY AND PHONOLOGY

2.1 Chilcotin Orthography

The data presented henceforth will be written in the Chilcotin orthography. The Chilcotin vowel and consonant systems are represented in (1) and (2). In most cases the orthographic symbols are the same as the phonemic symbols but in the cases where they differ the phonemic symbol is presented first:

* I would like to thank Michael Dobrovolsky for his valuable comments and insights in developing this paper. I am also grateful to my fellow student, Hooi Ling Soh, for her challenging questions and comments.

(1) Vowels (Cook 1989)

a) Tense

i u
æ/a

b) Lax

i/ /e u/o

(2) Consonants (Cook 1989)

b	d	dl	dz	ḏz	dy/j	g	G/gg	g ^w /gw	G ^w /gg ^w
p	t	tʰ	ts	t͡s	tc/ch	k	q	k ^w /kw	q ^w /qw
	t'	tʰ'	ts'	t͡s'	tc'/ch'	k'	q'	k ^w '/kw'	q ^w '/qw'
		l/lh	s	ṣ	c/sh	x/x		x ^w /wh	h
m	n	l	z	ḏ	j/y	ɣ/gh		w	ɣ ^w /ḡ

2.2 Morphology

Athabaskan is a family of prefixing languages. It is categorized as having a template type morphology because the verb prefixes have prespecified positions. There is an underlying template for the verb that determines the location of each prefix as it is affixed in the word formation process. For example the subject always occurs in position #2 which is next to the stem. The number of prefix positions varies between languages but usually varies around ten positions. Within each prefix position there is a set of prefixes which are mutually exclusive in the fully conjugated verb. The first six positions and their prefix sets are shown in (3):

3. (Cook 1989)

position	position class	prefix set
0	root	
1	classifier:	Ø, 1, l, d
2	subject:	s- (first person singular: 1sg) ne- (2sg) id- (1P duoplural: 1dp) h- (2 dp)
3	primary aspect/mode:	ne- (perfective) wē- (optative) ghe- (progressive)
4	conjugation markers:	Ø, se-, ghe-, ne
5	secondary aspect:	te- (inceptive)
6	secondary mode:	ú- (conative)

The root is almost always CVC or CV, consisting of only one syllable. A classifier is required by the root. The particular classifier chosen is marked in the lexical entry of the root.¹ The root plus its classifier compose a stem.² The subject position includes only the first and second person

¹ Due to phonological processes the form of the classifier is not always evident. For this reason, the classifier will only be represented in the derivations when its form is evident.

² The distinction between root and stem is not relevant to this analysis (other than the section on morphology). Henceforth, I will use the term stem.

singular and dual forms. The third person forms occur to the left of the sixth prefix, where the third person plural form is marked by the prefix /ye-/ and is sometimes modified by the plural marker /ji-/. The third person singular form is null (Ø), so its position is not easily identifiable. Primary aspect/mode marks what would be the equivalent to tense in English, although the exact meaning of each mode cannot be directly interpreted as tense. The primary aspect/mode prefix is often not evident on the verb because it is deleted through phonological processes. When a stem is inflected for primary aspect/mode a conjugation marker must co-occur with each primary aspect/mode. The choice of the conjugation marker to co-occur with the primary aspect is idiosyncratic and specified by the root. Secondary aspect and mode are optional and can co-occur with primary aspect/mode to modify the meaning. For example, the progressive mode (meaning that the action is not completed) can be modified by adding /te-/inceptive. The derived mode refers to an action which is about to begin.

There are other prefixes which exist beyond the six listed here. It is generally accepted by linguists in Athabaskan that a boundary, called the disjunct boundary, precedes the sixth prefix and any prefixes to the left of the boundary are labelled disjunct prefixes. These prefixes behave differently than the first six (conjunct prefixes) both in terms of phonological rules and semantic transparency. The conjunct prefixes undergo phonological processes which often drastically alter their underlying form. It is not unusual for two or three prefixes to coalesce forming a portmanteau morpheme. The phonological processes which apply to the disjunct prefixes do not alter the underlying form as drastically so the transparency of their meanings is maintained. A typical example of a Chilcotin verb is shown in (4):

- (4) te- se- s- chagh —————> tezeschagh 'I am getting big'
 position# 5 4 2 0

The stem is in the far right position and the prefixes are attached in their templatic order to the left of the stem. Notice that this verb consists of only conjunct prefixes. Disjunct prefixes are derivational and are optionally affixed to modify the meaning of the verb. It is important to note at this point that although prefixes have a prespecified order in which they must be affixed the order is not predictable according to morphological principles. According to Anderson (1982) derivation occurs closest to the verb and inflection occurs outside of derivation. However, Athabaskan verbs do not observe this morphological typology. In fact it is not uncommon to find inflectional affixes between derivational affixes.

2.3 Phonological Rules

A number of phonological rules apply to the verb, particularly within the conjunct boundary:

- (5) **metathesis:** Conjunct prefixes regularly undergo metathesis, particularly the subject and the conjugation marker:
 te- ne- bish —> te- en- bish
 Conj Subj
- (6) **tensing:** When two /e/'s are adjacent they coalesce into one tensed segment; /i/.
 te-en —> tin

Tensing usually co-occurs with metathesis because the conjunct vowels are almost always /e/. Therefore metathesis of conjunct prefixes results in an /ee/ sequence which, consequently, tenses to /i/.

(7) **d-effect:** i) /d/ is deleted before stops

ii) /d/ + /y/ becomes /j/

(8) **epenthesis:** When the conjunct prefixes do not include a syllabic segment epenthetic /he/ is added immediately to the right of the disjunct prefixes (see ii) or in the absence of disjunct prefixes /he/ is added word initially (see i). (Note: ## marks the word boundary, # marks the disjunct/conjunct boundary.)

i) ##s- tsagh —> hestsagh 'I cry (imperfective)'
1sg- cry

ii) ##te- #s- > tehesbans 'I roll it up (imperfective)'
up- 1sg- cl- roll

If the first morpheme of the word is conjunct and if it begins with a syllabic segment then epenthetic /h-/ is added initially:

iii) ##- > hunesjan 'I was shy (perfective)'
mod- perf- 1sg- cl- shy

(9) **vowel deletion:** In a sequence of two adjacent vowels the lax one is usually deleted.
ne- id—> nid

2.4 Tone

Tone in Athabaskan languages can be traced back to a stem-final glottal stop /ʔ/, historically. In some languages /ʔ/ has surfaced as a low tone, as in Dogrib and Sekani and in others it has surfaced as a high tone, as in Slave and Chipewyan (Cook 1989). The tone that has surfaced from the glottal stop in any one language appears to be the only lexically marked tone on stems in that language. Therefore, a stem is marked underlyingly for tone (either high or low depending on the language) or is toneless (Rice 1987, 1989, Odden 1986). Chilcotin appears to fall into the high-tone group of languages because its stems are lexically marked for high tone. If the stem is not marked for high tone then it is lexically toneless. There is no lexical low tone in Chilcotin. Toneless segments not associated with a high tone are marked for phonetic low tone by a default rule (Rice 1987, 1989). The study of tone in any Athabaskan language is a difficult task due to the complexity of the rich concatenating morphology and the phonological rules which often render morphemes almost completely unidentifiable.

3.0 THEORETICAL ASSUMPTIONS

3.1 Autosegmental Theory

3.1.1 Autonomy of Tone

According to autosegmental theory tone operates on a different level from other features on the segmental level. Although tone can be identified as being associated to a particular segment, it can also act independently from that segment. For example, in Margi the suffix 'na', which is not marked for tone, takes on the tone of the stem to which it is affixed:

- (10) a) /sá + na/ —————> [sáná] 'to lose'
 b) /ndàl + na/ —————> [ndàlà] 'to throw' (Durand, 1990)

In (10a) the stem /sá/ has a high tone. When /na/, which is toneless, is affixed to the stem, /na/ also becomes marked for high tone. The opposite occurs in (10b); the low tone of the stem /ndàl/ spreads onto the toneless suffix, /na/.

The independence of tone can also be observed in Chilcotin. When a prefix marked for high tone is affixed to a stem which is lexically toneless, the tone will spread onto the stem:

- (11) a) /ná + sbish/ —————> [násbìsh] 'I swim around'
 b) /te + sbish/ —————> [tesbìsh] 'I'm starting to swim' (Cook, 1989)

In (11a) the high tone on the prefix spreads onto the stem. Whereas in (11b) the same stem remains unmarked for high tone when the prefix is also toneless. The tone in (11a) provides an example to demonstrate the autonomy of tone from the phonemic melody and the necessity for a separate tier for tone to be represented.

3.1.2 Autosegmental Theory

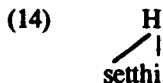
Goldsmith (1990) outlines the autosegmental representation of tone, which posits separate tiers for tones and segments. Tones are represented on an independent tier from the phonemic segments, the tonal tier, on which only tonal features can be specified. The tonal features are either high-tone (H) or low-tone (L):

- (12)
- | | | |
|---------|----------------|------------------|
| H L | tonal tier | |
| | | |
| b u l u | segmental tier | (Goldsmith 1990) |

In order to establish a connection between the tones of the tonal tier and the tone bearing units of the segmental tier, association lines are included in the representation. Thus, there need to be principles of association constraining the linking of tones to tone-bearing units. In Rice's analysis of Slave tone she notes that a tone which is lexically paired with the stem is realized by the preceding morpheme.



/se-/ is a first person genitive morpheme which is lexically toneless. The association rules in Slave need to link the tone paired with the stem to the toneless prefix, so the derived representation has the effect of the following representation:



In Chilcotin the tone is lexically paired with a morpheme but is realized on the vowel of that morpheme. Tone is realized on vowels in all languages; however consonants can have the capability of bearing a tone in some languages. Therefore, Goldsmith (1990) introduces 'tone bearing units' as the segments on the segmental tier which are capable of bearing a tone, where vowels will always bear tone and any other tone bearing units are determined language specifically.

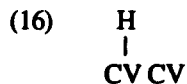
Goldsmith (1990) proposes three constraints for the association of the segmental tier with the autosegmental tier in the Well Formedness Condition:

(15) **Well Formedness Condition (WFC):**

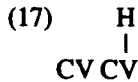
1. All vowels are associated with at least one tone.
2. All tones are associated with at least one vowel.
3. Association lines do not cross.

The constraints of the Well Formedness Condition are applied through association conventions specifying direction of association, (left-to-right or right-to-left), its starting point, as well as options such as spreading.

Tone languages often require a direction of association rule to associate the tonal tier to the segmental tier. This becomes particularly evident when there are more tone bearing units than tones. For example, the Initial Association Rule (Goldsmith 1990) which associates the first tone to the first segment is presented below:

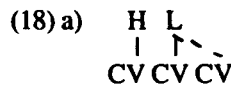


A direction of association is necessary because the left-to-right association, as in the preceding example can produce a very different form from a right-to-left association:

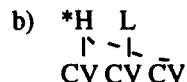


Recall that Chilcotin verbs are formed through concatenation of monosyllabic morphemes. Therefore, an association convention specifying direction of association is not necessary because the tone that a morpheme is paired with associates to the only tone bearing unit, the vowel.

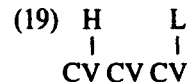
According to the WFC the unassociated segments in the preceding examples must be associated to a tone. Spreading of tones to tone-bearing units is one type of association convention to link unassociated segments. If, after all of the tones have been associated, there remains an unassociated segment then the spreading rule links it to the closest tone. In the following example the final CV segment is unassociated; it associates with the preceding L-tone through spreading.



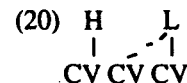
Recall the WFC states that association lines must not cross, so the final CV segment in (18a) cannot associate with the H-tone.



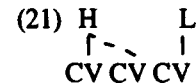
A language which employs a spreading rule needs to specify the direction of spreading. Without a specified direction, it is not always clear which tone will associate with unassociated segments:



In (19) it is not clear which tone, H or L, will associate with the medial CV segment. A right-to-left spreading rule would associated the medial segment to the following L-tone:



A left-to-right spreading rule would spread the H-tone rightwards to the medial CV segment:



In Chilcotin the spreading rule applies from left-to-right. In the following example the /id/ prefix is lexically marked for H-tone. A direction of spreading must be specified to determine if the preceding segment or the following segment (or both) associates with the H-tone.

- (22) H
 |
u-ghe-id-jid

In Chilcotin, an unassociated segment is consistently realized with a H-tone only if it is preceded by H-tone. Therefore, Chilcotin exhibits a left-to-right spreading rule.

- (23) H
 |
u-ghe-id-jid *hughljid* 'I kept poking it'

The association conventions apply before any other rules in Chilcotin. Recall that Chilcotin verbs are formed through concatenation of monosyllabic morphemes. Therefore, an association convention specifying direction of association is not necessary because the tone that a morpheme is paired with associates to the single tone bearing unit, the vowel.

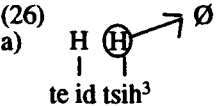
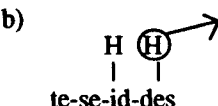
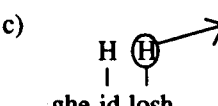
Leben proposed a condition to constrain the patterning and association of identical segments (Leben 1973).

- (24) **Obligatory Contour Principle (OCP):**(Leben 1973)
For any pair of adjacent segments a and b, $a \neq b$.

In the framework of autosegmental phonology, the OCP prohibits two identical tones from occurring in adjacent positions on the same tier. Adjacent tonal positions refer only to the tonal tier and therefore, any intervening segmental material does not affect the tonal tier. For example in a representation such as (25), despite the C between the two V's on the segmental tier, the two H-tones are adjacent, thereby creating an OCP violation.

- (25) H H
 | |
 VC V

Therefore, there needs to be a rule to correct the violation. For Chilcotin, I propose a deletion rule which deletes the rightmost H-tone. A verb which has a H-tone stem preceded by a H-tone prefix violates the OCP. In all such cases in Athabaskan the H-tone associated with the stem is deleted and the stem is phonetically realized as a L-tone. The left-most tone, on the prefix, is never realized as a L-tone. (Note that the rules of reassociation in Chilcotin will be outlined further in section 5.0).

- (26)
- a) 
- te id tsih³ *títsh* 'We shot several times'
- b) 
- te-se-id-des *tezídes* 'We are becoming heavy'
- c) 
- ghe-id-losh *ghídlosh* 'We loosened it'

Leben also points out that both the underlying and derived tonal representations are subject to the OCP. Whether (25) represents underlying or derived structure, it violates the OCP.

Multiple Associations

Autosegmental Theory assumes an intermediate tier between the phonemic tier and the tonal tier. The skeletal tier is represented simply with C's and V's corresponding to [-syllabic] and [+syllabic] phonemic segments, respectively.⁴ A Chilcotin stem which is lexically marked for high-tone is represented as in (27):

- (27)
- | | | | |
|---|---|---|----------------|
| | H | | tonal tier |
| | | | |
| C | V | C | skeletal tier |
| | | | |
| j | i | d | segmental tier |

In representing long vowels, geminates, or contour tones, autosegmental theory permits multiple associations between tiers.


Multiple Associations (Goldsmith 1990):

Two successive segments on a single tier are associated to a single position on another tier.


Multiple associations have relevance to a tonal analysis of Chilcotin in two regards. First, contour tones surface in sentence final position in Chilcotin (Cook, personal communication). A contour tone, according to Goldsmith's definition of multiple associations, is represented as two tones on the tonal tier associating to a single V-position on the skeletal tier.

³ Thanks to Eung-Do Cook for providing me with his fieldnotes from Williams Lake 1984-85 for the data in this paper.

⁴ The representation of the intermediate tier is assumed in the rest of the examples representing tonal associations directly to the phonemic tier.


- (28)  tonal tier
skeletal tier

Second, vowel lengthening also occurs in sentence final position (Cook, personal communication). Goldsmith argues that long vowels must be represented as multiple associations. Thus a long vowel is represented with two V-positions on the skeletal tier which multiply associate to one vowel on the segmental tier.


- (29)  skeletal tier
segmental tier

4.0 STEM TONE ALTERNATION

Chilcotin tone has an interesting pattern related to the first person duoplural prefix /id/. In most cases /id/ causes the tone associated with the stem to change either from H-tone to L, or from L-tone to H. For example if the stem tone is H then in a construction containing /id/ it reverses to L or if the stem tone is L then it changes to H.

- (30)  *ne#ne-id-bin* → *ne-id-bin* *nibín* 'We (dual) swam.'⁵
conj ldp- swim
mrkr

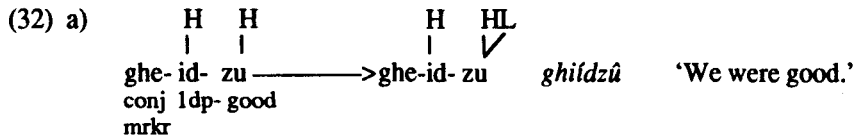
Example (30) appears to be a simple case of spreading. The H-tone of the subject prefix spreads to the stem. However, if the stem tone is marked H then /id/ appears to cause the H-tone to reverse and become a L-tone, as seen in (31):

- (31)  *ne#ne-id-qa* → *ne-ne-id-qa* *neníqa* 'We (dual) are sewing.'
conj ldp- sew
mrkr

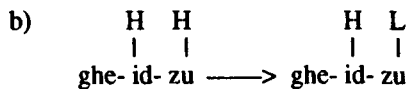
In this case the stem tone in the derived representation is the opposite from the subject prefix so the effects of /id/ cannot be analyzed simply in terms of spreading. There must be some other rule in effect to account for the alternation of the stem tone in (30) and (31). One further example will

⁵ Note that the leftmost representation is the underlying structure of the verb and that the arrow indicates derivation; thus the rightmost representation is the surface (derived) representation.

show that the alternation caused by /id/ is not simply a polarity rule. That is, it does not only alternate between two opposing features (H and L). Example (32) shows that /id/ may create a falling contour tone on the stem from an underlying high tone.



Recall that falling contour tone regularly occurs in sentence final position. (32a) is an example of a verb in sentence final position; if the verb /ghíldzû/ occurred sentence internally it would pattern like (31), in which the H-stem tone became L:



The stem tone alternations due to the /id/ prefix are represented in (33) with their position in the sentence specified:

(33)	STEM TONE	SENTENCE POSITION
a)	L→H	-internal and final
b)	H→L	-internal
c)	H→HL	-final

5.0 APPLICATION OF AUTOSEGMENTAL THEORY TO CHILCOTIN TONE

By representing tone autosegmentally, the processes involved in associating and reassociating tones to segments becomes much clearer. This is definitely the case for an analysis of tone in Chilcotin. The /id/ prefix in the Chilcotin verb causes an alternation of the stem tone. In most cases a H-stem tone becomes L or a L-stem tone becomes H. I propose that this alternation can be represented with two rules. One rule is a rightward spreading rule which causes a L-stem tone to become H. The second rule is a tone-deletion rule motivated by the OCP which accounts for the H to L stem tone alternation. The spreading and deletion rules also account for the H-stem tone alternating to a contour tone.

5.1 Autosegmental Rules

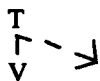
5.1.1 L→H Stem Alternation

A stem which is not marked for H-tone on the surface is lexically toneless. Therefore, it is a free segment which can be associated to a tone. If the free segment is preceded by a H-tone then it associates with the H-tone through spreading.

- (34) H
 |
 na #s bans 'I am rolling'
 1sg- roll

The stem /bans/ is toneless and therefore a free segment. It is preceded by a prefix marked for H-tone. The H-tone of the prefix spreads onto the free segment by a spreading rule.

- (35) Spreading Rule (Goldsmith 1990):



In Chilcotin the spreading rule applies from left-to-right like that represented in (35). A segment marked for H-tone will associate rightward to all unassociated segments. All free segments to the right associate with the H-tone because spreading in Chilcotin is unbounded. (36) shows how the spreading rule applies to (34):

- (36) H
 |
 nasbans násbáns 'I am rolling'

The high tone of the prefix spreads rightward to the unassociated segment. (Spreading is indicated by a broken line.) The example in (37) portrays the unboundedness of the spreading rule:

- (37) H
 |
 na #je lbans nájélbáns 'They are rolling'
 3pl-cl+roll

The H-tone spreads as far right as it can until there are no more unassociated segments. This rule is motivated by the WFC, which states that all vowels are associated with at least one tone.

In Rice's analysis of tone in Slave (1987, 1989), another Athabaskan language, she noted that H-tone spreads leftwards from the stem. Tones which are associated to prefixes are only lexically associated and they never spread. This analysis will not work in Chilcotin. Recall from examples (36) and (37) that the H-tone paired with the prefix /na-/ spreads to other prefixes and to the stem. Also note the direction of spreading did not initiate from the stem spreading leftwards; instead spreading started from a prefix (on the left of the stem) and spread rightwards. If spreading occurred in a right-to-left association ungrammatical constructions would be formed. For example, right-to-left spreading would predict the H-stem tone to spread to the prefixes in (38a).

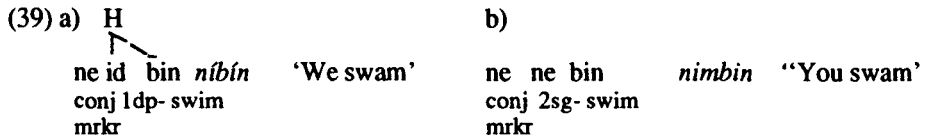
- (38) a) * H L H
 | | |
 ghe ah ?al gheh?al

In fact, in the surface form the prefixes are realized with L-tone, so the right-to-left association wrongly predicts the surface forms. (38b) represents the correct surface form of the verb in (38a):



We will see further evidence for the direction of spreading in the verbal constructions containing /id-/. The H-tone of the /id-/ prefix spreads rightward onto the toneless stem. (See example 39)

The spreading rule applied to the inflected verb containing /id/ will account for the L→H stem-tone alternation. (30) is rewritten here as (39) to show the application of the spreading rule:

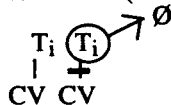


The stem /bin/ which is underlyingly toneless becomes a target for spreading. The H-tone of the /id/ prefix spreads rightward onto the stem. An example from the same primary aspect/mode paradigm is provided to exhibit the contrast of stem tone due to the /id/ prefix. The verb /nimbin/ in (b) has a toneless stem and a toneless prefix. In the absence of any H-tone the stem remains toneless until the derived representation, when L-tone is marked by default.

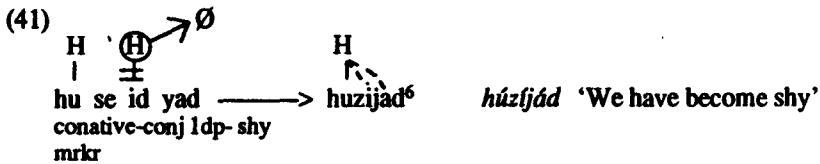
5.1.2 H→L Stem Alternations

The OCP prohibits two identical marked tones from occurring in adjacent positions on a tier. Therefore one must be deleted. In Chilcotin, the right-most tone is deleted and then is reassocated to the preceding H-tone by the spreading rule.

(40) Deletion Rule (Goldsmith, 1990)



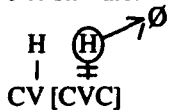
Identical tones are represented as T with the same co-indexed subscript. (41) is an example of the deletion rule applied in Chilcotin at the underlying structure.



In this example the stem tone alternation is not due to the prefix /id/ but to the H-tone of the conative prefix /u-/. The H-tone paired with /id/ is deleted and the preceding H-tone spreads rightwards.

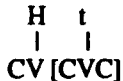
It is important to note that in Chilcotin if the deletion rule applies to the H-tone of a stem the stem does not reassociate to the preceding H-tone. (Note that the tone must have been associated to the segmental level before deletion applies in order to have any affect on whether the preceding tone could spread.)

(42) a) Deletion Rule:



When a stem tone is deleted the deleted tone leaves a tone trace.⁷

b) tone trace



A trace is a device used in syntactic analysis. In a syntactic framework a trace fills a position which was filled by a lexical element, but due to a 'move alpha' rule it no longer occupies the position. The position behaves syntactically as if it were filled; that is, no other lexical elements are permitted to occupy the position, although they could if it were empty. This is why syntacticians postulate a trace. The trace is not lexically apparent, although in the derivation it prevents the position from being occupied. Likewise in an autosegmental framework, I propose that the tone trace is associated to the stem thus preventing other tones from associating to the stem. Therefore, the stem is no longer a target for spreading.

Recall that the WFC requires all vowels to associate with at least one tone, where the tone settings are H or L. This requirement does not account for tone traces. Although a tone trace occupies the position of a tone it is not in itself a tone. Therefore, the construction in (42b) violates the WFC because the final vowel is not associated to a tone. The tone trace must be phonetically

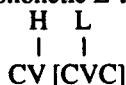
⁶ The /h-/ is epenthetic word initially. The /e-/ of the prefix /se-/ is deleted next to the /i/ of /id-/. Also, the d-effect causes the /d+y/ sequence to form /j/.

⁷ Personal communication Michael Dobrovolsky.

realized with a tone. Therefore, at the derived structure a phonetic L-tone is assigned to the position occupied by the trace by a default rule.

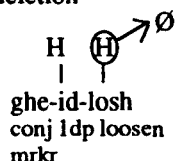
At the level of interpretation (logical form) for syntactic structures, traces which do not contribute to the semantic representation of a sentence are deleted (Lasnik and Saito 1984). In a similar manner, the tone trace is deleted once all of association rules have applied, as not only does it not contribute to the phonetic representation but it violates a fundamental condition, the WFC. At this point the default rule applies, assigning L-tone to the empty position. This corrects the WFC violation by assigning a tone to the last V position.

c) phonetic L-tone

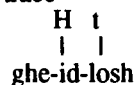


H-tone deletion can account for the H→L stem alternation. When /id-/ occurs with a H-marked stem, the two H-tones are adjacent. Therefore according to the OCP one must be deleted.

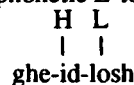
(43) a) deletion



b) trace



c) phonetic L-tone



ghídlōsh 'We loosened it'

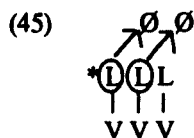
The WFC also motivates the default rule for the same reason as the spreading rule. That is, all vowels must be associated with at least one tone.

(44) **Default Rule:**

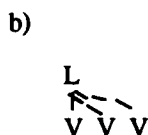
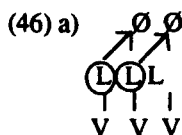
A low tone is assigned to all unassociated segments in the derived tonal representation.

Once all of the association rules have applied then the default rule fills in the gaps by assigning L-tone to those segments left unassociated. A L-tone is assigned to each unassociated segment at the derived representation. If any of the free segments are adjacent, the deletion rule must apply

in order to avoid an OCP violation. Therefore, adjacent L-tones are not permitted. All but one L-tone must be deleted and then that tone spreads rightwards. The directionality of the deletion rule becomes relevant at this point. The deletion rule specifies a right-to-left direction as seen in the H-tone deletion examples (41) and (43). If the deletion rule applied from left to right then the spreading rule could not associate the free segments to a L-tone.



The spreading rule only applies from left-to-right. Therefore the first two segments in (45) would be left unassociated and would violate the WFC. For this reason, the deletion rule must apply from right-to-left in order for spreading to associate the free segments.

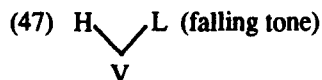


In (46a) the deletion rule applies recursively from right-to-left until only one tone remains. The remaining tone spreads onto the two unassociated segments as seen in (b).

5.1.3 H—> HL Stem Alternations

At this point, the stem alternations from H—> L and L—>H can be accounted for using the deletion rule and spreading rule, respectively. However, the H—> HL alternation remains to be explained. As stated earlier, this stem tone alternation can be represented with a combination of two autosegmental rules: the deletion and spreading rules.

Recall that affixation of /d-/ to a H-tone stem in sentence final position causes the formation of a falling tone (HL). A problem arises in analyzing the falling tone as a contour tone. Contour tones are multiply linked constructions in which two different tones are associated to the same segment.



Recall from section 3.1.2, Goldsmith stated that contour tones are multiple associations. He further specifies that contour tones only surface in languages which permit multiple associations of tones to a single V-segment on the skeletal tier. If contour tones surface sentence finally then Chilcotin must permit contour tones. However, there is no evidence for contour tones in positions other than sentence finally. Slave, another Athabaskan language does not permit contour tones

at all (Rice 1989). The existence of contour tones in Chilcotin needs to be questioned because there does not appear to be any support for contour tones being permitted.

Further problems arise in analyzing sentence final falling tone as a contour tone. In fact there does not appear to be any motivation to multiply link a L-tone to a H-tone in Chilcotin. H-tone is associated in the underlying representation while L-tone is assigned at the derived structure by a default rule. The default rule assigns L-tone only to unassociated segments. Therefore, there is no reason for the default L-tone to link to an already associated segment.

According to Cook (personal communication) open syllables which occur in sentence final position undergo vowel lengthening. If the vowel is lengthened then there are two V-segments which can associate to a tone.

The Chilcotin data strongly supports an analysis which posits that the stem tone is associated to the stem before vowel lengthening and that the second position of the lengthened vowel is inserted between the initial C and the V of the stem on the skeletal tier.

(48) C V V

When the H-tone stem is preceded by a H-tone prefix the second stem vowel does not associate through spreading although the first vowel does:

(49) a) H H
 └─┬─ ?
 te we id bji

Recall that a stem segment which undergoes a tone deletion rule does not reassociate. This suggests that it is the second vowel to which the stem tone associates. The OCP requires the stem tone to be deleted.

b) tone deletion

 H (H) → ∅
 | |
 te we id bii

The first vowel of the stem associates with the preceding H-tone but the tone trace prevents spreading to the segment whose tone was deleted.

c) spreading

 H t
 └─┬─
 te we id bii

The final vowel segment receives a phonetic L-tone by the default rule:

d) phonetic L-tone



For this reason I postulate that the sentence final falling tone is not a contour tone in the strict sense. Instead, the H and L-tones are associated to separate segments.

(50) H L
| |
C V V]]⁷

Phonetically the two vowels on the segmental level are not pronounced as two distinct segments, as can be heard in a consonant cluster such as /st/. Instead the two vowel segments are phonetically realized as one vowel with a timing sequence longer than that of one vowel and closer to that of two. The phonetic long vowel is represented as:

derived representation
VV

phonetic representation
V:

If the two vowels of a long V at the derived representation have different tonal settings (e.g. HL or LH), then the two tones will create the impression of a contour tone phonetically. The phonetic representation is as follows:

(51) Phonetic Representation:



Analysis of V lengthening

It would be logical to assume that the lengthened vowel position is inserted word finally:

CVV

However, such a representation requires a complicated derivation from the underlying to the derived representations which cannot predict the forms for constructions which have a high tone stem but not a preceding H-tone.

Recall the Initial Association Rule which associates the first tone to the first vowel. Goldsmith cites evidence from Hausa (Newman 1986) showing a right-to-left association. Although there

⁸]] indicates sentence final position.

is no evidence elsewhere in Chilcotin for the need of a directional association rule, by positing the lengthened vowel position as word final position a right-to-left association rule is necessary.

If the association rule is a left-to-right rule the initial vowel of the stem would not permit spreading from a preceding H-tone due to the deletion rule.

(52) a) deletion

H H ∅
| |
ghe-id-zuu

b) spreading: NO

H t ∅
| |
ghe-id-zuu

The default rule would assign L-tone to both vowels of the stem; when in fact the first vowel must be associated to a H-tone in order to create the HL sequence expected on the stem.

c) phonetic L-tone

H L ∅
| |
ghe-id-zuu

A right-to-left association rule avoids this problem:

(53) a) R → L Association:

H H ∅
| |
ghe-id-zuu

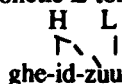
When the right-most H-tone is deleted it does not prevent the preceding H-tone from spreading to the first V-position.

b) deletion and spreading

H H ∅
| |
ghe-id-zuu

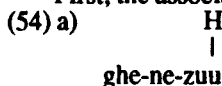
The default rule assigns L-tone to the word final V-position, which would create the expected phonetic falling tone.

c) phonetic L-tone



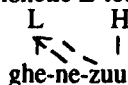
Although this analysis accounts for the H—>HL stem alternation in the presence of a preceding H-tone, it cannot correctly predict the forms in the absence of the preceding H-tone. In the absence of a preceding H-tone, a stem with a H-tone remains as a H-tone because there is no environment to alter it. However, this analysis would predict a rising tone (LH).

First, the association rule links the H-tone to the final V-position:

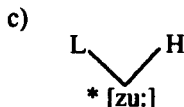


Because spreading in Chilcotin is rightwards, the first V-position would not be marked for H-tone through the spreading rule. Consequently, the default rule would assign a L-tone to all of the preceding toneless segments, including the first stem vowel:

b) phonetic L-tone



As a result the lengthened stem vowel would be phonetically realized as a rising tone but this is ungrammatical not only for this verb but there is no evidence for rising tone at all in Chilcotin:



The analysis which posits the lengthened vowel as word final rather than internal position requires a directional association rule. There is no justification for such a rule anywhere else in the grammar because all morphemes in Chilcotin are monosyllabic. Further, this type of analysis produces ungrammatical constructions. For this reason, an analysis which generates the lengthened vowel position between the C and V of the original stem, where the tone is associated with the original V, is proposed. It accounts for the data based on the two autosegmental rules presented thus far and it produces grammatical forms.

The stem alternation from H—>HL follows from the association rules postulated thus far. If the verb occurs in sentence final position there will be two vowel positions, where the extra vowel is inserted between the consonant and the vowel and the H-tone associated with the original vowel:

- (55) a) $\begin{array}{cc} \text{H} & \text{H} \\ | & | \\ \text{ghe id} & \text{z[uu]} \end{array}$ 'We (dp) once were good'
 conj 1dp-be good
 mrkr

The OCP causes the deletion rule to apply to the stem tone:

- b) $\begin{array}{cc} \text{H} & \text{H} \rightarrow \emptyset \\ | & | \\ \text{ghe id} & \text{z[uu]} \end{array}$

The spreading rule spreads H-tone to the first free segment of the stem. However, a stem segment which has undergone deletion does not reassociate and subsequently remains unassociated.

- c) $\begin{array}{cc} \text{H} & \text{t} \\ | & | \\ \text{ghe id} & \text{z[uu]} \end{array}$

At the derived representation, the unassociated segments are marked for L-tone.

- d) $\begin{array}{cc} \text{H} & \text{t} & \text{H} & \text{L} \\ | & | & | & | \\ \text{ghe id} & \text{z[uu]} & \text{ghid} & \text{z[uu]} \end{array} \longrightarrow$

The H→HL alternation is explained then in light of the fact that the falling tone regularly appears in sentence final position, a position in which the vowel of an open syllable lengthens creating an additional segment. The two segments of the lengthened vowel associate with the two tones of the falling "contour" tone. The OCP requires the stem tone to be deleted but restricts the tone-bearing unit from reassociating at the underlying structure. The preceding high tone of the /id-/ prefix spreads to the first vowel of the stem but not the second. Finally, the second vowel of the stem is assigned L-tone by the default rule.

There are some cases in which a contour tone surfaces from a H-tone in a closed syllable:

- (56) a) nítsên 'We are bad' cf. nentsén 'He is bad'
 b) hughíjíd 'We poked him' cf. hughíjíd 'I poked him' (Cook 1989)

The autosegmental analysis proposed thus far would predict vowel lengthening in the stem of (56a) and (b) in order to provide positions for the two tones (HL). Cook (personal communication) noted the occurrence of vowel lengthening in a stem with a nasal consonant in word final position. Therefore, vowel lengthening is not restricted to open syllables and the same processes apply to both open and closed syllables in sentence final position.

6.0 CONCLUSION

The variations in the stem alternations due to the first person duoplural prefix are predictable when analyzed within an autosegmental framework. The L—>H stem alternation is accounted for by the spreading rule. The H-tone of the /id-/ prefix spreads onto the toneless stem. Second, deletion accounts for the H—>L stem alternation. When the /id-/ prefix is present the adjacency of the two tones violates the OCP. The deletion rule requires the second tone to be deleted. A language specific rule prevents the stem segment of a deleted tone from being reassociated in the underlying representation. The default rule allows a L-tone to be assigned to the segment at the derived representation. Finally, the H—>HL stem alternation is the result of deletion and spreading applied to a stem in sentence final position. The HL is not a contour tone in the strict sense although phonetically it is realized as a contour tone. Instead, it is a H-L pattern associated to the two positions of the lengthened vowel. Thus Chilcotin stem alternation can be accounted for with two basic autosegmental rules: spreading and deletion, with some language specific variations.

References

- Anderson, Stephen R. (1982). Where's Morphology? *Linguistic Inquiry* 13, 571-612.
- Cook, Eung-Do. (1989). Chilcotin and Verb Paradigms. In Cook and Rice (1989).
- Cook, Eung-Do and Keren Rice. (1989). *Athapaskan Linguistics : Current Perspectives on a Language Family*. New York: Mouton and Gruyter.
- Durand, Jacques. (1990). *Generative and Non-Linear Phonology*. New York: Longman.
- Goldsmith, John A. (1990). *Autosegmental and Metrical Phonology*. Cambridge: Blackwell.
- Krauss, Michael E. (1978). Athabaskan Tone. Unpublished.
- Lasnik, H. and M. Saito (1984). On the Nature of Proper Government. *Linguistic Inquiry* 15, 235-289.
- Leben, W. (1973). Suprasegmental Phonology, MIT PhD thesis.
- Newman, Paul. (1986). Tone and Affixation in Hausa. *Studies in African Linguistics* 17, 249-67.
- Odden, David. (1986). On the Role of the Obligatory Contour Principle in Phonological Theory. *Language* 62, 353-383.
- Rice, Keren. (1987). Metrical Structure in a Tone Language: The Foot in Slave (Athapaskan). *Proceedings of the 23rd Regional Meeting of the Chicago Linguistics Society*.
- Rice, Keren. (1989). The Phonology of Fort Nelson Slave Stem Tone: Syntactic Implications. In Cook and Rice (1989).