Level Ordering in the Takelma Lexicon

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Borim Lee (1993) **Level ordering in the Takelma lexicon** *Linguistics*, vol 1. In this paper a model of a level-ordered lexicon of Takelma is proposed. This model distinguishes three basic levels in the lexicon: level 1 for stems, level 2 for stems and suffixes, and level 3 for prefixes. It is argued that prefixes, as opposed to suffixes, are not authentic units of a verb form. Arguments for the proposed levels are provided from various phonological processes which distinguish stems from suffixes or prefixes from stems and suffixes.

1. A Proposal

The verb in Takelma, an extinct Penutian American-Indian language, is the core of a sentence and requires special attention. A typical verb-form consists of a verb-stem with suffixes and prefixes added to it. Sapir (1922:63) provides the following formula for verb-forms:

(1) Verb forms in Takelma[1]
     [Loosely attached prefixes +[[verb-stem (or aorist stem derived from verb-stem)] + derivational suffixes + formal elements (chiefly pronominal)]]+ (syntactic element)

Sapir (1922) notes that prefixes in Takelma do not constitute vital grammatical structure of the verb as opposed to suffixes, which are more closely related to the verb-stem. In line with Sapir's description, we propose three levels (or strata) for the Takelma lexicon: level 1 for the stem, level 2 for suffixes, and level 3 for prefixes. Following is an approximate model of

the Takelma lexicon with relevant morphophonological processes proposed
in this work.

(2)   Takelma lexicon[2]
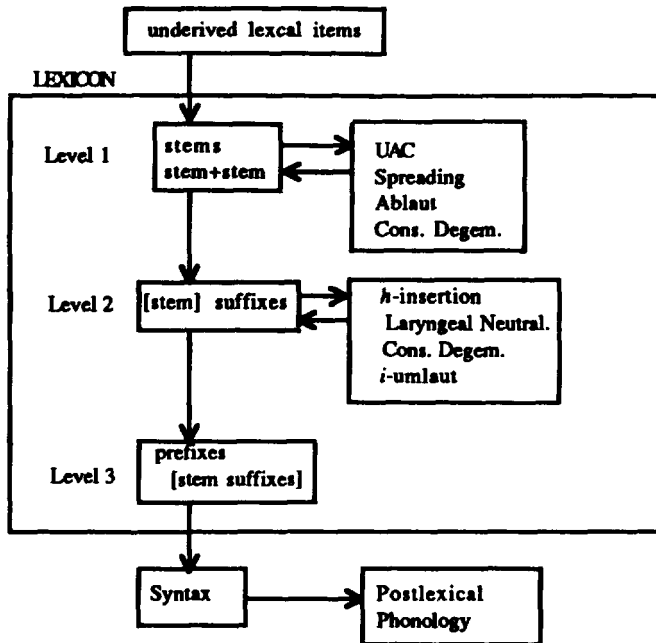
2. Level 1: Stem

Nonaorist stems and aorist stems are formed based on verb-roots using a
root-and-pattern type templatic morphology as found in Semitic (McCarthy
1979,1982, McCarthy and Prince 1989), Sierra Miwok (Smith and Hermans
1982, Kang 1990), and Yawelmani(Archangeli 1983, 1984, 1988). The
aorist, which is the most frequently used of the tense-modes in Takelma, has
different forms from the nonaorist verb-stem, which is used for tense-modes
like the future, inferential, potential, and present and future imperatives. The

difference is due to the fact that nonaorist and aorist verb stems take different templates. The following are sample representations:[3]

| (3) Nonaorist stem		Aorist stem		(S:92)
CVVC	naak	CVCV	naka	'say to'
CVCV	hala	CVVC	haal	'answer'
CVVC	toom	CVCVC	t'omom	'kill'

The examples above show that both stems use the same segmental melodies but that different outputs are derived from underlying templates which define each stem type. We assume here that stem formation in Takelma is a consequence of template morphology and that the melodies for consonants and vowels are represented on separate planes.

As in Semitic, the representation of segmental melodies obeys the segmental version of the Obligatory Contour Principle (OCP) of McCarthy (1979, 1986). This is based on the original version proposed by Leben (1973), which accounts for distributional regularities in lexical tone systems. The principle given in McCarthy (1986:208) reads as follows:

(4)   Obligatory Contour Principle
      At the melodic level, adjacent identical elements are prohibited.

Therefore, stems which appear to contain identical melodic elements are analyzed as the result of spreading. Assuming this, the representations of *t'omom* and *toom* are as follows:

(5)
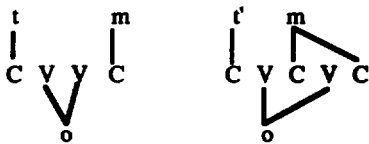
At the stem level (Level 1) the Universal Association Convention (UAC) applies, followed by Spreading. We follow the association conventions proposed by Pulleyblank (1983:31):

(6) Universal Association Convention

> Association Conventions:
> Map a sequence of tones onto a sequence of tone-bearing units,
>   a) from left to right
>   b) in a one-to-one relation.
>
> Well-formedness Condition:
> Association lines do not cross.

We slightly reinterpret the above association conventions for our purpose, since we are not dealing with tones. Thus we change "tones" into "melodic elements" and "tone-bearing units" into "skeletal slots". The UAC is assumed to apply whenever possible throughout the derivation. Associations given in (5) will involve an additional mechanism, i.e., spreading. Again following Pulleyblank (1983) we assume that spreading is not automatic, but rule-governed. We posit the following spreading rule:[4]

(7) Spreading Rule
> Spread melodic elements onto unassociated skeletal slots left to right.

Takelma also has reduplicated stems, and we argue that these are also derived at level 1. Reduplication is best described as the compounding of two stems derived at level 1, since the two parts of reduplicated stems constitute independent domains of templatic stem morphology and some phonological rules applying word-medially are blocked across the reduplicative boundary.

Briefly speaking, nonaorist and aorist reduplicated stems consist of CVC- and CVCV- respectively, followed by -CaC. We will refer to the first part as stem1 and the second part as stem 2. What is peculiar about Takelma reduplication is that it appears to be a mono-planar process by which only consonantal melodies are copied for the reduplicated stem, i.e., stem2. The reduplicated vowel always surfaces as *a* unless affected by other phonological processes. This suggests that the reduplicated vowel is underlyingly unspecified, surfacing as the default vowel *a*.

For illustration, consider the following data:

(8)   Reduplicated level 1 stems

<u>Nonaorist</u>	<u>Aorist</u>		
C_1VC_2-C_1aC_2	C_1VC_2V-C_1aC_2		(S:112)
kaxkax	kaxakax	'chew'	
keskas	kesekas	'wash'	
hemham	hemeham	'imitate'	
yulyal	yuluyal	'rub'	
silsal	silisal	'distribute'	

Another peculiarity of these reduplicated stems is related to the property of the vowels. That is, the vowel in stem 2 behaves as if it belongs to the next level, i.e., like a suffixal vowel, in that it undergoes i-umlaut and is immune to stem vowel ablaut. We attribute these phenomena to the underlyingly completely unspecified status of that vowel. Now let us elaborate on these issues.

3.   Level 2:   Suffixes

A verb stem of level 1 is combined with derivational and pronominal suffixes to make what Sapir calls "a verb form", which can function as an independent sentence.[5]

(9) a. toom - x - pi - n   >   toomxpin   (S:171)
        kill(non-aor) you(obj.) I (non-aor)   'I shall kill you'
    b. t'omom-x-pi - ?n   >   t'omooxpi?n   (S:170)
        kill(aor)   I (aor)   'I kill you'

We will consider two phonological rules that apply to this level as arguments for the level-ordered lexicon we propose for this language.

3.1 i-umlaut

The vowel system of Takelma includes ten vowels, short and long, i.e., /i, ii, e, ee, a, aa, o, oo, u, uu/. The process of i-umlaut is a case of regressive assimilation which changes all unspecified suffixal vowels from a to i to agree with the rightmost i in the suffix string.

Not all suffixes with *i* cause umlaut: Sapir(S:25) notes that pronominals like *-pi-* 'thee', *-si-* 'he to me', *-xi-* 'he me' fail to cause umlaut. Also the rule is apparently blocked when the trigger *i* is immediately preceded by an *h*, which itself appears to be epenthetic. The following examples illustrate the applicability of the rule. The forms in (10) undergo *i*-umlaut, but the rule does not apply to the forms in (11).[6]

(10) *i*-umlaut
    a. wa -k'ayay-an -í - ?n   >   wak'ayayiní?n   (S:25)
        with it-grow- caus-instr.-1 aor.subj tr   'I caused him to grow with it'
    b. i - k'um -an -anan -í-nk^h >   ik'uminininínk^h (S:26)
        inst- fix   - caus. - ind.'for'-inst.-3 fut subj tr.   'he will fix it for him'
    c. taí -xan -ikam   >   taáxinikam   (S:26)
        (<taak-xan) - we (fut.intr) find recip.   'we shall find each other'
    d. t'op-ak - ií   >   t'opikií   (S:25)
        lie as if dead - positional   'he lies as if dead'
    e. lohoo -n -anan -í- ?n   >   lohoonininí?n   (S:26)
        die - caus - ind.'for' - instr.-1 aorist subj tr   'I caused him to die
   (i.e.killed him) for him'

(11) Absence of *i*-umlaut
    a. k'ayay -an -á?n   >   k'ayayaná?n (S:26)
        grow - caus - 1 aorist subj tr   'I caused him to grow'
    b. i-k'uum-án   >   ik'uumán   (S:25)
        fix -   caus   'he fixed it'
    c. taí -xan -?t^h >   taáxan?t^h (S:26)
        (<taak-xan) - 3 fut.- find recip.   'they will find each other'
    d. t'op-ak-ás-taa   >   t'opakástaa   (S:25)
             3 p. fut.   'he will lie as if dead'
    e. lohoo -n -anán -i   >   lohoonanánhi   (S:26)
        die - caus - ind.'for' instr   'he killed him for him'
    f. wa-k'ayay-án-x-pi- ?n   >   wak'ayayánxpi?n (S:25)
        with grow caus. thee I   'I caused thee to grow with it'
    g. wa?i-t'uxúx-an-xi   >   wa?it'uxúxanxi   (S:145)
        with inst. gather caus. me   'he gathers them for me'

(10a) shows that the suffix *a* but not the stem *a* assimilates to the following instrumental *i* to become *i*. The corresponding form in (11a) without a trigger *i* does not undergo any changes. (10b) shows that the rule is unbounded. (10c) shows that *i* in a pronominal element also triggers

umlaut. (10d) is an example showing that umlaut applies also across nonsonorant consonants. In forms (11a-d), no *i* occur in the suffixes, hence all suffix vowels surface as *a*. The underlying form in (11e) meets the condition of the rule but is not affected by the rule because of the intervening *h*. The forms in (11f) and (g) indicate that the *i* of some pronominal elements are exceptional in that they do not trigger umlaut.

Adopting the theory of underspecification, we say that *a* is the default vowel of this language and is totally unspecified underlyingly. It surfaces as *a* by redundancy rules, unless affected by other phonological processes. We suggest, then, that *i*-umlaut is a level-final non-cyclic spreading rule applying at level 2. We adopt the feature geometry framework of segments developed by Clements (1985), Sagey (1986), McCarthy (1988) among others, and formulate this rule as follows:
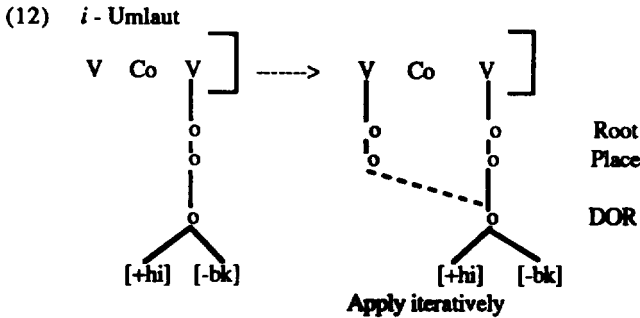
(12)   *i* - Umlaut

The *i*-umlaut rule, therefore, applies to fill in features of unspecified vowels. We argue that stem vowels are already specified and therefore are not affected by this rule. Stems with *a* also do not undergo the rule since the vowel is underlyingly specified as *a* prior to *i*-umlaut[7] and thus contrasts with suffixal unspecified vowels which have not yet received redundant specification as *a*.

In light of this, we now consider the behavior of reduplicated stems in the environment of *i*-umlaut. Whereas the vowels in stem1 are fully specified, those in stem2 are not filled with a copy of the stem1 vowel but rather just
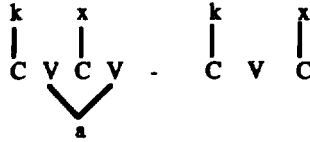
receive the default specification. Thus we expect the vowel in stem 2 to surface as *i* when followed by a trigger *i*, and otherwise as *a*.

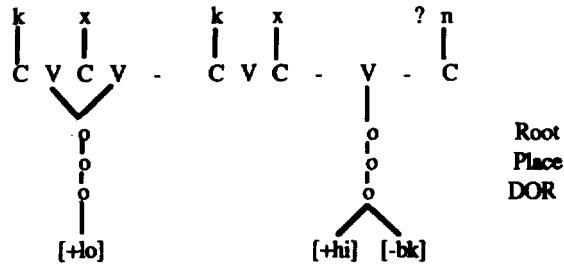The following forms demonstrate stem2 vowels assimilating to a following *i*.

(13) a. i-kaxakix-f-?n   'I scratch him'   (S:112)
         inst.pref   inst.suf. I
      b. i-ts'eléts'il-i-?n   'I rattled it'
      c. i-yulúyil-i-?n   'I rubbed it'
      d. i-smilísmil-i-?n   'I swung it'
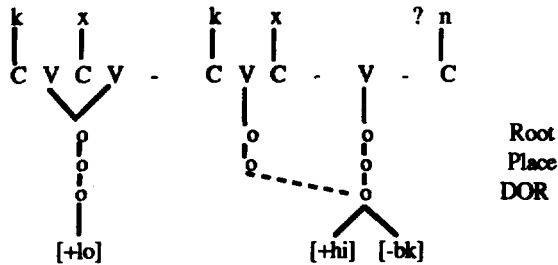
A sample derivation for (13a) is as follows:[8]

(14) a. Level 1

```
      k     x        k     x
      |     |        |     |
      C  V  C  V  -  C  V  C
          \  /
           V
           a
```

b. Level 2

```
      k     x            k     x            ?  n
      |     |            |     |            |  |
      C  V  C  V  -  C  V  C  -  V  -  C
          \  /                       |
           V                         o          Root
           o                         |
           o                         o          Place
           |                         |
         [+lo]                       o          DOR
                                    / \
                                [+hi] [-bk]
```

c. *i*-umlaut

```
      k     x            k     x            ?  n
      |     |            |     |            |  |
      C  V  C  V  -  C  V  C  -  V  -  C
          \  /               |          |
           V                 o          o       Root
           o                 |          |
           o                 o          o       Place
           |                  `-------- o       DOR
           o                           / \
         [+lo]                     [+hi] [-bk]
```

d. [kaxakixi?n]

In the above derivation, the *i*-umlaut cannot spread the features [+high, -back] to the stem vowels (*a*'s) since they already have full specification. Thus the rule is blocked from affecting stem vowels.[9]

Before we discuss another phonological process which applies at level 2, we will look at a morphological process which only affects specified stem vowels but not suffixal or reduplicated unspecified stem vowels, since this rule works in a complementary fashion with the *i*-umlaut rule that we have just seen.

3.2. Vowel Ablaut

Ablaut is a process by which stem vowels *a* and *o* become *e* and *u* respectively under certain morphological conditions. Conditions for ablaut are very complex,[10] and can not be captured in phonological featural terms. Sapir (S:61) describes the ablauted stems as referring to actions which take place "within the sphere of the person of central interest from the point of view of the speaker."[11]

Examples of vowel ablaut follow:

(15) a. saak-   'shoot'   (S:59)
         wa-seek-ik^{wh} 'wherewith it is shot'
      b. kaya-w-a?n   'I eat it'   (S:59)
         keye-w-alx-te?   'I eat'
      c. lok'^{W}-   'trap'   (S:60)
         lu?-x^{W}ak^{W}atinin   'I'll trap for him'
         (from /lok'^{W}-xa-/)
      d. nook^{W}-   'paint'   (S:60)
         al-nuuk^{W}a   'he painted his own face'

Like *i*-umlaut, ablaut also distinguishes stem vowels from suffix or epenthetic vowels, but it differs from *i*-umlaut in that it affects only stem vowels. This is easily dealt with by putting the ablaut rule at level 1. Being

a level 1 rule which ceases to apply at level 2, it cannot affect suffixal vowels. However, ablaut also does not apply to reduplicated stems:

(16) a. t^hkaalt^{h}kal   'it bounced from her'   (S:61)
      b. t^hkeelt^{h}kalsi   'it bounced from me'   (S:61)

These forms are explained if we assume the ablaut to be a process of stem vowel allomorphy which affects underlyingly specified vowels. The reduplicated stem2 suffix (along with other suffixes in this language) is not provided with an underlying vowel melody and, hence, is immune to ablaut.

3.3. Laryngeal Neutralization

Another process claimed to apply at level 2 is a rule of laryngeal neutralization. Let us first consider the consonant inventory of Takelma given in the following table.

(17)

		Labial	Coronal	Dorsal
Stops	lenis	p	t	k k^w
	fortis	p'	t'	k' k^w
	aspirated	p^h	t^h	k^h k^{wh}
Spirants	lenis		s	x
	fortis		ts'	
Sonorants	liquid		l	
	nasal	m	n	
	glide	w	y	
	laryngeal			h ?

All obstruents are voiceless and sonorants are all voiced, with the exception of the voiceless laryngeals /h, ?/ which are also classed as sonorants.

A constraint on medial clusters allows only lenis consonants between a preceding obstruent and a following vowel. Sapir (S:56) notes that "for a

cluster of stops in medial position, the last can be a media only, while the others are aspirated surds." Consequently, underlyingly aspirated stops are deaspirated after aspirated segments as shown in (18a).[12]

(18) a. xeép^{h}ka?   'I did it'   (S:40)
          (<xeep-k^h-a?)
          nonaor(do)-inf-I
          tín?xka?   'I was stretching out' (S:41)
          (<tin-k'-x-k^h-a?)
          nonaor(stretch)-inf-I

      b. xeép^{h}k^h 'he did it'
          (<xeep-k^h)
          tín$^?$xk^h 'long object was stretching'
          (<tin-k'-x-k^h)
          al-xfi$^?$k^{h}a?   'I saw it'   (S:40)
          (<al-xiik'- k^h-a?)
          eye see   inf. I
          alxfi$^?$k^h 'he saw it'

      c. kaiwát^{h}pa?   'ye shall eat it'   (S:41)
          (<kay-w- at^{h}pa?)
          eat   ye(fut.tr.)

      d. kayawát^{h}p^h 'ye ate it'
          (<kaya-w- at^{h}p^h)
          aor.   ye(aor.tr.)

      e. p'alá-p^h-te?   'I relate a myth'   (S:119)
          I(aor.intr.)
          thkeey-álx-te?   'I run around'   (S:118)

      f. senésan-t^{h}e?   'I whoop'   (S:51)
          nakaí-t^{h}e?   'I say'   (S:48)

      g. ta-smai-má-s-tee   'I shall smile'   (S:183)
          I(non-aor.intr.)

      h. taa-skék'i-t^{h}ee   'I shall listen'

      i. ais-ték^h 'my property'   (S:235)
          ts'ifk^h-tek^h 'my meat'

      j. séel-t^{h}ek^h 'my writing, paint'
          wiláu-t^{h}ek^h 'my arrow'

For most segments with alternating laryngeal features, it is generally difficult to determine the underlying form, due to various phonological

processes affecting obstruents. Obstruents are aspirated syllable-finally (and word-finally). Also, an accent causes aspiration on a following obstruent, a process thought by Sapir to be the same as the rule of h-insertion discussed above. For the third form in (b) we may say that the k^h is underlying because it occurs prevocalically and accentual considerations are not a factor in this position. But in (18a) the same inferential marker surfaces as k after an (aspirated) stop. Sapir (S:56) notes that *xeep^{h}ka?* stands for a theoretical *xeepk^{h}a?*, a phonetically impossible form. Comparison of the forms in (i) and (j) suggests underlyingly aspirated t^h in suffix initial position, since the aspirated t occurs in syllable-initial position after a falling pitch.

Despite the difficulty in determining the underlying form of alternating aspirated vs. lenis obstruents, we can make a surface generalization that clusters always surface as $C^h\text{-}CV$. We can account for the generalizations regarding medial clusters by the following laryngeal neutralization rule:

(19)
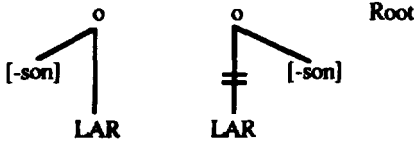
In the examples in (18), neutralization always occurs between stems and suffixes or between suffixes, i.e., the environment is derived at level 2. We claim that it is a level 2 rule. It does not apply if the condition is satisfied at level 1, e.g., between stem1 and stem2 in reduplicated verb stems.

(20) a. paa-t^{h}e?k^{h}t^{h}axtaa   'they will all bob up'   (S:113)
          (<t^{h}ek'-t^{h}ak-x)
      b. hee?-i-k^{h}a?p^{h}k^{h}ipin   'I shall chip them off'   (S:112)
          (<k^{h}ap'-k^{h}ap)

Likewise, neutralization is not evidenced between prefixes and stems, which supports the claim that prefixes belong to a different level from suffixes.

(21)   a.   tak^h-t^{h}ek'e-xa-te?   'I smoke'   (S:75)
            over smoke   intr. I   (literally, I raise [tobacco-smoke]
                                       over [one's head].)
       b.   tak^h-t'emeexik^h 'we assembled together' (S:75)
            (<t'emem-x) we

On the basis of these facts, we conclude that laryngeal neutralization is a level 2 rule which ceases to apply after level 2.

4.   Level 3:   Prefixes

4.1.   General Remarks

Body-part prefixes and local prefixes are genuine prefixes of this language.[13] Body-part prefixes are one of the most interesting features and Sapir (S:72) notes that they may be regarded to some degree as verbal classifiers. In the following table, examples of body-part prefixes are given:

(22)   Body-part Prefixes

Prefix	Literal meaning	Local meaning
tak^h	head	over, above
ta, te	mouth, lips	in front
taa	ear	alongside
sin	nose	
i	hand	
xaa	back, waist	between, intwo
kel	breast	facing
ti?	anus	in rear
k^{w}el	leg	under
sal	foot	down, below
al	eye, face	to, at

To illustrate the use of these prefixes, consider the following examples. In all forms, the first usage shows the literal meaning and the second the local meaning of the body-part prefix.

(23)   a.   tak^h-ts'ayaa-p^h-te?   'I washed my head'   (S:75)
            tak^h-waak-a?n   'I finished it'
                                       (literally, I bring it on top)

b. i-ts'ayaa-p^h 'he washed his hand'   (S:79)
i-hemem   'he wrestled with him'
c. sal-ts'ayaa-p^h 'he washed his feet'   (S:83)
hee?-sal-t^{h}kun   'kick him off!'
d. al-ts'aya-k-a?n   'I washed his face'   (S:84)
al-seek-i?n   'I bowed to him'   (S:85)

While local prefixes may be treated as independent adverbs, we consider them as prefixes because they can occur between body-part prefixes and verb stems.

(24)   Local Prefixes

Prefix	Gloss
han	across, through
hee?	off, away
me?	hither
wa	together
paa	up
pai	out, out of house
p'ai	down
apai	into house
pam	up into air
xam	in river

Examples follow:

(25)   a. han-yata-t^{h}e?   'I swim across'   (S:87)
b. me?-kini?k^h 'he came here'   (S:88)
c. paa-wa-wiliik^{wh} 'he traveled up along'   (S:88)
     (literally, he went up having it together with him)
d. kel-pam-saak^{wh} 'he shot it up'   (S:90)
e. kel-pam-?al-yowo?   'he looked up'   (S:90)
     look (eye-be)

Although they have the important function of giving a verb-form its exact material content (S:64), verbal prefixes constitute a separate domain in the phonology in that lexical rules which apply at level 1 and/or level 2 do not apply across the prefix-stem boundary. We have already noted that laryngeal neutralization does not apply across this boundary to affect prefixes

derived at level 3. In this section, we will discuss a rule that seems to apply at both level 1 and 2 but not at level 3.

4.2.   Anti-degemination

Geminate consonants, both "true" and "false", are prohibited in a Takelma word.[14]

(26)   a. true geminate   b. false geminate

If they should occur as a result of morpheme concatenation, degemination results. Laryngeal features and secondary labialization of the deleted segments, however, survive the degemination. Some examples follow:

(27) a. mot^h - tek^h > mot^hek^h (S:43)
          son-in-law   my   'my son-in-law'
      b. laak - $k^{wh}a$ - k^h > $laak^{wh}ak^h$ (S:43)
          give to eat 3 p obj inf   'he gave him to eat'
      c. te - k'iya-k -k^hi?   > $tek'iyak^h$i?   (S:43)
          ahead   go   if   'if it goes on'
      d. muluu-k' - $k^{wh}a$ > $muluu?k^{wh}a$ (S:109)
          swallow   3 p obj   'he swallowed him'
      e. kinaa-k - k^{wh} -k^hi? > $kinaak^{wh}$i?   (S:43)
          come   refl   if   'if he comes'

We analyze this as a two-step process: *merger* of two identical (except for laryngeal and secondary feature) consonantal melodies, triggered by the OCP, followed by *degemination* of one of the two skeletal slots linked to the same consonant, motivated by the language-specific constraint against adjacent geminate consonants. This is schematized in the following illustration:

(28)

$$X - X \xrightarrow[\text{Merger}]{} X \quad X \xrightarrow[\text{Degemination}]{} X$$

(with C under each X position)
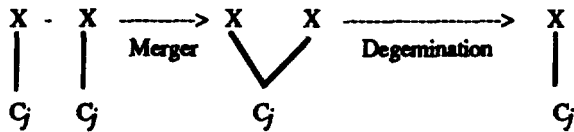
Whereas the examples in (27) are all derived at level 2, evidence for degemination at level 1 is hard to find because stems with identical consonants are rare and, furthermore, are hardly given in reduplicated forms in the data. However, there is at least one example that does show a sign of degemination.

(29) | Nonaorist | Aorist | (Sapir's Type 12) |
      | saas | saasas | 'stand' | (S:220) |

Sapir's Type 12 verbs are C_1VVC_2 nonaorist and $C_1VVC_2-C_1aC_2$ aorist. Based on this, we assume that *saasas* was derived form *saas-sas* by degemination. With this and with no evidence to the contrary, we conclude that degemination applies at level 1 as well as at level 2.[15]

However, geminate consonants are not degeminated at level 3.

(30)   a. $tak^h-k^hiwik^haw-k^{wh}$-an 'I brandish it over my head' (S:75)
       b. k^wel-leis-tee 'I shall be lame' (S:102)
          (<ley-s)
       c. al-look^w-i?n 'I stretched it out to him' (S:84)

The facts on degemination support the claim that prefixes belong to a different level than suffixes and stems.[16] Degemination applies only at levels 1 and 2 and not at level 3.

5.   Conclusion

In this work, we proposed a level-ordered lexicon for the Takelma language within a framework of Lexical Phonology and Underspecification Theory. We have shown that a number of phonological processes that we

have examined throughout this paper may boil down to one conclusion: in a Takelma verb form, a stem(s) forms a phonologically closer unit with a suffix(es) than with a prefix(es). We therefore suggest that stem and suffix in this language function as a prosodic word whereas a complete verb form with prefix makes a morphological word.

NOTES

[1] Brackets are mine. Syntactic elements in Sapir are suffixes like conjunctives, quotatives, e.g., -ta? 'when', -hi? 'it is said', and -si? 'but, and', and we assume that they are outside the verb form.

[2] Since Level 3 is justified solely on morphological grounds, we could perhaps dispense with it entirely.

[3] The alternation of t' and t is the result of a morphological consonant mutation rule. The sources of data referred to in this work will be identified in the following way: Sapir's grammar of 1922 is abbreviated as (S:page number), and the Texts of 1909 as (T:page number).

[4] McCarthy (p.c.) notes that the association conventions required in (6) and (7) also seem to be the same as those required in Semitic.

[5] Deletion of a repeated consonant, m in this case, before a connecting suffix x in (9b) is commonly observed in Sapir's type 8 verbs.

[6] Deletion of k in (10c) is by a regular phonological rule of Takelma.

[7] McCarthy (p.c.) suggests that we could assume cyclic application of default rules as suggested by Rice (1988) and Kiparsky (1989) to explain why the stem vowel is specified.

[8] CV planar segregation for verbal stems is motivated by root-and-pattern type templatic morphology for stem formation. We propose to extend this notion of CV planar segregation to the entire domain of verb forms (and possibly the whole language) based on the fact that suffixes are usually monosyllables with vocalic melodies restricted to a and i, with a few exceptions in the pronominal suffixes.

[9] In certain forms, the application of i-umlaut is constrained by a phonetic barrier, h (Sapir S:25). Refer to Lee (1991) for further discussion on this matter.

[10] For a list of morphological conditions for ablaut, see Sapir (S:59-62).

[11] Sapir (S:61) notes that "the palatal ablaut will be explained as the symbolic expression of some general mental attitude rather than of a clear-cut grammatical concept."

[12] We assume that fricatives are inherently [SG].

[13] Sapir considers certain particle elements and incorporated nouns as possible prefixes of verb forms, but he persuasively concludes that they are not genuine prefixes.

[14] This only applies to adjacent geminates unless otherwise stipulated, since we allow long distance geminates that result from templatic stem formation.

[15]The interrogative particle -*ti*, which is presumably a syntactic element, is not degeminated.

    helel-at^h-ti   'did he sing'   (S:16)

    xeme-l-at^h-ti 'do you wish to eat' (S:43)

Instead, a schwa-like reduced vowel, *i*, which is not an underlying Takelma vowel is inserted to keep the identical consonants apart. The function of this inserted vowel can be understood as another strategy to prohibit geminate consonants.

[16]We treat prefixes as part of a word instead of an independent word because of the following properties. First, prefixes provide meaning for verb forms, i.e., there are many verb stems which do not occur without appropriate prefixes. Secondly, prefixes seldom receive accents, and then only if the verb stems do not have accents, since only one accent is permitted per a word.

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