Stress Assignment in Halkomelem-Cowichan Roots

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1.0 INTRODUCTION

Until recently the systems of stress assignment in Coast Salish languages have not been studied extensively with the exceptions of Demers and Horn's (1978) and Davis's (1984) analyses of Squamish, and Bianco (1995) and Urbanczyk (1996) on Northern Lushootseed. In this paper I present an analysis of stress placement on roots in *həlˀq'əmíˀnəmˀ-qə́wˀəcen*, the language of the Cowichan people of Vancouver Island, British Columbia, which is more accurately described as a sub-dialect of the Island dialect of Halkomelem. Cowichan was originally spoken in a collection of villages in the areas of Cowichan Bay and the Cowichan River including the site of the modern town of Duncan, B.C.[1]

This study focusses on the assignment of primary stress on unaffixed roots in the language. When one considers only the limited set of data in (1) it appears that stress is randomly assigned in Cowichan. That is, roots can be stressed on any vowel. In order to more clearly illustrate the patterns of stress placement, I employ templates which pick out the nuclear vowels in a root. For now I distinguish only between schwa [ə] in opposition to as any full vowel [v].

(1) **disyllabic roots** / **trisyllabic roots**

a.	[ə́ ə]	c'ə́mˀəš	*herring roe*	h.	[v́ v ə]	θéθiˀən	*blood*
b.	[ə ə́]	wəƛ'ə́c'	*fall, stumble*	i.	[v́ ə v]	xʷíyənemˀ	*listen*
c.	[v́ v]	síˀemˀ	*well thought of*	j.	[ə́ ə v]	yə́čʷəleˀ	*bald eagle*
d.	[v v́]	ˀiˀéɬ	*dismay (paticle)*	k.	[ə v́ v]	qəmíneˀ	*abalone*
e.	[ə́ v]	sə́nˀƛ'eˀ	*eldest brother*	l.	[v v́ ə]	sx̣ʷiméɬəɬ	*place near Esquimalt*
f.	[ə v́]	sqʷəméyˀ	*dog*	m.	[ə ə v́]	smətəlí	*ball game*
g.	[v́ ə]	kʷ'áyəkʷ	*fish (verb)*	n.	[ə ə́ v]	məqə́yeˀ	*coffin*

The data which consist of disyllabic roots in (1) can be stressed on either the left or the right syllable regardless of the quality of the nuclear vowel. In roots which contain only schwas and no full vowels, as in a. and b., stress alternates between the left or right syllable respectively. In c. and d. which contain a sequence of the full vowels [i] and [e], the same alternation occurs. In e. and f. sequences of [ə] followed by the full vowel [e] are also alternately stressed. Finally, in g. the sequence of a full vowel [a] followed by [ə] is stressed on the leftmost syllable which contains the full vowel. No data exist which display a [v ə] pattern in which stress falls on the rightmost syllable.

In the data which contain three syllables stress placement is likewise variable. In h., i., and j. stress falls on the first (leftmost) syllable regardless of vowel quality. In k. and l. stress "skips over" the first vowel, schwa and a full vowel respectively, and the medial syllable receives stress. In m. and n., which each contain [ə ə v] sequences, stress alternates between the medial and the final (rightmost) nuclear syllables.

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Without any distributional facts concerning the frequency of the occurrence of the patterns illustrated in (1) the questions to be addressed are: "Which patterns are anomalous?" and "What is an explanation for the variation found in those whose occurrences are statistically significant?" In this paper I will argue that alternations in stress patterns in Cowichan are determined in part by a tendency toward overall assignment of stress to the leftmost syllable, and in part by a sonority hierarchy of vowels such that more sonorous vowels attract stress away from less sonorous vowels. I will show how the interaction of constraints concerning directionality and the relative sonority of syllable nuclei account for the placement of stress for more than 95% of Cowichan roots.

2.0 PHONOLOGY and ROOT SHAPES

Cowichan is similar to other Salish languages in that it has a rich inventory of consonants while the vowel inventory is simple.

(2) a. **Consonant Phonemic Inventory**[2]

Obstruents											
	p	tθ	t	c	č		k	kʷ	q	qʷ	
	p'	tθ'	t'	c'	č'	ƛ'		kʷ'	q'	qʷ'	
		θ	s		š	ɬ		xʷ	x̣	x̣ʷ	
Sonorants											
	m		n		y	l		w			h
	m'		n'		y'	l'		w'			ʔ

b. **Vowel Phonemic Inventory**

i			u
(ii)			(uu)
e	(ə)		
(ee)		a	
		(aa)	

The reduced vowel schwa [ə] and the long vowels [vv] are given in parentheses. Although the status of schwa is not relevant to the following discussion, in Bianco (1996) I argue that schwa is not a phoneme of Cowichan; but rather that its occurrence is predictable as the result of the requirements of syllable structure in the language. However, the status of long vowels in Cowichan is not clear to me; their surface shape may sometimes be conditioned by the presence of glottalized sonorant consonants, and may sometimes be the synchronic reflex of historically underlying sequences of vowels plus the glottal segments [ˀ] or [h]. I do not address their phonemic reality further here, but lacking a full analysis for their status, I do not include those roots which contain long vowels in the counts given below.

The counts in (3) show that Cowichan roots do not generally contain more than four consonants with the result that about half of the total number are monosyllabic and roots in the language are generally maximally trisyllabic.

[2] The occurrences of [tθ], [č], [č'] and [k] are marginal: [tθ] is found only in deictics; [č] and [k] are almost exclusively limited to loanwords; and [č'] is found only in forms of the root *č'əkʷ'* 'fry'. The symbol [x̣] represents a voiceless uvular fricative.

(3) **Cowichan Root Count**

1C	22	1.6 %
2C	629	46.7 %
3C	513	38.1 %
4C	161	11.9 %
5C	24	1.8 %

3.0 CONSTRAINTS on STRESS

In this paper I apply the tenets of Optimality Theory (Prince and Smolensky, 1993) which assumes that a set of potentially violable universal constraints are ranked against one another in the evaluation of a theoretically infinite number of possible outputs of a form. The ranking of possible candidates provides a language specific output which in the case of this analysis, results in a particular pattern of stress placement. The restrictions on Cowichan stress assignment are from Prince and Smolensky (1993) and McCarthy and Prince (1993a,b) and are given in (4). I discuss the interpretation of the individual consraints as they are introduced.

(4) **Constraints on Stress Assignment**

FOOT-BIN
  Feet are binary at some level of analysis (σ σ)
FOOT-FORM (TROCHAIC)
  Ft → ($\acute{\sigma}_S$ σ_W) i.e. S=strong (stressed); W=weak (unstressed)
PARSE-SYLL
  All syllables must be parsed
ALIGN-PrWd,L Foot,L
  Align every prosodic word, left with a foot, left
PEAK-PROM
  Primary stress falls on the most sonorous peak in the word (foot)
NON-FINALITY
  No prosodic head of the prosodic word is final in the prosodic word

In the following discussion I will show that within a framework of Optimality Theory (OT), stress in Cowichan falls on a particular syllable as the result of its attraction in two, sometimes opposing, directions: (1) towards the leftmost syllable in the word; and (2) towards the most sonorant syllable in the word.

4.0 DATA and DISCUSSION

This analysis of stress assignment in Cowichan is perhaps most easily appreciated if we consider separately the classes of disyllabic and trisyllabic roots. Disyllabic forms most clearly illustrate the tendency towards leftward stress assignment and also present the simplest motivation for the use of templates which distinguish between schwa and full vowels.

4.1 Disyllabic Roots

Although the data in (1) above apparently indicates that stress is randomly assigned, in fact Cowichan most generally exhibits an overall pattern of leftward directionality.

4.1.1 Leftward Directionality

Consider the placement of primary stress which is illustrated in the data in (5).

(5) a. [ə́ ə]	b. [$\acute{v}_1$ v_1]	c. [v́ ə]	d. [$\acute{v}_1$ v_2]
mə́nˀə *offspring*	t'ác'aˀ *roasting stick*	sáˀəkʷ *Sooke*	ˀéli *go away*
x̣ə́ləmˀ *chiton*	t'éqeˀ *salal berries*	ˀéwə *come here*	sɬéniˀ *woman*
qə́ləm *eye*	x̣ácaˀ *swamp*	qéləx̣ *digging stick*	stᶿ'áqʷiˀ *spring salmon*

The data in (5) show that directionality of stress assignment in disyllabic roots is leftward when (1) the nuclei of the two syllables are identical, either schwas as in a. or full vowels as in b.; (2) when a full vowel nucleus precedes a nuclear schwa as in c.; and (3) when the nuclei consist of two full vowels.

Within an OT anlysis leftward stress placement for the data in (5) is determined by two constraints on foot structure. The constraint FT-BIN requires that syllables are obligatorily parsed into binary feet; a disyllabic root must be parsed as [(σ σ)] and not as *[(σ)(σ)]. The FT-FORM constraint requires stress feet to be trochees, i. e. stressed on the left syllable (left-headed). In the following section however, we see that leftward directionality in disyllabic roots is not always consistent.

4.1.2 Stress and Schwa

In contrast to the data in (5) above, the data in (6) display rightward directionality which produces iambic feet: i.e. stressed-unstressed syllable sequences (σ σ́), in violation of the constraints on foot structure.

(6)	a.	šəmén	*enemy*	b.	c'əxʷléˀ	*sometimes*
	c.	qəmáˀ	*nurse (feed)*	d.	šxʷənˀwás	*cloudy*
	e.	təwˀínˀ	*raw*	f.	tᶿ'əykʷíkʷ	*blue elderberries*

In the data in (6) the sequences of nuclear vowels consist of a schwa followed by a full vowel. I will argue throughout this paper that the motivation for this divergence from the overall pattern of leftward directionality is the result of constraints upon the relative sonority of vocalic nuclei.

4.1.2.1 Peak Prominence

Kinkade (1998), among many other researchers, has examined the properties of schwa versus full vowels in Salish languages, particularly with respect to the often acknowledged phenomenon of a preference for stress to fall on full vowels over schwa. (See Carlson 1989, Czaykowska-Higgins 1993, Matthewson 1994, Bianco 1995, and Urbanczyk 1996, among others.) In OT the attraction of stress to full vowels can be interpreted as a constraint upon the relative sonority of vocalic nuclei which arise from a sonority hierarchy of vowels.

Prince and Smolensky (1993:39) propose the constraint Peak-Prominence (PK-PROM) in order to "establish the relation between the intrinsic prominence of syllables and the kind of elevated prominence known as stress." The constraint holds that the element which is the most sonorant (that is, which occupies the highest position on a hierarchy of sonority of sound segments), is the most optimal nucleus of the prosodic constituent syllable. The sonority scale grades phonemes such that [t] is the least sonorant consonant and [a] is the most sonorant vowel.

(7) **PK-PROM**
*P/t ..... >> n ..... >> a

The peak prominence constraint reflects the fact that cross-linguistically obstruents are the least likely segments to occur in the peak (nucleus) position of a stressed syllable, and that vowels (specifically [a]) are the most likely segments to receive stress.

4.1.2.2 Stress and the Sonority Hierarchy

The constraint gives rise to the sonority hierarchy of vowels given in (8) such that [a] is the most sonorant and schwa is the least sonorant vowel on the hierarchy.

(8) **Sonority Hierarchy of Vowels**
a >> e,o >> i,u >> ə

Kenstowicz (1994) expands the peak prominence constraint and shows that for some of the world's languages the most optimal target for stress assignment within a word is the the syllable which contains the most sonorant nucleus. In order to explain the attraction of stress to more sonorant vowels he formulates the PK-PROM constraint into a set of micro-constraints which apply at every level of the sonority hierarchy. In this way separate constraints for each segment can be ranked according to their relative sonority. The overarching constraint is given in (9).

(9) **PK-PROM Constraint**
*P/ə >> *P/i.u *P/e,o *P/a

The hierarchy in (9) is expressed as a negative constraint in which each dominance relation is to be considered as a separate (micro-) constraint. Crucially, the constraint must be interpeted as a prohibition against, rather than a requirement for a particular nucleus. The constraint implies an inverse relationship between the position of a vowel on the the sonority hierarchy and its suitability as a nuclear syllable. In other words, the constraint can be interpreted to read "It is more important to avoid stressed [ə] than it is to *avoid* a stressed [e], etc." By transitivity, it is "better" to stress any full vowel than a schwa in a word.

The tableau in (10) demonstrates that the constraint against stressed schwa, *P/ə, is ranked above the constraint which requires a trochaic (left-headed) foot.

(10) **[ə v] → [ə v́]**

θəˀit 'true'	*P/ə	FOOT-FORM
a. ☛ θəˀít		*
b. θə́ˀit	* !	

The result of the constraint hierarchy *P/ə >> FT-FORM produces an iambic (right-headed) stress foot for roots which contain [ə v] sequences in contrast to the more general trochaic pattern in Cowichan disyllabic roots.

An important tenet of OT provides for violations (*) of constraints by the most optimal output candidate (☛) iff those violations involve constraints which are ranked lower on the constraint hierarchy than those which are violated by unsuccessful candidates. (By convention the constraint hierarchy is represented horizontally in descending order from left to right.) Thus, although candidate b. displays a required trochaic foot form, it violates the more highly ranked constraint against stressed schwa. This fatal (!) violation resolves the conflict with the result that the most optimal (not perfect) candidate a. is the output.

PARSE (McCarthy and Prince 1993a) is a constraint on licensing of prosodic constituents: segments must be dominated by a syllable node and PARSE-SYLL requires that in turn, syllables must be parsed into metrical feet. The parsing constraint must be more highly ranked than *P/ə in order to prevent a lack of footing while also avoiding stressed schwa. I return to the ranking of PARSE-SYLL in section 4.2.2.1.

(11) **[ə v] → [(ə v)]**

θəˀit 'true'	PARSE-SYLL	*P/ə
a. ☛ (θəˀít)		*
b. θəˀit	* !	

The data in (6) illustrate the need to distinguish schwa from full vowels. Thus far the ranking which has been established for the constraint hierarchy is PARSE-SYLL >> *P/ə >> FT-FORM. I will return to the discussion of disyllabic roots in section 4.2.2.2 when I will consider stress placement with respect to those roots which contain sequences of non-identical full vowels.

In the following section I provide further evidence from trisyllabic roots that the peak prominence constaint is active in the evaluation of stress assignment of stress in Cowichan.

4.2 Trisyllabic Roots

In the previous section I demonstrated that in disyllabic roots which have a [ə v] template, stress falls on the full vowel in contrast to the general pattern of leftward directionality. In this section I show that the constraints on directionality and sonority interleave to produce a variety of patterns in trisyllabic roots. In the following sub-section I demonstrate the ranking of the four constraints on directionality.

4.2.1 Directionality Constraints

In the case of trisyllabic roots whose syllable nuclei contain no full vowels, constraints on foot stucture and alignment interact to produce stress in a leftward direction.

(12) **[ə ə ə] Templates**

a. tx^{w}ə́məcən *September*
b. lə́k$^{w'}$əmən *Esquimalt*
c. ʔə́lməcən *wait*

4.2.1.1 Parse

The PARSE-SYLL constraint requires syllables to be parsed exhaustively. However, in the case of odd-parity words (i.e. those which have an odd number of syllables), PARSE-SYLL must necessarily conflict with the constraint FT-BIN. (Recall that FT-BIN requires metrical feet to be binary, i.e. bounded into disyllabic feet.) In Cowichan FT-BIN dominates PARSE-SYLL with the result that violation of the lower ranked constraint is unavoidable. For example, a trisyllabic root such as *cəlʔéqəɬ* 'yesterday' can be parsed into binary feet as either [(*cəlʔé*) *qəɬ*] or [*cəl* (*ʔéqəɬ*)]. In OT the domination relation renders the failure to parse one syllable as minimal.

(13) **[ə ə ə] → [(ə́ ə) ə]**

tx^{w}ə́məcən 'September'	FT-BIN	PARSE-SYLL
a. ☛ (tx^{w}ə́mə)cən		*
b. (tx^{w}ə́məcən)	* !	
c. (tx^{w}ə)(mə)(cən)	* !	

Candidates (13)b. and c. violate the highly ranked constraint on foot binarity: b. contains a trisyllabic foot, while c. contains three monosyllabic feet.[3] Candidate a. is successful because it violates only the lower ranked constraint on parsing and therefore, its violation is minimal and not fatal.

The constraints that I have introduced thus far demonstrate an interaction and therefore ,a dominance relation between two pairs which are not otherwise ordered with respect to one another.

(14) *P/ə >> FT-FORM
FT-BIN >> PARSE-SYLL

A fourth possible output candidate in (13) above parses the root as tx^{w}ə́(məcən). In the following section I demonstrate that the rightward parse is prohibited by an alignment constraint.

[3] For the sake of simplicity in representation I have interpreted the violation of FT-BIN in (13)c. as a single, fatal instance of failure to parse feet into disyllables. Alternatively, each bracketed foot could count as a violation in which case three asterisks would express this interpretation. In practice the inviolability of FT-BIN produces the correct output without my addressing this question further here.

4.2.1.2 Foot Alignment

Alignment constraints as laid out in Prince and Smolensky (1993) require that the edges of grammatical categories coincide with edges of prosodic categories. The constraint ALIGN-ProsodicWord,Left, Foot,Left ensures that feet will be parsed from the left by its requirement for every *prosodic word* in Cowichan to begin with a foot [(σ σ) σ].[4] Therefore, the root in (13) must be parsed as [(*tx^{w}ə́mə)cən*] and not as *[*tx^{w}ə(mə́cən)*] although both candidates obey the FT-FORM constraint.

Data from roots which contain [ə v ə] sequences provide evidence for the inviolability of AL-PrWd,L in the constraint hierarchy. They also provide further evidence that when schwa precedes a full vowel it appears to be invisible as a candidate for stress assignment.

(15) **[ə v ə] Templates**

a. c'əwx̣íləm *Tzoubalem*
b. q$^{w'}$əyíləš *dance*
c. k^{w}ənánəɬ *over there*

For trisyllabic roots which contain [ə v ə] sequences such as *q$^{w'}$əyíləš* 'dance', six possible candidates for evaluation exist.

(16) **[ə v ə] Candidates**

a. (q$^{w'}$əyí)ləš
b q$^{w'}$ə(yíləš)
c. (q$^{w'}$ə́yi)ləš
d. q$^{w'}$ə(yilə́š)
e. (q$^{w'}$əyíləš)
f. (q$^{w'}$ə)(yí)(ləš)

Candidates (16)e. and f. are non-optimal because they violate the high-ranking constraint FT-BIN as I demonstrated in the tableau in (13) above. The tableau in (17) demonstrates the evaluation of candidates (16) a. and b. Since neither candidate violates the constraint against stressing schwa, *P/ə, the conflict is resolved according to the constraint hierarchy AL PrWd,L >> FT-FORM.

(17) **[ə v ə] → [ə v́ ə]**

q$^{w'}$əyíləš 'dance'	AL-PrWd,L	FT-FORM
a. ☛ (q$^{w'}$əyí)ləš		*
b. q$^{w'}$ə(yíləš)	* !	

[4] Cohn (1989) on Indonesian and Czaykowska-Higgins (1993) on Nxaʔamcín argue that prefixes in these languages constitute independent phonological words which are unaffected by constraints on root stress. My analysis similarly assumes that the alignment constraint entails the exclusion of prefixes with respect to stress assignment in Cowichan.

The tableau in (17) shows that even when *P/ə is obeyed the alignment constraint dominates FT-FORM which ensures that the optimal candidate does not have an initial unfooted syllable. The candidate in (16)d. is vacuously disallowed because the parse *qʷə (yiləš́)* violates AL-PrWd,L and it contains a stressed schwa in violation of *P/ə.

The final candidate to consider, *(qʷə́yi)ləš* does not violate the highly ranked AL-PrWd,L but is rejected because schwa is stressed as the tableau in (18) demonstrates.

(18) **[ə v ə] → [ə v́ ə]**

qʷˀəlíyəš 'dance'	AL-PrWd,L	*P/ə	FT-FORM
a. ☛ (qʷˀəlí)yəš			*
b. (qʷˀə́li)yəš		* !	

The ranking hierarchy *P/ə >> FT-FORM, which was determined above for disyllabic roots, ensures that stress falls on the full vowel [i] in (18). The tableau in (19) summarizes the possible permutations of alignment and footing for [ə v ə] roots. For ease of exposition I represent the root in the tableau as a vocalic template.

(19) **[ə v ə] → [ə v́ ə]**

[ə v ə]	FT-BIN	AL-PrWd,L	PARSE-SYLL	*P/ə	FT-FORM
a. ☛ [(ə v́) ə]			*		*
b [ə (v́ ə)]		* !	*		
c. [(ə́ v) ə]			*	* !	
d. [ə (v ə́)]		* !	*	*	*
e. [(ə v́ ə)]	* !				
f. [(ə) (v́) (ə)]	* !				

In summary, (19)e. and f. are disallowed because they are not parsed into disyllabic feet. Candidates b. and d. fail to align a foot with the left edge of the word and are rejected. Candidates a. to d. equally violate the PARSE constraint with the result that no violation is fatal. Therefore, the conflict between a. and c. is settled in favour of a. because candidate c. violates the constraint against stressing schwa. The constraint rankings which have been established thus far are given in (20).

(20) a.

FT-BIN	>>	PARSE-SYLL
PARSE-SYLL	>>	*P/ə
*P/ə	>>	FT-FORM
AL-Pr-Wd,L	>>	FT-FORM

b.

FT-BIN >>	PARSE-SYLL	>>*P/ə >>	FTFORM
AL-PrWd,L		>>	FT-FORM

The separate constraint rankings given in (20)a. illustrate that FT-BIN, *P/ə and AL-PrWd,L are not ranked with respect to one another and nor are FT-FORM and PARSE-SYLL. The hierarchy given in

(20)b. is derived by transitivity from (20)a. The same constraint hierarchy accounts for trisyllabic roots which have the following templates.

(21) a. **[ə v v]** b. **[v ə v]** c. **[v ə ə]**

qəmíneʔ	*abalone*	sʔámənaʔ	*Somenos*	háʔyəlʔəq	*wave*
šxʷəwʔwə́li	*parents*	θákʷəlaʔ	*bet (verb)*	sáləʔəc	*rush sail*
cəlqámaʔ	*raspberry*	xʷiyənemʔ	*listen*	sƛ'éləqəm	*dangerous*

The tableaux in (22), (23) and (24) illustrate the descriptive facts of stress assignment with the same interactive constraints that I demonstrated for roots which contain [ə ə ə] and [ə v ə] sequences. I supress the candidates which are parsed into trisyllabic and monosyllabic feet. Again, for ease of exposition I will represent the data sets with vowel templates.

(22) **[ə v v] → [ə v́ v]**

[ə v v]	FT-BIN	ALPrWd,L	PARSE-SYLL	*P/ə	FT-FORM
a. ☛ [(ə v́) v]			*		*
b. [(ə́ v) v]			*	* !	
c. [ə (v́ v)]		* !	*		
d. [ə (v v́)]		* !	*		*

In the tableau in (22) no candidates violate FT-BIN and all equally violate PARSE-SYLL. Candidates c. and d. each fatally fail to align a foot with the left edge of the word, demonstrating once again the inviolability of the alignment constraint. The avoidance of stressed schwa results in the output in a.

(23) **[v ə v] → [v́ ə v]**

[v ə v]	FT-BIN	ALPrWd,L	PARSE-SYLL	*P/ə	FT-FORM
a. ☛ [(v́ ə) v]			*		
b. [(v ə́) v]			*	* !	*
c. [v (ə́ v)]		* !	*		
d. [v (ə v́)]		* !	*		*

The tableau in (23) shows that the same constraints which produce [ə v́ ə] and [ə v́ v] stress patterns also yield the optimal candidate for roots with [v ə v] sequences. In the tableau in (24) stress predictably falls on the initial syllable, a full vowel, in roots which contain [v ə ə] sequences.

(24) **[v ə ə] → [v́ ə ə]**

[v ə ə]	FT-BIN	ALPrWd,L	PARSE-SYLL	*P/ə	FT-FORM
a. ☛ [(v́ ə) ə]			*		
b. [(v ə́) ə]			*	* !	*
c. [v (ə́ ə)]		* !	*	*	
d. [v (ə ə́)]		* !	*	*	*

In (24) once again the same constraint hierarchy seen in the preceding tableaux produces stress on the full vowel.

Roots which contain vowel sequences of [ə ə v] exhibit a seemingly anomalous stress pattern. The data in (25) show that stress is placed not on the full vowel but on the initial schwa in contrast with the patterns which avoid stressed schwa.

(25) **[ə ə v] Templates**

a.	yə́x̣ʷəleˀ	*bald eagle*
b.	tθ'ə́məkʷaˀ	*tommy cod*
c.	hə́lˀx̣əwˀe	*pitlamp*

Although the data appear to exhibit an exceptional stress pattern, in fact the ranking of the constraints which produce all of the previous patterns predict a word initial stressed schwa. The tableau in (26) demonstrates the assumed, but as yet unsupported ranking of the alignment constraint above the constraint against stressed schwa.

(26) **[ə ə v] → [ə́ ə v]**

məx̣ʷəyeˀ 'navel'	AL-PrWd,L	*P/ə
a. ☛ (mə́x̣ʷə)yeˀ		*
b. mə(x̣ʷəyeˀ)	* !	

The tableau in (26) shows that alignment of a foot with the left edge of the word is more crucial than the avoidance of stressed schwa. The constraints must be ranked as AL-PrWd,L >> *P/ə. In (27) all candidates are evaluated with respect to the entire constraint hierarchy.

(27) **[ə ə v] → [ə́ ə v]**

[ə ə v]	FT-BIN	AL-PrWd,L	PARSE-SYLL	*P/ə	FT-FORM
a. ☛ [(ə́ ə) v]			*	*	
b. [(ə ə́) v]			*	*	* !
c. [ə (ə́ v)]		* !	*	*	
d. [ə (ə v́)]		* !	*		*

The tableau in (27) demonstrates the inviolability of the constraint AL-PrWd,L, even at a cost of inevitably electing a candidate which contains a stressed schwa. Candidates c. and d. are eliminated because they fail to align a foot with the left edge of the word. The remaining candidates, a. and b. equally violate the constraints on parsing and stressing schwa and the conflict is resolved according to the requirement for feet to be trochaic. Thus, candidate a. emerges as the optimal candidate as the result of the hierarchy such that *P/ə is ranked lower than AL-PrWd,L but higher than FT-FORM.

In the next section I show how constraints which reflect the sonority hierarchy interleave with directionality constraints in order to account for roots which contain two full vowels.

4.2.2 Sonority Constraints

The trisyllabic roots in (28) and (29) contain [v v ə] sequences which display alternations in the placement of stress between the first and second full vowels.

(28) [v v ə] → **[(v́ v) ə]**

a.	šéˀitən	*hair*
b.	θéθiˀən	*blood*
c.	sɬániˀ-stəm	*made into a woman*

(29) [v v ə] → **[(v v́)ə]**

a.	ˀiléˀəq	*in back of vehicle*
b.	sinéˀəc	*Tyee salmon*
c.	sc'iyáyə	*twins*

In (28) the data set includes roots which contain full vowel sequences of [e i] and [a i] which are stressed on first (word initial) syllable. In contrast, the data set in (29) is stressed on the second full vowel, the word medial syllable; the vowel sequences are [i e] and [i a].

4.2.2.1 Peak Prominence Revisited

Recall Kenstowicz's (1994) proposal to expand the PK-PROM constraint into micro constraints against the suitability of individual vowels to occur as nuclei of prominent (stressed) syllables. Thus far in the analysis only the constraint against stressed schwa has been relevant to stress assignment in Cowichan. However, *P/ə is just the most highly ranked of a series of sonority constraints on nuclear vowels. That is, the second constraint in the hierarchy is *P/i and is read as "avoid stressed [i]", followed by *P/e (avoid stressed [e] etc. I reproduce Kenstowicz's set of micro-constraints in (30).

(30) *P/ə >> *P/i,u >> *P/e,o >> *P/a

The micro-constraints on peak sonority interact with the already established constraints on directionality and schwa. The following two tableaux contain the same candidates which are evaluated with respect to two pairs of constraints. The first gives support to Kenstowicz's analysis which ranks full vowels individually. The tableau in (31) illustrates the dominance relation between the micro-constraints *P/i and *P/e for a trisyllabic [i e ə] template.

(31) **[i e ə] → [i é ə]**

ˀileˀəq *'in back of vehicle'*	*P/i	*P/e
a ☛ (ˀiléˀ)əq		*
b. (ˀíleˀ)əq	* !	

The tableau in (31) shows that the constraint against stressed [i] dominates the constraint against stressed [e]. The reverse order produces the incorrect output * *ʔíʔeləq*. The same candidates also show that the constraint *P/i dominates FT-FORM in (32).

(32) **[i e ə] → [i é ə]**

ʔileʔəq *'in back of vehicle'*	*P/i	FT-FORM
a ☛ (ʔiléʔ)əq		*
b. (ʔíleʔ)əq	* !	

Candidate (32) b contains a trochaic foot as required by FT-FORM, but it fatally violates the more highly ranked constraint *P/i, with the result that the optimal candidate is an iamb. *P/e is not ranked with respect to FT-FORM because candidate a. in (31) and (32) violates both constraints equally. The ranking hierarchy ensures that a.'s violation is minimal in each case. However, the tableau in (33) shows that when FT-FORM is ranked above *P/i the incorrect output results.

(33)

ʔileʔəq *'in back of vehicle'*	FT-FORM	*P/i
a (ʔiléʔ)əq	* !	
b.* ☛ (ʔíleʔ)əq		*

The alternations in stress patterns shown in (28) and (29), therefore fall out from the peak prominence constraint hierarchy and the ranking of FT-FORM below all of the constraints on peak prominence. That is, for roots which contain [v v ə] sequences, stress fall on the initial syllable only if initial nuclear vowel is more sonorant than the medial vowel. On the other hand, when the initial vowel is less sonorant than the medial nucleus then stress is assigned to the more sonorant medial vowel. For example, the roots *sc̓iyáyə* 'twins' [i a ə] and *siné?əc* 'Tyee salmon' [i e ə]are also stressed on the second syllable because [a] and [e] are more sonorant than [i].

The case of trisyllabic roots which contain two non-adjacent full vowels however, do not behave in the same manner as those whose full vowels are contiguous. The root *x^wíyənemʔ* 'listen' exemplifies the difference wherein the less sonorant [i] is stressed rather than the more sonorant [e]. In tableau (27) above I showed that AL-PrWd,L dominates *P/ə to produce stress on initial schwa for roots which contain [ə ə v] sequences. Therefore, by transitivity, inviolable AL-PrWd.L also dominates *P/i.

(34) **[i ə e] → [î ə e]**

x^wiyənemʔ 'listen'	AL-PrWd,L	*P/i
a. ☛ (x^wíyə)nemʔ		*
b. x^wi(yənémʔ)	* !	

Although candidate (34)b. obeys the constraint against stressing [i], it fatally violates the undominated alignment constraint. The dominance relation which falls out from the sonority hierarchy such that *P/ə >> *P/i, is demonstrated in (35). Both candidates obey the AL-PrWd,L constraint and the conflict is settled according to the sonority hierarchy.

(35) **[i ə e] → [î ə e]**

x^wiyənemʔ *'listen'*	*P/ə	*P/i
a. ☛ (x^wíyə)nemʔ		*
b. (x^wiyə́)nemʔ	* !	

The ranking *P/ə >> *P/i completes the representation of the micro-constraints on peak sonority. The hierarchy within which they are interleaved with constraints on directionality are given below. Ranking of the constraints *P/e and *P/a with respect to one another cannot be conclusively determined because no trisyllabic roots which contain both segments are attested in the data.

(36) AL-PrWd,L >> *P/ə >> *P/i >> *P/e,a >> FT-FORM

The tableau in (37) summarizes the constraints which produce leftward stress (on [i]) for trisyllabic roots whose vowel sequences are [i ə e].

(37) **[i ə e] → [î ə e]**

x^wiyənemʔ *'listen'*	AL-PrWd,L	*P/ə	*P/i
a. ☛ (x^wíyə)nemʔ			*
b. x^wi(yənémʔ)	* !		
b. (x^wiyə́)nemʔ		* !	
b. x^wi(yə́nemʔ)	* !	*	

The final tableau concerning trisyllabic roots employs the same constraints which produce stress on the initial syllable for words which contain [i ə e] sequences as in (37). The tableau in (38) demonstrates how the same ranking results in a different pattern for roots which contain a [ə i e] sequence.

(38) **[ə i e] → [ə î e]**

qəmineʔ 'abalone'	AL-PrWd,L	*P/ə	*P/i
a. ☛ (qəmí)neʔ			*
b. (qə́mi)neʔ		* !	
c. qə(míneʔ)	* !		*
d. qə(minéʔ)	* !		

Having accounted for why [a] and [e] are stressed in preference to [i] in the trisyllabic data given in (28) and (29) above, in the following section I return to disyllabic roots which contain [i a] and [i e] sequences.

4.2.2.2 Non-Finality

The constraint hierarchy for whcih I have argued in this paper fails to obtain the correct output for one class of Cowichan roots.

(39) a. **[i a] Templates** b. **[i e] Templates**

q̓ít’aʔ	*swing, hammock*	l̓ísek	*sack*
t^{θ}’ík^{w}aʔ	*left-handed*	síʔemʔ	*respected*
l̓ílaʔ	*salmonberry*	x̣íʔleʔc	*dog salmon (after spawning)*

The data in (39) contain sequences in which stress falls on [i] despite the constraint hierarchy which predicts that stress will occur on the following more sonorant vowel,[a] or [e]. The tableau in (40) illustrates the problem for the root *tíʔyaʔx̣ʷ* 'busy'.

(40) **[i a] → [í a]**

tiʔyaʔx̣ʷ *'busy'*	*P/i	*P/a
a. tíʔyaʔx̣ʷ	* !	
b. * ☛ tiʔyáʔx̣ʷ		*

According to the constraint hierarchy demonstrated in the previous section, the candidate in (40)b. should be the optimal output. However, the correct output contains an initial stressed [i] which fact suggests the necessity of one additional constraint which will prohibit stress from being assigned to the final syllable. Prince and Smolensky (1993:57) propose the universal constraint in (41).

(41) NON-FINALITY
No prosodic head of PrWd is final in PrWd.

The constraint NON-FIN, like the alignment constraints, is a concern of postional theory, which in opposition to foot theory and parsing theory, comprise the three components necessary to "map the structure of the basic rhythmic system." In Cowichan the ranking of NON-FIN illustrates the manner in which the sonority constraints are interleaved naturally with other relevant restrictions. It is ranked below the constraint against stressed schwa but above the constraints against stressed full vowels. The tableau in (42) illustrates the ranking of NON-FIN aabove *P/i

(42) **[i a] → [í a]**

tiʔyaʔx̣ʷ *'busy'*	NON-FIN	*P/i
a. ☛ tíʔyaʔx̣ʷ		*
b. tiʔyáʔx̣ʷ	* !	

Since NON-FIN dominates the constraint against stressed [i], by transitivity it also dominates *P/e and *P/a. However, roots which have [ə i] sequences provide evidence that the sonority constraints are divided along the lines of non-finality. The tableau in (43) show that in these instances the full vowel and not schwa receive stress.

(43) **[ə i] → [ə í]**

θəʔit *'true'*	*P/ə	NON-FIN
a. ☛ θəʔít		*
b. θə́ʔit	* !	

The constraint ranking which determines stress assignment for disyllabic and trisyllabic roots in Cowichan is given in (44)

(44) FT-BIN >> PARSE-SYLL >> *P/ə >> NON-FIN >> *P/i >> *P/e , *P/a >> FT-FORM
AL-PrWd,L FT-FORM

4.3 Exceptional Data

Of the stress patterns given in (1) this analysis accounts for the following.

Disyllabic Roots			**Trisyllabic Roots**		
[v v]	→	[v́ v]	[ə ə ə]	→	[ə́ ə ə]
[v ə]	→	[v́ ə]	[ə v ə]	→	[ə v́ ə]
[ə ə]	→	[ə́ ə]	[ə v v]	→	[ə v́ v]
[ə v]	→	[ə v́]	[v ə v]	→	[v ə́ v]
			[v ə ə]	→	[v́ ə ə]
			[ə ə v]	→	[ə́ ə v]
			[v v ə]	→	[v́ v ə]

With respect to the stress placement patterns as they are represented by templates in (1), stress assignment for some data remains anomalous. However, the total of 21 out of more than 700 disyllabic and trisyllabic roots whose stress placement is not accounted for by this analysis represent less than five percent. Among disyllabic roots,the data include three whose output are [ə ə́] e.g. *wəƛ'ə́c'* 'fall, stumble' (whose nuclei display equal sonority but which consist of an iambic foot); two whose output is [v v́] e.g *ʔiʔét* 'dismay particle' (whose prosodic head is word final **and** the sonority of whose initial vowel is greater than schwa); and ten whose output is [ə́ v] e.g. *sə́nʔƛ'eʔ* 'eldest brother'. (in which schwa is stressed in a position preceding a full vowel).[5]

Among trisyllabic roots with unpredicted stress patterns,the data include four whose output is [ə ə v́] which display rightward foot alignment, and one each of [ə ə́ v] and [ə ə́ ə] whose footed syllables have equal sonority but result in iambic feet.

5.0 SUMMARY

I have presented an analysis of stress assignment in Cowichan roots using constraints which are held as universal within Opimality Theory and which demonstrate the adequacy of the model. Following Kenstowicz (1994) I have argued that acknowledgement of the role of sonority is integral to an acount of stress placement for Cowichan. The analysis supports Kenstowicz's account of micro-constraints which give rise to the sonority hierarchy of vowels cross-linguistically. Along with Urbanczyk's (1996) suggestions concerning stress in Lushootseed, the analysis which I propose may have implications for other Salish languages.

[5] Of the 13 anomalous stress assignment patterns represented by [ə ə́] and [ə́ v] templates, 8 also display atypical syllabification patterns. These facts may suggest that the stressed schwas are underlying full vowels. (T. Hukari, p.c.)

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