Licensing by the initial foot

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In this paper I present a range of evidence to support the claim that a prosodic constituent — such as a syllable or foot — can serve as the licenser of marked phonological or morphological structure (cf. Zoll 1996, Beckman 1998). In particular, such a constituent can be strong, and therefore a valid licenser, by virtue of either its inherent prominence, such as stress, or its positional prominence, such as peripheral position. The case I focus on here is the licensing of marked structures by a foot which is prominent due to its location in word-initial position, independent of whether it correlates with phonetic stress.

In the main body of the paper I show that a variety of non-metrical processes in Kashaya are sensitive to the location of the first foot of the word. That is, the foot structure which determines stress and iambic lengthening — and which is dependent on whether or not initial-syllable extrametricality is present — is also crucial for the proper analysis of phenomena which have no inherent relation to feet. The initial foot licenses three different marked structures. These are the outcome of vowels in hiatus, the choice of suffixal allomorphs, and the distribution of the glottal segments called laryngeal increments. Since the first foot does not always bear stress, the licenser cannot be reduced to the category "stressed foot". Adopting the framework of Zoll (1996), I propose an analysis within Optimality Theory which generalizes alignment theory to the notion of "coincidence" of some element with another — in this case, the first foot of the word. The function *Edgemost*(P, Q), which here picks out the leftmost foot (P) of the word (Q), crucially defines the prosodic category which licenses the marked structure.

I begin in §1 by discussing three cases from the literature where certain featural constrasts are restricted to prominent, especially initial, positions. In §2 I present data from Nootka which shows that the initial (but perhaps only) foot in the word determines the distribution of long vowels and also restricts the realization of glottal stop. Starting in §3 I turn to Kashaya, first sketching the pattern of both stress and foot-based vowel lengthening, and initial-syllable extrametricality which displaces the initial foot. I then turn to the non-metrical phenomena in Kashaya that depend on the location of that foot. In §4 I show that whether elision of two adjacent vowels yields a short or long vowel is determined by whether the resulting syllable is located in the first foot of the word. In §5 I demonstrate that the allomorphy of the Durative suffix also depends on whether the suffix overlaps with the initial foot. In §6 I show that laryngeal increments, quite common in the language, are constrained to appear immediately before the initial foot, with various consequences. A brief summary and conclusion is provided in §7.*

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The following abbreviations are used to indicate the sources of data: C (Chapallaz 1979), D (Oswalt 1990), H (Haviland 1979), J (Jacobsen 1997), Sm (Smyth 1920), St (Stonham 1990), Sw (Swadesh 1937), SS (Sapir & Swadesh 1955), T (Oswalt 1964), W (Wilson 1986). In the Kashaya sections, unlabeled numbers indicate Oswalt (1961) and unreferenced examples are from the author's fieldnotes. The symbol <c> represents [č] for Kashaya, otherwise [ts].

1. Licensing in prominent positions

Before the demonstration of special status for the initial foot of the word, it is useful to consider a few examples in other languages which demonstrate that prominent positions in general, and initial positions in particular, are often the locus of contrasts not found elsewhere. Three cases, together with brief analyses, are discussed here: mid vowels and the stressed syllable in Italian (§1.1); word-initial aspirated vowels in Ancient Greek (§1.2); and vowel length in the first foot in Guugu Yimidhirr (§1.3).

1.1. The stressed syllable in Italian

It is well known that stressed syllables often license contrasts that are not permitted elsewhere. For example, Standard Italian distinguishes the pairs of mid vowels /e, ɛ/ and /o, ɔ/ in stressed syllables (Chapallaz 1979: 49, 55). Transcriptions reflect lengthening of stressed vowels in open syllables.

(1)	a.	*collega*	[kollé:ga]	'connects' C 52
		collega	[kollɛ́:ga]	'colleague' C 52
	b.	*venti*	[vénti]	'twenty' C 52
		venti	[vɛ́nti]	'winds' C 52
(2)	a.	*scopo*	[scó:po]	'I sweep' C 57
		scopo	[scɔ́:po]	'aim' C 57
	b.	*torta*	[tórta]	'cake' C 57
		torta	[tɔ́rta]	'twisted' C 57

In unstressed syllables, however, the lax vowels /ɛ, ɔ/ are not permitted, as the following alternations in root vowels illustrate.

(3)	a.	*terra*	[tɛ́rra]	'earth' C 51
		terrestre	[terréstre]	'earthly' C 51
	b.	*vecchio*	[vɛ́kkyo]	'old'
		vecchietto	[vekkyétto]	'ageing, elderly' C 221
(4)	a.	*nove*	[nɔ́:ve]	'nine' C 222
		novanta	[novánta]	'ninety'
	b.	*comodo*	[kɔ́:modo]	'convenient, comfortable'
		comodissimo	[komodíssimo]	'very comfortable' C 223

The distributional restriction on these vowels, which can be treated in terms of the feature [ATR], suggests that [–ATR] is restricted to stressed positions.[1]

Several approaches are available for the expression of this type of position-dependent contrast, such as Steriade (1995b), Zoll (1996), and Beckman (1998). For reasons discussed in the analysis of Kashaya in §5, I adopt the framework of Zoll (1996), and assume familiarity with the conventions of Optimality Theory (Prince and Smolensky 1993). To formalize positional licensing, Zoll proposes the constraint type COINCIDE(x,y), which requires that the two constituents **x** and **y** stand in a relationship of temporal coincidence. This relationship exists in three situations, illustrated in (5).

[1] I assume a higher-ranked constraint requiring that low vowels be [–ATR], so that the distribution of /a/ is not restricted.

(5) a. y = x *the two constituents are coextensive*

b.  *y dominates x*

c.  *x dominates y*

The constraint itself takes the following general form, where **x** is some type of marked structure and **y** is a strong position which serves to license that marked structure.

(6) COINCIDE(marked structure, strong constituent)

(i) $\forall x$(x is marked $\rightarrow \exists y$(y = strong constituent $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

In other words, for each token of the identified marked structure, there must be a particular strong constituent with which it coincides, else a constraint violation is assessed against the candidate.

In Italian, the strong position which licenses lax mid vowels is the stressed syllable, indicating a COINCIDE constraint such as the following.

(7) COINCIDE([–ATR], stressed syllable)

(i) $\forall x$(x is [–ATR] $\rightarrow \exists y$(y = stressed syllable $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

This constraint naturally must dominate IDENT(ATR), which prevents gratuitous changes in this feature from input to output.

(8)

/tɛrr-ɛstre/ (3a)	COINCIDE(ATR)	IDENT(ATR)
a. tɛrrɛ́stre	*!	
b. ☞ terrɛ́stre		*
c. terréstre		**!

The same point could be made for other featural representations of the lax mid vowels. The subtype of coincidence instantiated in (7) is domination by the strong constituent, i.e. (5b). See §5.3 for further discussion of these facts.

Before moving to the discussion of initial positions, it should be noted that COINCIDE can also be used when encoding more traditional licensing requirements that refer to segment-internal properties (cf. (5a)). For instance, many languages permit distinctive rounding only on Dorsal consonants (cf. Ladefoged & Maddieson 1996: 356). In Zuni, with representative stops /p t k/, this means only the velar /k^w/ (Newman 1965: 13); in a typical Northwest Coast language, with stops /p t k q/, this means both velar and uvular /k^w, q^w/ (Thompson and Kinkade 1990: 43). For both types of languages, the feature [round] can be restricted to temporally coincide with Dorsal, which prevents it from occurring on other consonants, i.e. labials and coronals.

1.2. Aspirated vowels in Ancient Greek

Ancient Greek permits aspirated vowels only word-initially, unlike aspirated stops which are licensed throughout the word (Steriade 1982: 154, 1995a: 159; Smyth 1920: 10, 31). As a result,

when two elements are in close juncture, e.g. prefixation, cliticization, or compounding, the initial vowel ceases to be initial and the aspiration must find a new licenser, i.e. a stop, even if this involves skipping over a sonorant.

(9)	a.	epi-^{h}orǭ	→	ep^{h}orǭ	'I oversee'
	b.	kata-^{h}edrā	→	kat^{h}edrā	'seat'
	c.	auto-^{h}adę̄s	→	aut^{h}ádę̄s	'self-willed' Sm 31
	d.	to ^{h}īmation	→	t^{h}oimátion	'the cloak' Sm 31
	e.	pro-^{h}oros	→	p^{h}rōrós	'watchman' Sm 31
	f.	tetra ^{h}ippos	→	tét^{h}rippos	'driving four horses' Sm 31

Particularly striking is a historical change whereby *s which became [h] in an onset moved to a word-initial vowel, where it could be licensed (Lejeune 1972: 95, Steriade 1982: 162).

(10)	a.	*ewsǭ	→	eu^{h}ǭ	→	^{h}euǭ	'I burn'
	b.	*iseros	→	i^{h}eros	→	^{h}ieros	'holy'
	c.	*ę̄smai	→	ę̄^{h}mai	→	^{h}ę̄mai	'I sit'
	d.	*arsma	→	ar^{h}ma	→	^{h}arma	'fitting'
	e.	*e-serpon	→	e^{h}erpon	→	^{h}eirpon	'I crept'

This change is easily understood if a noninitial vowel cannot license aspiration: the feature must move to the initial position, where it can be realized. Other cases in the literature where more contrasts are licensed in word-initial position than elsewhere in the word include consonant features in !Xóõ (Traill 1985) and Kukuya (Paulian 1975: 85, Hyman 1987), and vowel features in Shona (Beckman 1995).

While one might at first be inclined to analyze this pattern, and others like it, as an alignment (McCarthy & Prince 1993) of the aspiration feature with the left edge of the word, Zoll (1996: 141) notes that "licensing **always** constitutes an all-or-nothing proposition whereby marked structures are licit in licensed positions but ill-formed everywhere else." For example, in Greek, when the preceding consonant is not a possible licenser of aspiration, the feature is deleted: it simply cannot be licensed on a noninitial vowel.[2]

(11)	a.	eks-^{h}edrā	→	eksedrā	'hall with seats' Sm 10
	b.	polu-^{h}istǭr	→	poluistǭr	'very learned' Sm 10

This situation stands in stark contrast to standard uses of alignment, where minimal violation by displacement of some element is quite common. A well-known example is the Ethiopian Semitic language Chaha, where the suffixal feature of labialization occurs as close as possible to the right edge of the stem, but when necessary will be misaligned in order to surface at all (McCarthy 1983, 1986). This arises when the rightmost consonant(s) is a coronal, which does not license labialization in Chaha.

(12)	a.	dənəg-^{w}	→	dənəg^{w}	'he hit him'
	b.	nəkəb-^{w}	→	nəkəb^{w}	'he found him'
	c.	kʼənəf-^{w}	→	kʼənəf^{w}	'he knocked him down'
	d.	nəkəs-^{w}	→	nək^{w}əs	'he bit him'
	e.	kʼəťər-^{w}	→	kʼ^{w}əťər	'he killed him'

Such gradient preference for a certain position is appropriately formalized by means of a gradiently violable constraint, whether ALIGN (McCarthy & Prince 1993) or NO-INTERVENING

[2] Since the aspiration is occasionally retained in inscriptions and can often occur in Latin transcriptions, it is possible that there was variation in the actual pronunciation (Allen 1968: 55). As Allen points out, this variation may correlate with the extent to which two elements in a compound were considered a single word — that is, whether or not the aspirated vowel was initial in its domain.

(Zoll 1996: 112). Categorical positional licensing as in Greek cannot be analyzed by means of alignment, however: it requires a constraint which is either satisfied or not, such as COINCIDE (6).

In Italian, it is the **inherent** prominence of a stressed syllable that licenses marked features such as [-ATR]. In Greek, on the other hand, it is the **positional** prominence of the initial segment which makes aspirated vowels possible; the pitch accent system of the language is defined from the right edge of the word, and is no help here. To encode positional licensing in a framework that makes the right predictions, Zoll uses COINCIDE together with the function *Edgemost*(P,Q), which identifies the left- or rightmost constituent P located in constituent Q.

(13) *Leftmost*(P, Q) = the leftmost P in Q
Rightmost(P, Q) = the rightmost P in Q

This function is crucial to capturing the special behavior of a peripheral constituent, and will be used — in various ways — for each phenomenon discussed in this paper. In Greek, the locus of vowel aspiration is the leftmost segment in the word.

(14) *Leftmost*(Segment, Word)

What we now need is a way to require that every aspirated vowel be located in this position, which is precisely what COINCIDE can do. Specifically, in Greek, an aspirated vowel must coincide with the initial segment of the word.

(15) COINCIDE(aspirated vowel, *Leftmost*(Segment, Word))
'an aspirated vowel occurs as the initial segment of the word'

(i) $\forall x(x = \text{aspirated vowel} \rightarrow \exists y(y = \textit{Leftmost}(\text{Segment, Word}) \wedge \text{Coincide}(x,y)))$
(ii) Assess one mark for each value of x for which (i) is false

Naturally, this COINCIDE(^{h}V) must dominate whatever constraint would otherwise ensure preservation of the aspiration feature. For simplicity I call this MAX(h), though the fact that the feature can move from one segment to another actually raises more complex issues regarding the proper formulation of faithfulness constraints (cf. McCarthy & Prince 1995, Lamontagne & Rice 1995, Zoll 1996, and others).

(16)

/polu-^{h}istǭr/ (11b)	COINCIDE(^{h}V)	MAX(h)
a. polu^{h}istǭr	*!	
b. ☞ poluistǭr		*

In examples such as (9) and (10) where the feature moves to a new segment, I assume that IDENT is ranked below MAX(h), or whatever constraint prefers preservation of the underlying feature regardless of its surface location.

1.3. Long vowels in Guugu Yimidhirr

The Italian data show licensing of marked features in an inherently prominent position, the stressed syllable. The Greek data illustrate licensing at the beginning of the word. The next example shows that it is not only the beginning but also the entire range of a peripheral constituent which can behave in a special way. In Guugu Yimidhirr, a Pama-Nyungan language of Australia, long vowels are restricted to the first two syllables of the word (Haviland 1979, Kager 1995). Following Zoll (1996: 149), this domain can be treated as a foot which includes the first two syllables, regardless of weight (though see below). An active consequence of this restriction is that "lengthening suffixes", which induce a long vowel in the syllable preceding the suffix (17), fail to have this effect when that syllable is beyond first foot of the word (18).

(17)	a.	mayi-ŋu	→	(mayi:)ŋu	‘food-PURP’ H 53
	b.	ŋalgal-ŋu	→	(ŋalga:l)ŋu	‘smoke-PURP’ H 130
	c.	gu:gu-ŋu	→	(gu:gu:)ŋu	‘language-PURP’ H 119
	d.	dʸi:ral-gal	→	(dʸi:ra:l)gal	‘wife-ADES’ H 54
(18)	a.	baḏibay-ŋu	→	(baḏi)bayŋu	‘bone-PURP’ H 53
	b.	ḏaɽamali-gal	→	(ḏaɽa)maligal	‘thunder-ADES’ H 111
	c.	biḏa-guɽ-gal	→	(biḏa)guɽgal	‘child-PL-ADES’ H 54
	d.	galga-diɽ-gal	→	(galga)diɽgal	‘spear-COM-ADES’ H 59

For Kager, the lengthening suffixes have an underlying floating mora, which links to lengthen a preceding vowel when no other aspect of the grammar — such as the restriction of long vowels to the first two syllables — prevents it.

(19) *Realization of a floating mora*

a. *In the first foot*

b. *Outside the first foot*

Since the suffix itself is always outside the first foot, there is no option of linking the floating mora rightward.

To identify the domain in which long vowels are permitted, we can pick out the leftmost foot in the word.

(20) *Leftmost*(Foot, Word)

As above in (15), the licensing constraint requires that a long vowel coincide with this position.[3]

(21) COINCIDE(long vowel, *Leftmost*(Foot, Word))
‘a long vowel belongs to the first foot’

(i) ∀x(x is a long vowel → ∃y(y = *Leftmost*(Foot, Word) ∧ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

This constraint, which can be referred to as COINCIDE(V:), must dominate MAX(μ), which prefers the realization of every underlying mora.

(22)

/ŋalgal-$^{\mu}$ŋu/	COINCIDE(V:)	MAX(μ)
a. ☞ (ŋalga:l)ŋu		
b. (ŋalgal)ŋu		*!
c. (ŋalgal)ŋu:	*!	

[3] Zoll (1996: 149) actually refers to a “heavy syllable” rather than a “long vowel”, but since coda consonants do not bear weight in Guugu Yimidhirr, the two notions are equivalent. Use of “long vowel” here connects the Guugu Yimidhirr pattern to those described below for Nootka (§2) and Kashaya (§4).

(23)

/badibay-$^{\mu}$ŋu/	COINCIDE(V:)	MAX(μ)
a. ☞ (badi)ba:yŋu	*!	
b. (badi)bayŋu		*

Essentially the same analysis is well motivated for vowel-length variation that arises from different sources in Nootka (§2) and Kashaya (§4), though in these languages COINCIDE(V:) is lower ranked and long vowels do sometimes occur outside the first foot.

The quantity insensitivity of the feet shown in (17) characterizes a syllabic trochee. In Guugu Yimidhirr, however, if both the first two syllables are heavy, they are both stressed, as in *búuráay* 'water'. The constituent which includes both these syllables cannot be a normal stress foot (which has a single head that bears stress, and is otherwise quantity-sensitive in Guugu Yimidhirr). Though I have followed Zoll in labeling this as a foot, Kager actually identifies it as a recursive prosodic word, the head of the overall prosodic word. I assume here that the constituent is a "parsing" foot rather than a stress foot; see, for example, McCarthy & Prince (1986), Hammond (1989), and Crowhurst (1991). However, since there are differing views about the identity of the constituent in which these long vowels are permitted, I devote the following section to discussion of Nootka, a language where the relevant constituent is clearly a foot rather than a prosodic word.

2. Nootka

Nootka, a Wakashan language of British Columbia, presents a restriction on vowel length which is remarkably similar to what that described for Guugu Yimidhirr in the previous section. The data thus add support not only for the proposed COINCIDE, in particular COINCIDE(V:) but also for the *Leftmost*(Foot, Word) function. However, since it is possible to claim that only one foot is present in the representation of Nootka words (see §2.5), the facts presented in this section might also be taken as support only for licensing by the foot, rather than the (coincidentally) initial foot. As such these data serve as prologue to the Kashaya facts, which unambiguously refer to the initial foot of the word.

Sources of Nootka data and analysis include Sapir (1924), Swadesh (1937), and Sapir & Swadesh (1939, 1955). I follow Sapir & Swadesh (1955: 4), as well as Jacobsen (1979) and Stonham (1990), in transcribing the earlier symbols <o, ɔ> as [u, o] respectively. The notations [’] and [‘] indicate "hardening" and "softening" suffixes; see §2.4 for discussion. For convenience, reduplication is notated simply by RED, which may or may not include vowel length; see Sapir & Swadesh (1939: 239) for a summary of reduplicative patterns.

2.1. Variable length

In Nootka, as well as the related Nootkan languages Nitinat and Makah (cf. Wilson 1986, Jacobsen 1997), vowels described as having "variable length" surface as long when they occur in one of the first two syllables of the word; otherwise they surface as short. As observed by Wilson (1986: 290) and Stonham (1990: 141), these two syllables can be identified with a foot.

In citing examples, I follow Jacobsen (1979: 145f) for Makah and Buckley (1997) for Kashaya (see §4) and represent the variable length in underlying forms with a raised period [·], and persistent underlying length as [:]. Here surface length is uniformly marked with [:].

(24)
a. ʔi·ḥ-ma· → (ʔi:ḥma:) 'is large' Sw 78, SS 236
b. hił-ma· → (hiłma:) 'is there' Sw 84
c. hił-'aƛ-ma· → (hiłʔaƛ)ma 'is there then' Sw 84

	d.	qu:ʔas-ma·	→	(qu:ʔas)ma	‘is a man’ Sw 78, SS 235
	e.	mamu:k-ma·	→	(mamu:k)ma	‘is working’ Sw 78
(25)	a.	caqi·c	→	(caqi:c)	‘twenty’ SS 237
	b.	RED-caqi·c	→	(caca)qic	‘twenty (distrib)’ SS 237
(26)	a.	ʔi·ḥ-tu·p	→	(ʔi:ḥtu:p)	‘whale’ (=‘big thing’) St 128
	b.	RED-ʔi·ḥ	→	(ʔiʔi:ḥ)	‘big here and there’ St 139
	c.	RED-RED-ʔi·ḥ-yimɬ	→	(ʔiʔi)ʔiḥyimɬ	‘big-shouldered (DISTRIB)’ St 128
(27)	a.	c̓ax^{w}-yu·	→	(c̓axyu:)	‘speared’ Sw 90
	b.	ʔi:nax-yu·	→	(ʔi:nax)yu	‘prepared’ Sw 90
(28)	a.	ʔu-na·k^{w}	→	(ʔuna:k)	‘possessing it’ SS 237
	b.	wa:-na·k^{w}	→	(wa:na:k)	‘having someone say’ Sw 93
	c.	ni:s-na·k^{w}	→	(ni:sna:k)	‘possessing a kettle’ Sw 92
	d.	qaḥ-na·k^{w}	→	(qaḥna:k)	‘having someone dead’ Sw 93
	e.	ʔaya-na·k^{w}	→	(ʔaya)nak	‘having many things’ Sw 93
	f.	čapac-na·k^{w}	→	(čapac)nak	‘having a canoe’ SS 237
	g.	t̓aṅa-na·k^{w}	→	(t̓aṅa)nak	‘have a child’ SS 14
	h.	ƛ̓us-ḥa·ɬ-’as-na·k^{w}	→	(ƛusḥa:)y̓asnak	‘having s.o. go to buy herring’ Sw 90
cf.		ʔaƛ-ḥta-ḥa·ɬ-’as-na·k^{w}	→	(ʔaƛḥta)ḥay̓asnak	‘having s.o. go to buy two sackfuls’ Sw 86

The last two examples in (28) also afford a comparison between two surface realizations of the suffix *-ḥa·ɬ* ‘buy’, which like the other suffixes retains its length only within the first foot.

This variable length is distinct from persistent length; the latter vowels surface as long regardless of the syllable in which they occur. Contrast in particular the variable length of /i·/ in (29) with the persistent length of /u:/ in (30).

(29)	a.	ʔam-qi·	→	(ʔapqi:)	‘on top’ Sw 91
	b.	hita-qi·	→	(hita)qi	‘on top’ Sw 91
(30)	a.	ʔam-qu:-ʔa·	→	(ʔapqu:)ʔa	‘come around a rocky point of land’ Sw 91
	b.	hita-qu:-ʔa·	→	(hita)qu:ʔa	‘on a rocky point of land’ Sw 91
(31)	a.	suč̓-i:p	→	(suč̓i:p)	‘obtain five’ S #165
	b.	hin-i:p-ƛa	→	(hini:p)ƛa	‘again obtained’ S #162
	c.	ʔaƛa-k^{w}a·ɬ-i:p	→	(ʔaƛa)k^{w}aɬi:p	‘obtained eight’ S #173

To complete the picture, note that a simple short vowel remains short even when it occurs within the first foot, so there is no plausible rule lengthening a short vowel in that phonological context.[4]

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[4] Short vowels do lengthen as the result of morphological processes triggered by specific suffixes (with or without reduplication): *ƛus-* ‘herring’, *ƛu:s-mi:k* ‘getter of herring’ (Sapir & Swadesh 1939: 239). Similarly, a persistent long vowel is shortened in particular morphological contexts: *ʔo:šso:qƛ-* ‘bad-tempered, brave’, *ʔošsoqƛ-aq* ‘very bad-tempered’. In choosing the examples in this paper I have avoided such contexts in order to focus on the purely phonological length alternations that depend on the first foot. Interestingly, however, morphological lengthening and shortening are restricted to the first two syllables, i.e. the first foot, suggesting a further role for this constituent. One iterative pattern results in long vowels in **both** the first two syllables with other vowels shortened: *ʔaƛak^{w}aɬ* ‘eight’, *ʔa:ƛa:k^{w}aɬ-mik-ši:ɬ* ‘become getter of eight (animals) at intervals’; the final syllable is also long, but this appears to be an underlying property of the iterative suffix (cf. Wilson 1986: 286).

(32) a. qʷa-ẏak → (qʷaẏa̲k) ‘way of doing so’ Sw 90
b. ṗiš-ẏak → (ṗišẏa̲k) ‘instrument for evil’ Sw 90
c. ʔap-ṗi-ẏak → (ʔapṗi)ẏa̲k ‘back piece’ Sw 90
d. łic-sapi-‘iɬ-ẏak → (łicsa)piɬẏa̲k ‘screen’ Sw 90

(33) a. ƛ̓uɬ-cḥi → (ƛ̓uɬcḥi̲) ‘married to a good-looking person’ Sw 90
b. qu:ɬ-cḥi → (qu:ɬcḥi̲) ‘married to a slave’ Sw 90
c. hoʔa-cḥi → (hoʔac)ḥi̲ ‘remarried’ Sw 93
d. ḥakum-cḥi → (ḥakum)cḥi̲ ‘married to a princess’ Sw 90
e. ċiša·-ʔatḥ-cḥi → (ċiša:)ʔatḥcḥi̲ ‘married to a Tsishaath man’ Sw 90
f. hita-cḥi-nƛ̓ → (hitac)ḥinƛ̓ ‘get married’ Sw 90

In sum, we need a three-way distinction among vowels that are short /V/, long /V:/, and variable /V·/.

The following examples from closely related Makah (Jabobsen 1997) illustrate that the same distinction between short, long [:], and variable [·] vowels exists, as well as the restriction that variable length surfaces only in the first foot of the word. In (34) we see examples of reduplication where underlying variable length, if present, surfaces only within the first foot.

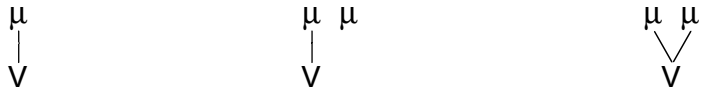
(34) a. RED-ʔaya-bał → (ʔaʔa)yabał ‘many arms, i.e. kelp or spider crab’ J 3
b. RED-łaṗi·x̣-bał → (łała)ṗi̲x̣bał ‘wing arms, i.e. angel’ J 3
c. RED-ha·ċa-bał → (ha:ha:)ċabał ‘long arms’ J 3

In (35) we see that underlying stable length surfaces intact outside the first foot; variable length in these words behaves as in (34).

(35) a. RED-ya·-čʼa:ʔap → (ya:ya:)čʼa:ʔap ‘in pain’ J 4
b. RED-wiq̇is-čʼa:ʔap → (wiwi)q̇isčʼa:ʔap ‘bad sickness, gonorrhea’ J 4
c. RED-ƛ̓upa·ɬ-čʼa:ʔap → (ƛ̓uƛ̓u)pałčʼa:ʔap ‘fever’ J 4

I propose to treat variable-length vowels in Nootka and Makah as a short vowel with a floating mora (cf. Buckley 1997). The three-way distinction is thus represented as follows.

(36) a. *Short* b. *Variable* c. *Long*



The variable-length vowels (36b) are underlyingly of the same configuration that arises in Guugu Yimidhirr upon the addition of a lengthening suffix, illustrated in (19a): a linked mora followed by a floating mora. In Nootka, as in Guugu Yimidhirr, the floating mora must link to the preceding mora or be deleted. Once again no special constraint is necessary to achieve this effect, since whenever the left vowel is unavailable for lengthening — i.e. when it is outside the first foot — then the right vowel will also be unavailable, since it too will be outside the first foot.[5]

2.2. Formal analysis

The fate of a variable-length vowel depends on whether the floating mora is able to link to the vowel. As the examples above show, a long-vowel output is permitted only in the first two

[5] The only outcome that must be prevented is the linking of the floating mora to the right vowel even when the left vowel is available. In Kashaya the parallel choice is determined by foot alignment (see Buckley 1997); in Nootka I assume that some constraint on syllable alignment (cf. Mester and Padgett 1994) favors a long vowel further left in the word.

syllables. I am not aware of any evidence for more than one foot in Nootka words, located at the left edge. If footing is iterative by default, then we need to refer to the first foot of the word, as in (21). But it is also possible that the constraint in Nootka has a simpler form, as in (37) below which refers only to the foot regardless of location.

(37) COINCIDE(long vowel, Foot)
'a long vowel belongs to a foot'

(i) $\forall x$(x is a long vowel $\rightarrow \exists y$(y = Foot $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

It is not crucial to the rest of the analysis of Nootka whether or not the function *Leftmost* is included in the formalization of COINCIDE(V:). I simply refer to the constraint by the same name but will not claim that Nootka gives clear evidence for licensing by the **first** foot. It does, however, clearly support reference to the foot as a licenser of marked structure, a possibility which is absent from the typology of Beckman (1998) and therefore an important empirical result in itself. See also the discussion of Nootka stress in §2.5.

In Guugu Yimidhirr, COINCIDE(V:) is unviolated: no long vowels occur beyond the first two syllables. In Nootka, of course, the restriction is more limited: long vowels are freely permitted later in the word if they are underlying (as in (30) and (31)). Only derived long vowels are restricted to the first foot. To make sense of this pattern, we have to think about the way in which these long vowels are derived. To begin with, the constraints that are most centrally involved in alternations in vowel length are listed below (cf. McCarthy & Prince 1995).

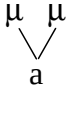
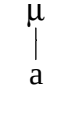
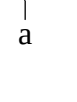
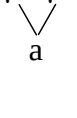
(38)

DEP(μ)	Do not insert a mora.
MAX(μ)	Do not delete a mora.
STAYSHORT	Do not add a mora to a segment.
STAYLONG	Do not remove a mora from a segment.

The two constraints STAYSHORT and STAYLONG are the result of splitting the constraint that McCarthy (1996: 31) calls WT-IDENT, which penalizes any change in length.[6] McCarthy notes that such a split is probably necessary, and I argue below that this is explicitly required. In addition to the constraints in (38), of course, we have COINCIDE(V:), whether or not it refers to the foot as initial.

Consider the following inputs and outputs, and the way in which they violate the various constraints just mentioned.

(39)

	Input	*Output*	*Violations*
a. *Underlying Length Surfaces*			potentially COINCIDE(V:)
b. *Underlying Length Lost*			MAX(μ); STAYLONG
c. *Floating Mora Surfaces*			STAYSHORT; potentially COINCIDE(V:)

[6] Other names for the unitary constraint are TRANSFER (Urbanczyk 1995: 512), IDENT(μ) (Zoll 1996: 144), and Q-IDENT (Buckley 1997). Under this more subtle view, the arguments in Buckley (1997) for the Kashaya ranking Q-IDENT$^{\{2\}}$ » ASYM » Q-IDENT$^{\{1\}}$ actually apply to STAYSHORT$^{\{2,1\}}$.

d.	*Floating Mora Lost*	μ μ | a	μ | a	MAX(μ)

While both an intact underlying long vowel (39a) and a derived long vowel (39c) entail a long vowel on the surface, only the derived long vowel is restricted to the first foot of the word; an underlying long vowel is free to surface later in the word. Here, of course, is where COINCIDE(V:) plays a central role.

To achieve the correct result, the analysis must prohibit the loss of underlying length (39b) while permitting (outside the first foot) the loss of a floating mora. In both cases, an underlying mora is lost; but the two changes differ in the relationship between the segment and the moras. When a long vowel is shortened, the segment loses an association to a mora; but when an underlying short vowel fails to lengthen, no such loss occurs. Thus it is the constraint STAYLONG, referring specifically to the associations between moras and segments, which captures the difference.

The following tableaux illustrate the necessary ranking. STAYLONG must dominate COINCIDE(V:) so that a long vowel outside the first foot remains intact; this ensures that maintenance of underlying length is not sensitive to foot structure.

(40)

/hita-qu:-ʔa·/ (30b)		STAYLONG	COINCIDE(V:)	MAX(μ)
a.	(hita)qu:ʔa:		**!	
b. ☞	(hita)qu:ʔa		*	*
c.	(hita)quʔa	*!		**

If STAYLONG were lower-ranked, we would expect (40c) to win in deference to COINCIDE(V:). However, since the fate of a floating mora is sensitive to the leftmost foot, the constraint which is responsible for the preservation of that mora (i.e. MAX(μ)) must be ranked below COINCIDE(V:), to prevent (40a) from winning.

Further, since (within the first foot) preservation of the mora entails lengthening of an underlyingly short vowel, MAX(μ) must be above STAYSHORT.

(41)

/hił-ma·/ (24b)		COINCIDE(V:)	MAX(μ)	STAYSHORT
a. ☞	(hił-ma:)			*
b.	(hił-ma)		*!	

The overall ranking, then, is as follows.

(42) STAYLONG » COINCIDE(V:) » MAX(μ) » STAYSHORT

Notice in particular that STAYLONG and STAYSHORT are separated by two other constraints. Naturally, this ranking cannot hold unless they are distinct constraints, rather than the unitary WT-IDENT. The separation of the constraints is necessary to distinguish the failure to become long, but not simply to remain long, outside the first foot.

This analysis ensures that a true long vowel (underlyingly linked to two moras) will retain its length anywhere in the word, due to STAYLONG » COINCIDE(V:). But since a variable-length vowel involves a floating mora, STAYLONG is irrelevant and COINCIDE(V:) » MAX(μ) prevents the realization of that mora outside the first foot.

2.3. Vowel coalescence

When two short vowels come together we find behavior identical to that of a variable-length vowel. Specifically, within the first foot the two short vowels coalesce to form a single long vowel.[7] Outside the first foot, however, the result is a short vowel, just as a variable-length vowel surfaces as short in that context. (The marks [‘], [’] can be ignored here, but see §2.4.)

(43)	a.	hita-‘iɬ	→	(hitiːɬ)	‘in the house’ Sw 91
	b.	ma-či-‘iɬ	→	(mačiːɬ)	‘in the house’ Sw 92
	c.	ɬic-sapi-‘iɬ	→	(ɬicsa)piɬ	‘spread out in the way in the house’ Sw 90
(44)	a.	ḥa-ayiːʔiƛ	→	(ḥaː yiː)ʔiƛ	‘come completely into the house’ Sw 91
	b.	ma-aɬča-’as	→	(maːɬčaːs)	‘house against wall on the ground’ St 143
	c.	hita-’as	→	(hitaːs)	‘on the ground’ Sw 91
	d.	či-ʔatu-’ap	→	(čiʔa)tap	‘to cut off’ Sw 95
(45)	a.	RED-p̓a-’ataḥ	→	(p̓ap̓aː)taḥ	‘ready to potlatch’ St 143
	b.	RED-ʔu-’ataḥ	→	(ʔuʔuː)taḥ	‘whaling’ SS 237, Sw 87
	c.	RED-RED-ʔu-’ataḥ	→	(ʔuʔu)ʔutaḥ	‘whaling here and there’ SS 237
(46)	a.	t̓aṅa-ak-ʔi	→	(t̓aṅaːk)ʔi	‘the child of (him)’ SS 15
	b.	ʔumʔiːqsu-ak-ʔi	→	(ʔumʔiːq)sakʔi	‘the mother of’ SS 35
	c.	ʔumʔiːqsu-ak-it-ʔi	→	(ʔumʔiːq)sakitʔi	‘the former mother of him’ SS 37

Thus when the second of two adjacent vowel autosegments is unable to surface, its mora behaves identically to an underlyingly floating mora.[8]

The following diagrams illustrate the similarity between short vowels in hiatus and the underlying variable-length vowels shown in (39c-d). Each short vowel provides a mora, both of which associate to the surface vowel when creation of a new long vowel is permitted, i.e. in the first foot (47a). But since COINCIDE(V:) prevents new long vowels outside the licensing domain of the first foot, in later syllables only one mora surfaces (47b).

			Input	*Output*	*Violations*
(47)	a.	*Coalescence to Long*	μ μ | | a b	μ μ \ / a	STAYSHORT; potentially COINCIDE(V:)
	b.	*Coalescence to Short*	μ μ | | a b	μ | a	MAX(μ)

As the violations shown in (47) indicate, coalescence is really no different from variable length: the second mora, which is unable to remain linked to its underlying features due to the effect of coalescence, can link to the preceding vowel only when it occurs in the first foot.[9]

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[7] According to Sapir & Swadesh (1939: 237), the stem vowel surfaces in preference to a suffixal vowel. Otherwise the quality of the vowel which surfaces depends on the features present in the two underlying vowels: [u] surfaces if either input vowel is /u/; [a] if both vowels are /a/; otherwise [i].

[8] Wilson (1986: 285) formulates this process such that the two vowels which coalesce must be in the first two syllables **before** contraction, i.e. a resulting long vowel occurs only in the first syllable. He gives only one pair of forms to illustrate, with no source cited: *ʔu-aqsti:* → *ʔuːqsti:* ‘within it’ versus *ʔu-ʔu-aqsti:* → *ʔuʔuqsti:* ‘within it here and there’, where the latter has a short vowel in the second syllable. The data in (43) to (46) show a different pattern where it is clearly either of the first two syllables **after** contraction; Sapir & Swadesh (1939: 237) confirm this generalization.

(48)

/ƛaȴa-ak-ʔi/ (46a)	COINCIDE(V:)	MAX(μ)	STAYSHORT
a. ☞ (ƛaȴa:k)ʔi			*
b. (ƛaȴak)ʔi		*!	

(49)

/ʔumʔi:qsu-ak-ʔi/ (46b)	COINCIDE(V:)	MAX(μ)	STAYSHORT
a. (ʔumʔi:q)su:kʔi	*!		*
b. ☞ (ʔumʔi:q)sukʔi		*	

The same situation holds even when one of the input vowels is variable-length: the output vowel is long in the first foot, and short elsewhere.

(50)
a. wi-a·s → (wi:s) 'not quite on a surface' Sw 91
b. ni-a·s-ẏak^{w} → (ni:sẏak) 'kettle' Sw 92
c. ʔu-k^{w}i-a·s-ḥ-ẏak^{w} → (ʔuk^{w}i:sḥ)ẏak 'instrument for being on it meanwhile' Sw 83
d. RED-q^{w}aȴa·-iyaqḥ → (q^{w}aq^{w}a)ȴiyaqḥ 'singing thus many songs' St 143

This result follows from the fact that Nootka, like most languages, does not permit vowels to associate to more than two moras. The third mora has no hope of surfacing, and whether the second mora surfaces depends entirely on whether the vowel is located in the first foot: outside that foot the vowel cannot link to a new mora, and all but the original mora must be deleted.

(51) *Coalescence with variable length*

a. *In the first foot*

b. *Outside the first foot*

This point can be reinforced by the following examples. Variable length occurring initially in a suffix surfaces as long (in the first foot) whether or not a vowel precedes, since there are always at least two moras present, and the addition of a third is irrelevant (52). With a suffix-initial short vowel, however, the presence of a stem-final vowel is essential to providing another mora for a long vowel; after a consonant, it surfaces as short (53).

(52)
a. ʔust-a·sċa → (ʔusta:s)ċa 'on the roof' Sw 91
b. hina-a·sċa → (hina:s)ċa 'on the roof' Sw 91

(53)
a. ʔust-'as → (ʔustʔas) 'on the ground' Sw 91
b. hina-'as → (hina:s) 'on the ground' Sw 91

These facts require no addition to the analysis other than the already necessary restriction against tri-moraic syllables.

2.4. Glottal stop

A rather different example of the special status of the (first) foot in Nootka is found in the treatment of the sequence [VʔV]. As we will see, a glottal stop between vowels is disfavored when it occurs outside the first foot of the word. First, it is necessary to identify some properties

[9] Loss of the second vowel is forced by the ranking ONSET, DEP » MAX; cf. Lamontagne & Rosenthall (1996).

of the "hardening" and "softening" suffixes, which affect an immediately preceding consonant in particular ways (see Sapir 1924: 82, Sapir & Swadesh 1939: 238). For example, a hardening suffix, marked with [ʼ], changes a preceding stop or affricate to an ejective, and a preceding fricative to a glottalized glide.

(54)	a.	yac-ʼas	→	yaċas	'standing on the ground' Sw 94
	b.	qaḥ-siƛ-ʼas	→	qaḥsiƛ̓as	'about to die' Sw 85
	c.	his-ẏakʷ-ʼaqƛ-ṅuk	→	hisẏaḵʷaqƛṅuk	'holding an axe in the hand' Sw 94
	d.	ƛus-ʼiˑs-aḥ	→	ƛuẏiːsaḥ	'I am eating herring' Sw 85
	e.	caqiˑc-qimɬ-ʼaqƛ	→	caqiːcqimẏaqƛ	'twenty round objects inside' Sw 87
	f.	ƛ̓imš-ʼiˑs	→	ƛ̓imẏiːs	'consuming soup' Sw 92

A softening suffix, marked with [ʻ], has no effect on a preceding stop, but changes a fricative to a plain glide.

(55)	a.	yaːɬ-ʻis-it-aḥ	→	yaːyisitaḥ	'I was there on the beach' Sw 85
	b.	quʔac-ʻiɬ-aḥ	→	quʔaciɬaḥ	'I am a person in the house' Sw 85
	c.	maƛ-ʻiɬ	→	maƛiɬ	'imprisoned' Sw 96

The hardening suffixes are best thought of as having a floating glottalization feature [gl] (cf. Lombardi 1991, Zoll 1996). The softening suffixes are less clear, but perhaps have a combination of [gl] and [voice].

I do not pursue a full formal analysis of these effects here, but important motivation for including [gl] as part of the representation of these suffixes is that when the preceding stem ends in a vowel, a glottal stop sometimes appears at the beginning of the suffix. Since hardening and softening suffixes are always vowel-initial, the glottal stop appears in the context [VʔV]. The generalization is that if the glottal stop can occur within the first foot, it does so. But if the glottal stop would surface later in the word, the glottalization feature is deleted and the vowels coalesce. Surface length obeys the principles described in the preceding section.

(56)	a.	ƛa-ʼas	→	(ƛaʔas)	'sticking up on the ground' St 144
	b.	čiː-ʼas-im	→	(čiːʔa)sim	'thing for pulling on the ground' St 144
	c.	ma-ʼas	→	(maʔas)	'residing on the ground; tribe' Sw 96
	d.	RED-t-ma-ʼas	→	(maːtmaːs)	'tribes' SS 237
	e.	haẇa-ʼas	→	(haẇaːs)	'go in order to eat' St 144
	f.	ma-aɬċa-ʼas	→	(maːɬċaːs)	'house against wall on the ground' St 143
	g.	ʔu-wiˑḥta-ʼas	→	(ʔuwiːḥ)tas	'he is in the lead on the ground' St 144
(57)	a.	ta-ʻiɬ	→	(teʔiɬ)	'sick' Sw 96
	b.	ƛ̓iː-ʻiɬ	→	(ƛ̓iːʔiɬ)	'holding a feast' Sw 96
	c.	čiː-ʻiɬ	→	(čiːʔiɬ)	'pulled up in the house' Sw 94
	d.	hita-ʻiɬ	→	(hitiːɬ)	'in the house' Sw 91
	e.	ɬic-sapi-ʻiɬ	→	(ɬicsa)piɬ	'spread out in the way in the house' Sw 90

In particular, candidates such as **(hitaʔiɬ* and **(haẇaʔas* are rejected because the glottal stop lies outside the first foot, in obedience to ONSET.

Whatever the ultimate motivation for this pattern — it may be related to the possibility of perceiving the sequence [aʔa] as [aː] with incidental creakiness — the following constraint formalizes this generalization.[10]

[10] Stonham (1990: 138) proposes that the first foot of the word permits these special structures because it allows a more complex syllable structure, one which contains a special moraic position in the rime. In the N' style of Levin (1985), the relevant structure is $[[[CV]_N \_\_]_{N'} C]_{N''}$. This rime position can be filled by a glide, a glottal stop, or a nasal consonant; other consonants branch directly off the syllable. I have not followed this analysis for several

(58) COINCIDE(intervocalic glottal stop, Foot)
'an intervocalic glottal stop occurs in a foot'

(i) $\forall x$(x is an intervocalic glottal stop $\rightarrow \exists y$(y=Foot $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

As with (37), it is unnecessary to include *Leftmost* in the formulation if we assume just one foot is present. This constraint, which I abbreviate COINCIDE(VʔV), is by no means undominated, since underlying glottal stops are not restricted to the first foot: they surface intact wherever they happen to occur.[11]

(59)

a.	ƛaƞa-ʔi	→	(ƛaƞe)ʔi	'the child' Sw 84
b.	ʔiˑḥ-quːʔa-maḥ	→	(ʔiːḥquː)ʔamaḥ	'I am big coming around the point' Sw 85
c.	kamitq-wiːʔas	→	(kamitq)wiːʔas	'to run out of the house' Sw 95
d.	kʷaːɬmiʔa-štaq-imɬ	→	(kʷaːɬmi)ʔaštaqimɬ	'Kwahlmia's band' Sw 87

Recall my proposal that the hardening and softening suffixes are represented with the floating feature [gl]. The glottal stops in (59), on the other hand, are full segments with an underlying root node. It is faithfulness to the segment (as opposed to the feature) which is responsible for this difference. Following the framework of Zoll (1996: 170), the essential ranking is MAX(SEG) » COINCIDE » MAX(SUBSEG). In other words, preservation of a segment such as /ʔ/ outranks the distributional restriction COINCIDE(VʔV), which in turn dominates faithfulness to a (floating) subsegment, i.e. MAX([gl]).

(60)

/ƛaƞa-ʔi/ (59a)	MAX-C	COINCIDE(VʔV)	MAX([gl])
a. ☞ (ƛaƞe)ʔi		*	
b. (ƛaƞiː)	*!		

---

reasons. First, Stonham assumes abstract glides are responsible for variable vowel length; that is, the contrast in (36) is treated as V ≠ VG ≠ VV. While this approach is made possible by the apparent fact that there are no surface glides in Nootka codas, the use of a floating mora is a more direct representation which does not require abstract segments nor a special syllable structure. Second, Stonham requires the assumption that an intervocalic glottal stop syllabifies in the coda rather than in the onset of the following syllable, contrary to the universal preference for onsets. Finally, it is not clear to me that this approach makes the right predictions about nasals. Stonham argues based on reduplication and phonotactic patterns that nasal codas occupy this special position, but nasal codas are attested outside the first foot (e.g. *ʔuːcʔuːwimṯweʔin*, p.140), where the special syllable position should not be available.

[11] There are additional complications which interact with the foot generalization. First, Nootka has two classes of suffixes, which Sapir & Swadesh (1939: 236) term "formative" and "incremental". The incremental suffixes, much smaller in number, are less closely bound to the stem than the formative suffixes, and in at least some respects seem to pattern as clitics to the basic prosodic word. For example, before a formative suffix, labialization is preserved (*qaḥ-ak̓ʷ-as* 'dead on the ground'); but before an incremental suffix it is lost (*qaḥ-ak̓-aƛ* 'dead now'), as happens word-finally (cf. (28); see also Swadesh 1937: 80). Most germane to the present discussion is that the hardening feature of an incremental suffix can surface as an intervocalic glottal stop outside the first foot (*čiˑ-cswiː-ʔaƛ* 'now cut through'). This is probably attributable in some way the the special prosodic structure of these suffixes — for example, they may form separate syllables and retain the glottal stop which serves as an onset — so I restrict my attention in this section to the formative suffixes only. (Some formative suffixes also appear to have special junctural properties; these, too, are excluded.) A second complication is that some morphemes have a "movable" final consonant which disappears before a hardening or softening suffix, to be replaced by an (intervocalic) glottal stop (*mat-ši-ʔaƛ* 'now fly away' versus *mat-šiƛ* 'fly away'). I assume that this is an opacity effect, and that the glottal stop is not intervocalic at the appropriate level of representation (i.e., where the movable consonant is present).

Crucially, MAX(SEG) — more specifically, MAX-C referring to any consonant — is simply irrelevant to the fate of an underlyingly floating feature, in which case COINCIDE asserts itself.[12]

(61)

/ma-ʾas/ (56c)	MAX-C	COINCIDE(VʔV)	MAX([gl])
a. ☞ (maʔas)			
b. (ma:s)			*!

(62)

/RED-t-ma-ʾas/ (56d)	MAX-C	COINCIDE(VʔV)	MAX([gl])
a. (ma:tma)ʔas		*!	
b. ☞ (ma:tma:s)			*

The constraint type MAX(SUBSEG) refers to floating features and nodes: it says that a floating feature such as [gl] is preserved in the output (whether floating there or not). It must be distinguished from IDENT(Feature), which regulates the faithfulness of features between correspondent segments (McCarthy and Prince 1995). In particular, IDENT([gl]) ensures that if an underlying segment bears [gl] then the corresponding segment in the output must also bear that feature. IDENT([gl]), together with MAX-C, dominates COINCIDE(VʔV) to preserve the underlying glottal stop intact even when it occurs outside the first foot.

2.5. Stress

Nootka stress is normally initial (63) but is attracted to a heavy syllable, i.e. one containing a long vowel or a nasal coda (64); cf. Wilson (1986: 288), Stonham (1990: 144).

(63)
a. tíqʷilʔa 'now he sat down' W 289
b. ʔínƙi 'the fire' W 289
c. čímsṁi:t 'Son of Bear' St 134
d. ʔú:simčа 'now trained at ...' W 289
e. nú:taswеʔin 'they are going to play the hoop game, it is said' St 134
f. ṅá:csa:ƛ̓weʔin 'they looked at her, it is said' St 134

(64)
a. ƚasí:ʔaƙi 'his door' W 289
b. ḥačímsiqsakʔi 'her brothers' St 134
c. hawá:taƛ̓weʔin 'after eating, it is said' St 134

However, it is only weight in the second syllable which attracts the stress.[13] If, for example, the only long vowel in the word is outside the first two syllables, stress remains initial.

(65)
a. (ƚúƚuh)caqċu:ʔi 'having a head at each end' W 289
b. (qʷáye)ċi:k 'wolf' W 289
c. (čáʔac)si:b *proper name* W 289

[12] For simplicity, MAX is restricted here to the segment /ʔ/, and is not violated by vowel coalescence. In fact, MAX (or better, MAX-C) can refer to any consonant. It needs to be distinguished from MAX-V, which is dominated by ONSET and DEP-C in order to achieve the effect of coalescence (cf. Archangeli 1997: 11). Since DEP-C is violated when the floating [gl] surfaces as a full consonant, it has to be ranked below MAX([gl]); therefore MAX-V must be ranked even lower, and cannot be identical to MAX-C, which dominates MAX([gl]) by transitivity. In sum: MAX-C » MAX([gl]) » DEP-C » MAX-V.

[13] Stonham (1990: 144) suggests that there are exceptions to this generalization, but does not go into detail or provide relevant data.

This pattern indicates that while stress is attracted to heavy syllables, it is constrained to occur in the first disyllabic constituent of the word. In other words, the first foot of the word must be the bearer of stress — or, of course, there is only one foot in the word.

When stress is initial, as in (65), that disyllabic constituent is easily treated as a trochaic foot. When the stress is on the second syllable, as in (64), there are two solutions involving a binary foot: the foot is a trochee which is displaced by one syllable (66a), or the foot is merely right-headed, i.e. iambic (b).

(66) a. *Trochee (displaced)* ƛa(sí:ʔa)k̓i
b. *Iamb* (ƛasí:)ʔak̓i

Since words with second-syllable stress do not exhibit displaced patterns of variable vowel length and glottal stop distribution, it must be the case that the foot is still constructed over the first two syllables, but it is an iamb (66b).

In a framework such as OT where constraints are violable, it is a rather simple matter to achieve this variability in headedness (Prince and Smolensky 1993: 55, Hung 1994: 89, Kager 1996; cf. also Crowhurst 1991). In such cases of "rhythmic reversal", the position of the foot is fixed, but its headedness may deviate from the normal pattern of the language. In Nootka, the foot is normally trochaic, as evidenced by the preference for initial stress, but can be iambic to satisfy the Weight-to-Stress Principle (WSP). Under this analysis, the position of the foot is maintained, indicating that ALIGNLEFT also dominates RHYTHMICTYPE.

(67) ALIGNL Align(PrWd, L; Ft, L). Align the left edge of the word with the left edge of a foot.
WSP Heavy syllables are stressed.
RHTYPE Feet are left-headed.

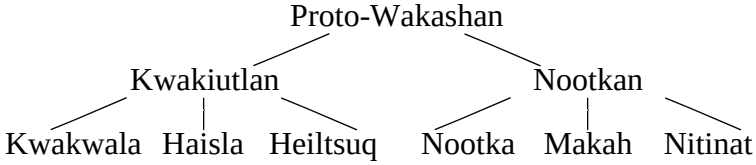
(68)

		ALIGNL	WSP	RHTYPE
a.	(ƛási:)ʔak̓i		*!	
b.	ƛa(sí:ʔa)k̓i	*!		
c. ☞	(ƛasí:)ʔak̓i			*

Unlike in Guugu Yimidhirr (§1.3), then, it is possible to equate the foot which licenses marked structures such as vowel length with the foot which actually encodes the stress.

We return now to the question of whether in Nootka we must refer to the first foot, or simply to the only foot present in the word. Wilson (1986: 289) assumes that footing in Nootka is noniterative; this would mean that the function *Leftmost* is unnecessary for the Nootka COINCIDE constraints. Let us consider the evidence by looking at the situation in related languages. The Wakashan family has two branches, shown in (69).

(69)



The Kwakiutlan branch has iterative footing, but does not show special treatment of the first foot (Wilson 1986: 284). For example, Wilson reports that Kwakwala words can have secondary stresses, and primary stress can fall beyond the first two syllables due to an attraction to more prominent syllables (cf. Boas 1947: 218, Bach 1978).

(70) a. ṗá:dəḵə̀mʔidà *no gloss* W 287
b. góx^{w}bidəwè *no gloss* W 287
c. ṁək^{w}əlá 'moon' W 287

Wilson (1986: 289) states that Makah is like Nootka in restricting stress to one of the first two syllables, differing only in the fact that when both the first two syllables are light stress is attracted to the second syllable.[14] He suggests that the Kwakwala stress pattern represents the older form of the language; it then follows that in Nootkan, the importance of the (first) foot is an innovation. For Wilson, the change in stress was first (itself caused by the loss of distinction between full and reduced vowels), with subsequent changes in the distribution of vowel length. These processes "do not take the specific location of stress in any given word into account. Rather, it is the foot itself that is the strongest candidate for inclusion in their structural descriptions. Even though the weak node of a given metrical foot is identical (in theory) to the weak nodes assigned by the word tree, the generalized strength of the foot itself takes precedence" (p. 290).

In contemporary Nootkan, where transcriptions do not indicate secondary stress, there are two possibilities: footing is also iterative, but the first foot is singled out not only for the purposes of vowel length and glottal stop but also for the location of stress; or footing is non-iterative, and all these processes refer simply to the one existing foot. The latter option is the simplest, and barring positive evidence for feet beyond the first one, for Nootka we must maintain the simpler formulations of COINCIDE given in (37) and (58). As noted earlier, however, the fact of the foot as a licenser is important in itself, and Nootka amply supports this claim. We turn now to the case of Kashaya, where not just the foot but specifically the first foot of the word is the licenser of marked structure: the analysis of the patterns requires a combination of the foot licensing of Nootka seen in this section and the *Leftmost* function seen for Greek in §1.2.

3. Kashaya foot structure

Kashaya, a Pomoan language of northern California, has a metrical system of considerable intricacy; see Oswalt (1961, 1988) and Buckley (1994b,c, 1997) for full details. I concentrate here on verbs, which have much greater morphological complexity than nouns and provide a richer source of examples.

3.1. Lengthening and extrametricality

Kashaya foot structure is iambic (i.e. quantity-sensitive and right-strong), with feet constructed iteratively from left to right in traditional terms. Barring the intervention of processes described below, main stress falls on the first foot, and all feet induce iambic lengthening of a short open syllable in strong position (except in a set of suffixes which occur late in the word; see Buckley 1994c, 1997). Heavy syllables are those containing a long vowel or a coda consonant.[15] In the representations here, parentheses indicate the location of feet; I assume here that degenerate feet are avoided (cf. Hayes 1995), so a final light syllable is unfooted unless it bears the main stress.[16]

(71) a. **mac**-id-uced-u → (mací:)(duce:)du 'keep going in there'
b. **ʔi**-yiċ-iwaċ-em → (ʔiyí:)(ċiwa:)(ċem) 'while they were staying' T 110

[14] This pattern indicates that in Makah the default rhythmic type is iambic, and so it is not surprising that related Nootka permits the iambic foot in (68c).

[15] Every Kashaya syllable has exactly one consonant in the onset and a maximum of one in the coda. The only exception is found in word-final CVCC, where the final C is provided by an Evidential suffix.

[16] Certain segmental changes are shown as part of the input form in order to simplify the derivation. For example, all tokens of [b, d] are derived from /ṁ, ṅ/ located in the onset (Buckley 1994c: 48f).

c.	**mo**-mac-ela	→	(momá:)(cela)	'I run in'
d.	**nat**-ad-uced-u	→	(natá:)(duce:)du	'mock' T 150
e.	**cad**-uced-u	→	(cadú:)(cedu)	'look at'
f.	**w**-ala-bi-na	→	(walá:)(bina)	'had gone down' T 150

An important category in Kashaya metrical phonology is the BASE: a morphological constituent which includes the root, any prefix which may be present, and any of a small set of suffixes (e.g. *-hci*). If the base of a word is monosyllabic, metrical structure is created over the entire domain: that is, foot construction begins at the absolute left edge of the word. This is the case for the verbs in (71); for ease of reference, the root and any suffix which is included in the base are shown here in boldface.

In polysyllabic bases, the first syllable is extrametrical: it is excluded from the domain of foot construction. (For some exceptions, see §6.5.) I represent this extrametricality simply by excluding that syllable from foot structure.

(72)	a.	**bimucid**-uced-u	→	bi(mucí:)(duce:)du	'used to eat' T 98
	b.	**caq^{h}am**-ala-w-ibic-ʔ	→	ca(q^{h}amá:)(lawi:)(biʔ)	'start to cut downward' 194
	c.	**libut**-ad-u	→	li(butá:)du	'keep whistling'
	d.	**boʔo**-t-ad-un	→	bo(ʔotá:)(dun)	'while hunting' T 98
	e.	**šiwey**-ibic-ed-em	→	ši(weyí:)(bice:)(dem)	'when new growth starts' T 150
	f.	du-**ƙil**-iċ-i	→	du(ƙilí:)ċi	'point at yourself!'
	g.	p^{h}i-**ʔtạ**-m-aqac-ed-un	→	p^{h}iʔ(tạmá:)(qace:)(dun)	'whenever she looked up' T 152

Notice that in the words with an extrametrical syllable (72), it is the **third** syllable which lengthens: this is because that syllable heads the first foot of the word. Contrast this with (71), where there is no extrametrical syllable: the first foot begins on the first syllable of the word and it is the **second** syllable which lengthens. Most important for the present discussion is that, due to the existence of this restricted extrametricality, the first foot of the word can begin with the first or second syllable of the word.

3.2. Skipping of initial feet

Two additional facts about Kashaya metrical structure are relevant to the examples discussed here. There are no secondary stresses, so the location of iambic lengthening is the primary evidence for iterative foot construction. However, iterative footing is also necessary to account for instances where the main (and only) stress falls on a noninitial foot. Specifically, when the first foot of the word is of the shape CVV, it is skipped and stress falls on the second foot. This can result in stress as far in as the fourth syllable, when combined with syllable extrametricality and a branching second foot.

(73)	a.	**di:ċ**-aq-qa-w	→	(di:)(ċáh)(qaw)	'cause to bring message out here'
	b.	**di:ċ**-waċ-a-emu	→	(diċ)(waċá)mu	'what they say is' T 192
	c.	**ḑa:**-muċ-ba	→	(ḑa:)(múċ)ba	'after leaving each other'
	d.	**buwi**-:c-id-t^{h}u-ʔ	→	bu(wi:)(cíʔ)(t^{h}uʔ)	'don't keep stringing beads!' 214
	e.	**miku:ṭ**-e: mu	→	mi(ku:)(ṭé:)mu	'he is humming' 282
	f.	**ʔima:ta**-ʔem	→	ʔi(ma:)(taʔém)	'the woman (Subj)'
	g.	**moʔo:da**-t^{h}in-ʔe: mu	→	mo(ʔo:)(dat^{h}í)(ne:) mu	'that is not a fern'

The first foot is skipped even when the long vowel is shortened in a closed syllable, as in (73b); see Buckley (1994c, 1997).

A related phenomenon is what Buckley (1994c) terms Foot Flipping. This is a change from underlying CVV.CV (long–short) to CV.CVV (short–long), resulting in a canonical iamb. (There are morphological restrictions not discussed here.) The foot that results from this change

is always skipped for stress, just like the CVV in (73). The stress can then fall as far in as the fifth syllable.

(74)	a.	**di:ċ**-aq^{w}-iċ-i	→	(diċa:)(qoċí)	'take a message out!' 202
	b.	**ťe:t**-ibic-ʔ	→	(ťeti:)(bíʔ)	'stand up' 193
	c.	**bo:ť**-am-e: mu	→	(boťa:)(mé:) mu	'it becomes soft' D
	d.	**miku:ṭ**-ad-e: mu	→	mi(kuṭa:)(dé:) mu	'he keeps humming' 283
	e.	**qašo:q^{w}**-ad-i	→	qa(šoqo:)(dú)	'be getting well' 213
	g.	p^{h}a-**ťe:t**-ad-ela	→	p^{h}a(ťeta:)(delá)	'I put it upright' T 324
	h.	**loq̇o:c**-ad-uwad-u	→	lo(q̇oca:)(duwá:)du	'keep moving about' T 150

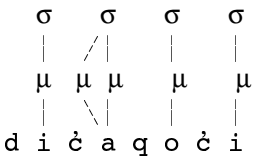
I do not dwell here on the formal analysis of most of these patterns; the important point is that the first foot of the word does not necessarily correspond to the category "main stress", and in the description of the three non-metrical patterns presented in the remaining sections, it is necessary to make specific reference to "first foot".[17]

The nature of Foot Flipping is sufficiently relevant to merit discussion. Notice the two possible realizations of vowel length in a root such as *di:ċ-* 'say' in the two examples repeated here.

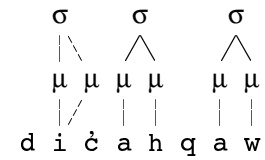
(75)	a.	**di:ċ**-aq^{w}-iċ-i	→	(diċa:)(qoċí)	'take a message out!'
	b.	**di:ċ**-aq-qa-w	→	(di:)(ċáh)(qaw)	'cause to bring a message out here'

Buckley (1997) argues that in roots of this type — the normal type for verbs with vowel length — only the first mora is underlyingly linked to a vowel, while the second mora is floating, exactly as proposed for Nootka variable-length vowels in (36). In Kashaya, the docking of the floating mora is determined by syllable and foot well-formedness. When possible, the mora links to the following vowel to create a canonical light-heavy iamb, as in (75a). But when the following syllable is closed by a consonant, the mora is forced to linked to the preceding vowel (75b). These differing locations are illustrated in the following diagrams.

(76) a.



b.



In Kashaya, the floating mora is able to move beyond its original morphological affiliation to lengthen the vowel of a following suffix. This distinguishes it from the floating moras in Guugu Yimidhirr and Nootkan. Notice, however, that in both Kashaya outcomes the long vowel surfaces in the first foot of the word, which will be either branching or nonbranching: this is consistent with the claim motivated below that COINCIDE(V:) refers in Kashaya to the first foot. Further, the floating moras are found only in the first metrifiable syllable of a root — never in a suffix, where it would be liable to occur outside the first foot. Thus even beyond the three patterns discussed in the following sections, the restriction on the creation of long vowels

[17] One could conceivably make reference to an intermediate stage before stress has moved from the first foot; but Buckley (1997) argues forcefully against such an intermediate stage as unable to account adequately for metrical phenomena such as Foot Flipping.

functions as a limit on the distribution of floating moras in the lexicon. In subsequent sections, underlying length that consists of a floating mora will be marked [·], as for Nootka.

4. Elision

The first non-metrical process which is sensitive to the presence of extrametricality is Elision. When two adjacent vowels arise in morphological concatenation, the features of the second vowel are lost, but whether the remaining vowel surfaces as short or long depends on the position of the original vowel within the word. I show that when the vowels come together in a syllable which is located in the initial foot, the outcome of Elision is a long vowel. This is, of course, very similar to the coalescence pattern discussed for Nootka in §2.3. Kashaya Elision arises in a variety of specific cases, which are considered in turn here.

4.1. Without extrametricality

First we look at words with monosyllabic bases, where there is no extrametricality. When the two vowels come into contact in the first syllable, a long vowel results. (There is a one-to-one correspondence in Kashaya between vowels and syllables.)

(77)	a.	**mo**-ibic-ʔ	→	(mo:)(bíʔ)	'run away'
	b.	**mo**-ad-eti	→	(mo:)(detí)	'even though it was running' T 196
	c.	**ca**-ad-u	→	(ca:)(dú)	'fly along'
	d.	**da**-ibic-qa-w	→	(da:)(bícʰ)(qaw)	'go away' T 70

When, however, the Elision occurs in the second or later foot of the word, it results in a short vowel.[18]

(78)	a.	**šat**-qa-iċ-ed-u	→	(šátʰ)(qaċe:)du	'cover his (body)' T 190
	b.	**kel**-ci-iċ-ed-em	→	(kél)(ciċe:)(dem)	'peeking from behind' T 146
	c.	**q̣a·**-hqa-ibic-ʔ	→	(q̣ah)(qabíʔ)	'rescue'
	d.	**celʰ**-ma-iċ-i	→	(célʰ)(maċi)	'wear it as a backpack!' D
(79)	a.	**dú:bayʰ**-ci-iċ-em	→	(dú:)(bayʰ)(ciċem)	'being too busy' D
	b.	**ší:batʰ**-ci-iċ-e:	→	(ší:)(bac)(ciċe:)	'feel sorry for oneself' D

This pattern holds even if the vowel length does not remain in the first syllable, due to Foot Flipping (§3.3).

(80)	a.	**mo**-adadad-u	→	(moda:)(dadú)	'run intermittently' 208
	b.	**ci**-iċ-id-u	→	(ciċi:)(dú)	'happened' D

A single generalization remains: a long vowel results if it surfaces in the first **foot** of the word, not just in the first syllable.[19]

---

[18] The data required to show clearly that Elision has resulted in a short vowel are of a restricted type: the two vowels must be preceded by a heavy syllable to rule out iambic lengthening as an analysis; but ultimately in an open syllable to avoid closed-syllable shortening; and there are few vowel-initial suffixes which occur in the relevant context. All examples given here of short vowels resulting from Elision satisfy these conditions.

[19] Examples (78a-b) might conceivably be interpreted like (80), i.e. a long vowel from Elision and then Flipping, but (c-d) show this cannot be the case, since Flipping is not possible in a CVV.CVC context, nor word-finally (cf. (77) where Flipping fails for these reasons). That is, there is no trace of a long vowel in (c-d), so the vowel has to be short as the direct result of Elision.

4.2. With extrametricality

The examples in (78) have no extrametricality, with Elision in the second syllable; those in (79) also lack extrametricality (despite the length of the base: they are lexical exceptions), and show Elision in the third syllable.[20] Let us now examine words with extrametricality. The following data show that Elision can result in a long vowel in the second (absolute) syllable when the first is extrametrical.

(81)	a.	cʰi-**de**-ibic-ʔ	→	cʰi(de:)(bíʔ)	'lift up'
	b.	cʰi-**de**-ad-u	→	cʰi(de:)(dú)	'carry along'
	c.	cʰi-**de**-adadad-u	→	cʰi(deda:)(dadú)	'carry in stages' 208
	d.	**šohko**-ad-u	→	šo(ko:)(dú)	'be sitting'
	e.	**buhku**-ad-u	→	buh(ku:)(dú)	'go along hunched over'
	f.	**yehe**-ala-w	→	ye(he:)(láw)	'drag down'
	g.	**pʰila**-ačic-ʔ	→	pʰi(la:)(čiʔ)	'go away (pl)'

The long vowels arising in (81) are like those seen in the first syllable in (77), but here they are in the second syllable. What unites the two cases is that we find a long vowel in the first foot of the word.

As predicted by the statements above, in the presence of initial-syllable extrametricality it is in the third and later absolute syllables — i.e. starting from the second or third footed syllables, depending on the size of the first foot — that Elision results in a short vowel.

(82)	a.	**tubic**-ʔta-ič-em	→	tu(bíʔ)(tačem)	'while starting in (pl.)' D
	b.	ba-**qʰaṭ**-qa-ič-in	→	ba(qʰáṭʰ)(qačin)	'sounded good' T 96
	c.	du-**ba·l**-ci-ič-i	→	du(bal)(čičí)	'wipe with your finger!' D
	d.	**malucma**-ibic-ʔ	→	ma(lúcʰ)(mabiʔ)	'start to bake (pl.)'
	e.	ba-**hqoṭol**-qa-ič-ed-u	→	bah(qoṭól)(qače:)du	'failed to heed' T 162
	f.	du-**ƛ̓il**-qa-ič-ed-u	→	du(ƛ̓íl)(qače:)du	'make (him) point at yourself!' 231
	g.	du-**ƛ̓il**-qa-ič-i	→	du(ƛ̓íl)(qači)	'point at yourself deliberately!' 230

The data in (81) show that the result of Elision is sensitive to extrametricality; (78) shows that it is not simply a matter of "first or second syllable".

4.3. Analysis: Coincidence of long vowels

This situation is more complex than that seen in Nootka since there is extrametricality. That is, the correct application of Elision requires reference to the domain defined by syllable extrametricality, even though it is not inherently foot-based. For example, it is not possible to say that Elision produces a long vowel in a syllable that begins a foot, since that is equally true of the context in (82), where a short vowel results. Illustrative foot structures are summarized in (83).

(83)	a.	*Long vowel*	(mo:)(bic...)	cf. (77)
			cʰi(de:)(bic...)	cf. (81)
	b.	*Short vowel*	(ƛ̓ah)(qabic)	cf. (78)
			(du:)(bayʰ)(cic...)	cf. (79)
			ma(lucʰ)(mabic)	cf. (82)

By making direct reference to the category "first foot", a very simple generalization is possible for the outcome of Elision. Trying to define the process in terms of syllable count forces not only counting — a theoretically dubious algorithm (cf. McCarthy & Prince 1986) — but also a

[20] There are no examples of Elision in an extrametrical syllable: this would require a vowel-final prefix and a vowel-initial root, but the latter are nonexistent.

recapitulation of the same principles involved in the location of the first foot. The complication engendered by extrametricality is descriptive only: the theoretical analysis of the pattern is essentially the same as needed in Nootka. By referring to foot structure, the effect of extrametricality follows automatically.

The relevant constraint is repeated here from that proposed for Guugu Yimidhirr in (21), since it has precisely the same form in Kashaya.

(84) COINCIDE(long vowel, *Leftmost*(Foot, Word))
'a long vowel belongs to the first foot'

(i) $\forall x$(x is a long vowel $\rightarrow \exists y$(y =*Leftmost*(Foot, Word) $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

In Guugu Yimidhirr COINCIDE(V:) is unviolated: no long vowels occur beyond the first two syllables. In Kashaya, as in Nootka, the restriction is more limited: long vowels are freely permitted later in the word if they are underlying (as with *-e:* in (79)), or the result of iambic lengthening (as in (71) and elsewhere). Only in the specific case of Elision are long vowels restricted to the first foot.[21]

The set of possible inputs and outputs for Kashaya is given below; this repeats the structures given for Nootka in (39) and (47), with the addition of iambic lengthening (85e).

		Input	*Output*	*Violations*
(85)	a. *Underlying Length Intact*			potentially COINCIDE(V:)
	b. *Underlying Length Lost*			MAX(μ); STAYLONG
	c. *Elision to Long*			STAYSHORT; potentially COINCIDE(V:)
	d. *Elision to Short*			MAX(μ)
	e. *Iambic Lengthening*			DEP(μ); STAYSHORT; potentially COINCIDE(V:)

Iambic Lengthening is not impeded by either DEP(μ) (else it would never apply) or COINCIDE(V:) (else it would apply only in the first foot), so the constraint which forces the creation of an asymmetric iambic foot — ASYM in Buckley (1997) — is clearly higher-ranked than both of them. As in Nootka, STAYSHORT is low ranked overall. I will not pursue this case further here.

The following tableaux illustrate that the necessary ranking is the same as that motivated for Nootka in (42). The word *ba:ś́ó:yaw,* a variety of acorn, is used to illustrate underlying long

[21] Underlying long vowels do shorten under particular circumstances, e.g. in a closed syllable, but this is independent of the question of the leftmost foot. Obviously, constraints on syllable structure and other aspects of the representation must outrank MAX(μ) in order for such shortening to occur (see Buckley 1997).

vowels. For ease of reference, only the first foot is shown, though footing is clearly iterative (§3).

(86)

/ba:ʂo:yaw/		StayLong	Coincide(V:)
a. ☞	(ba:)ʂo:yaw		*
b.	(ba:)ʂoyaw	*!	
c.	(baʂo:)yaw	*!	
d.	(baʂo)yaw	*!*	

Elision to a short vowel outside the first foot (87) demonstrates Coincide(V:) » Max(μ), while within the first foot Coincide(V:) has no effect (88).

(87)

/du-ƙil-qa-iċ-i/ (82)		Coincide(V:)	Max(μ)
a.	du(ƙil)qa:ċi	*!	
b. ☞	du(ƙil)qaċi		*

(88)

/mo-ibic-ʔ/ (77)		Coincide(V:)	Max(μ)	StayShort
a. ☞	(mo:)biʔ			*
b.	(mobiʔ)		*!	

In sum, the restrictions on vowel length in Nootka and Kashaya (and Guugu Yimidhirr) are remarkably similar. All are compatible with the Coincide constraint formulated in (84), but only in Kashaya is it unambiguously a foot, and unambiguously the first of a sequence of feet.

5. Durative allomorphy

The next process in Kashaya which makes reference to the initial foot is allomorphy. The Durative suffix has complex conditions on its shape, two of which are discussed here (see also Oswalt 1961: 211ff; Buckley 1994c: 328f): forms chosen after a vowel (§5.1), and after a palato-alveolar affricate (§5.2).

5.1. Forms after a vowel

After a vowel-final stem, two allomorphs of the Durative occur, *-cid* and *-med*. First, consider words which have no extrametricality. For these, we can make the generalization that *-cid* occurs after a stem which is one syllable in length (89), and *-med* occurs after longer stems (90).

(89)

a.	**ca**-cid-u	(cací:)du	'sit' T 98
b.	**ne**-cid-u	(necí:)du	'set down' T 162
c.	**wa**-cid-uwad-u	(wací:)(duwa:)du	'come' T 258
d.	**ma**-cid-uced-u	(mací:)(duce:)du	'go across!' 226
e.	**ḍa·**-cid-u	(ḍaci:)(dú)	'leave (behind)'

(90)

a.	**mo**-aq-qa-med-u	(moh)(qamé:)du	'drive vehicle' 212
b.	**mo**-ht-aq-qa-med-ʔ	(móh)(tah)(qameʔ)	'drive vehicles (pl. agt.)' 212
c.	**w**-ala-med-em	(walá:)(medem)	'come down' T 226
d.	**mo**-ala-med-u	(mola:)(medú)	'keep running down' 265
e.	**ṭahy**-ala-med-ʔ	(ṭáh)(yala:)(meʔ)	'they poured down' T 226

When extrametricality is present, *-cid* occurs with disyllabic stems (91), while *-med* occurs elsewhere (92).

(91)

a.	**buwi**-cid-u	bu(wicí:)du	‘string beads’ 212
b.	**cuma**-cid-u	cu(mací:)du	‘sit’ T 230
c.	**cahno**-cid-u	cah(nocí:)du	‘talk’ 88
d.	**dihqa**-cid-u	dih(qací:)du	‘would give’ T 98
e.	mu-**ʔbe**-cid-u	muʔ(becí:)du	‘hold breath’ T 226
f.	šo-**ṭo·**-cid-u	šo(ṭoci:)(dú)	‘keep on peeling’ 212
g.	ba-**hye**-cid-un	bah(yecí:)(dun)	‘whenever he stopped’ T 90
h.	di-**hci**-cid-u	dih(cicí:)du	‘take away’ T 142

(92)

a.	ma-**nac**-ala-med-ʔ	ma(nacá:)(lameʔ)	‘drive down’ T 266
b.	ba-**hnat**-ci-med-u	bah(nátʰ)(cime:)du	‘kept asking’ T 66
c.	**ṭʰaʔba**-m-ci-med-u	ṭʰaʔ(bám)(cime:)du	‘happens’ T 142
d.	**ʔihyu**-m-ci-med-u	ʔih(yúm)(cime:)du	‘when it grows cold’ T 274
e.	šu-**šaẏṭa**-med-ʔ	šu(šáẏ)(ṭameʔ)	‘they whipped’ T 270
f.	**cahci**-hqa-med-u	cah(cíh)(qame:)du	‘make sit’ T 160
g.	pʰa-**ʔša**-t-ma-med-u	pʰaʔ(šátʰ)(mame:)du	‘strike’ T 160
h.	du-**ǩil**-qa-med-u	du(ǩíl)(qame:)du	‘keep making (him) point’ 231

Notice in particular that simple syllable counting is empirically inadequate: both (91) and (90) have the Durative in the third syllable of the word, but take different allomorphs.[22] A simple generalization which distinguishes the two allomorphs is that *-cid* occurs (at least partly) in the first foot of the word, and *-med* occurs elsewhere. Representative examples are repeated in (93).

(93)

a.	**ne**-cid-u	(necí:)du	cf. (89)
b.	**buwi**-cid-u	bu(wicí:)du	cf. (91)
c.	**mo**-aq-qa-med-u	(moh)(qamé:)du	cf. (90)
d.	ma-**nac**-ala-med-ʔ	ma(nacá:)(lameʔ)	cf. (92)

Of course, by referring to foot structure, the effect of extrametricality is automatically taken care of, since extrametricality affects the location of the first foot.

5.2. Forms after a palato-alveolar

The analysis in terms of “first foot” is supported by a very similar Durative allomorphic pattern after a palato-alveolar affricate (/c, ċ/). Here, if the suffix occurs in the first foot, we find *-id.*

(94)

a.	**di·ċ**-id-u	(diċi:)(dú)	‘say’ T 86
b.	**di·ċ**-id-pʰila	(di:)(ċíṅ)(pʰila)	‘if (you) tell’ T 162
c.	**bo·c**-id-u	(boci:)(dú)	‘multiply’ D
d.	**ci**-iċ-id-u	(ciċi:)(dú)	‘do, happen’ T 74
e.	**be**-c-id-un	(becí:)(dun)	‘would pick up’ T 268

(95)

a.	**munac**-id-u:li	mu(nací:)(du:)li	‘after having gathered’ 88
b.	**muna·c**-id-u:li	mu(naci:)(dú:)li	‘after having been too shy’ 88
c.	**haluċ**-id-u	ha(luċí:)du	‘be putting over one’s head’ 214
d.	di-**buc**-id-em	di(bucí:)(dem)	‘when it rains’ T 128
e.	**cohtoc**-id-u	coh(tocí:)du	‘would leave’ T 98
f.	ba-**hye·**-c-id-un	bah(yeci:)(dún)	‘whenever he stopped’ T 90

[22] It is also true that *-cid* tends to occur directly after roots, and *-med* after suffixes. This is not a viable alternative explanation, however; for example, in *šušáẏṭameʔ* in (92) *-med* follows a root. See also the related alternation between *-id* and *-ed* below for more copious conterexamples. The tendency for the presence of a suffix to correlate with the choice of the second allomorph is due, of course, to the fact that suffixes add length to the stem and may “push” the Durative out of the first foot.

g.	**ċa:hac**-id-em	ċa:(hací:)(dem)	'when he marries' T 184
h.	**yalac**-id-u	ya(lací:)du	'straighten out' 85

Later in the word, i.e. outside the first foot, the close variant *-ed* is selected. (There is no phonological rule affecting vowel height in Kashaya which will account for this difference.)

(96)	a.	**ʔdú:ciċ**-ed-un	ʔ(dú:)(ciċe:)(dun)	'when they think' T 226
	b.	**di·ċ**-aqac-ed-u	(diċa:)(qacé:)du	'keep carrying message up hence' 215
	c.	**kel**-ci-iċ-ed-em	(kél)(ciċe:)(dem)	'peeking from behind' T 146
	d.	**šat**-qa-iċ-ed-u	(šát^{h})(qaċe:)du	'wear' T 190
(97)	a.	**qanemaċ**-ed-u	qa(nemá:)(ċedu)	'they were related' T 62
	b.	**bane**-mac-ed-u	ba(nemá:)(cedu)	'swing out over there' T 66
	c.	du-**htay**-iċ-ed-un	duh(tayí:)(ċedun)	'it's hurting' T 96
	d.	ba-**hnat**-iċ-ed-u	bah(natí:)(ċedu)	'ask (to do) with' T 56
	e.	p^{h}i-**ʔɬa**-m-aqac-ed-un	p^{h}iʔ(ɬamá:)(qace:)(dun)	'whenever she looked up from' T 152
	f.	**yehe**-ala-meċ-ed-u	ye(hela:)(meċé:)du	'barely be getting down off' 87

Once again, syllable counting is ineffective: (95) and (96) show different allomorphs in the third syllable. Likewise, the notion "stressed" is not relevant: both allomorphs are found stressed and unstressed, thanks to stress shift (§3.2). What matters is simply whether the suffix is in the first foot.

5.3. Analysis: Coincidence of allomorphs

The Durative allomorphy of Kashaya described above can be analyzed in a similar way to the Elision pattern in §4.3. Recall that *-cid* (or *-id*) occurs in the first foot, while *-med* (or *-ed*) occurs elsewhere in the word. This means that *-cid* is the marked case, with a more restricted distribution, while *-med* is the unmarked (elsewhere) case. All we have to do is substitute the marked allomorph *-cid* (subsuming *-id*) in the constraint shown in (84), and the rest is identical.

(98) COINCIDE(*-cid*, *Leftmost*(Foot, Word))
'the allomorph *-cid* belongs to the first foot'

(i) $\forall$x(x is *-cid* $\rightarrow$ $\exists$y(y=*Leftmost*(Foot, Word) $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

This constraint is violated by any token of *-cid* which does not coincide with an initial foot. Naturally, it must dominate whatever constraint we use to encode the basic preference for *-cid* over *-med*: we insert the marked allomorph whenever possible. I simply use *MED to express this notion.

		COINCIDE(*cid*)	*MED
(99)	a. ☞ (cací:)du		
	b. (camé:)du		*!
(100)	a. (moh)(qací:)du	*!	
	b. ☞ (moh)(qamé:)du		*

This analysis is quite straightforward, and requires the same elements that we have motivated based on the facts of Elision: the constraint COINCIDE and the function *Leftmost*. The location of the suffix-final /d/ is not relevant to the selection of the allomorph: in the winning candidate the /d/ of *-(c)id* often syllabifies as an onset outside the initial foot, as in (99a). This irrelevance is captured formally by the fact that COINCIDE requires only overlap rather than complete contain-

ment: as long as some part of the marked suffix *-(c)id* coincides with the first foot, it is properly licensed.[23]

At this point it is appropriate to compare the positional licensing approach of Zoll (1996), which uses the COINCIDE constraint adopted here, with other approaches, specifically Steriade (1995b) and Beckman (1998). The essence of Steriade's approach is that underlying features are realized on the surface when the phonetic context makes it easier to do so. For example, recall from §1.1 that the Italian lax mid vowels /ɛ, ɔ/ surface only in stressed syllables. Unstressed syllables are less effective carriers of the [ATR] distinction, and so the loss of this distinction can be attributed to constraints on the implementation of underlying features and their interaction with LAZY, which effectively eliminates distinctions. A constraint ranking of the following general type will implement [ATR] distinctions only in stressed syllables.

(101) IMPLEMENT-STRESSED-[ATR] » LAZY » IMPLEMENT-[ATR]

In both Nootka and Kashaya, however, it is the entire foot rather than the stressed syllable which licenses marked structure, and in Kashaya the foot may not be stressed at all. The explanation for these phenomena requires a more abstract vocabulary than one which relies on phonetic cues. The abstract nature of this licensing is particularly striking for the Kashaya Durative allomorphy just discussed. An approach couched in phonetic terms cannot be used to analyze the phonological and morphological patterns that are the subject of this paper.

For Beckman (1998), who advocates an approach similar to that of Lombardi (1996), the appearance of certain contrasts only in "privileged" positions follows from faithfulness constraints such as IDENT which are specific to segments which occur in a position of this type. For Beckman, the Italian vowel neutralization would be the result of an IDENT constraint that preserves [ATR] in the privileged position of stress, but has no effect on unstressed syllables; for these weak positions only the regular IDENT constraint is relevant. By ranking a markedness constraint between the two faithfulness constraints, this difference is derived.

(102) IDENT-*stressed syllable*(ATR) » *[–low, –ATR] » IDENT(ATR)

This is precisely the analysis that Beckman (1998: 135ff) gives to account for the same vowel distribution in Western Catalan.

The inventory of privileged positions that Beckman accepts consists of root-initial syllables, stressed syllables, onsets, roots, and long vowels. In principle it should be possible to add "initial foot" (and possibly just "foot") to this list to account for the Kashaya and Nootka facts:

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[23] A more subtle interpretation of what counts as coincidence may be necessary for other cases. A telling example occurs elsewhere in Kashaya, where it appears that the location of a vowel is what matters. The example comes from the analysis of the blocking of extrametricality in bases of less than two syllables (cf. the data in (71)). Buckley (1997) argues for a constraint that at least some root material be incorporated into a foot; and when the root is only one syllable and unprefixed, this constraint prevents the skipping of the root syllable. Crucially, a root-final consonant which serves as the onset of a following footed syllable does not count for the purposes of "footing" the root: for example, in ill-formed **ca(ducé:)du* the /d/ of the root *cad-* is dominated by the first foot, but this candidate must be rejected in favor of *(cadú:)(cedu)*. The answer presumably lies in the headedness of hierarchical prosodic constituents. The relationship of a morpheme — normally a string of segments — with a particular foot is mediated by syllable structure. If coincidence of a morpheme with a syllable (and therefore with the higher foot) is defined with reference to the head of that syllable, i.e. the vowel, then a consonant in the onset or nucleus will be insufficient to satisfy COINCIDE. Based on the Kashaya evidence, morphemic coincidence (defined via the syllable head) is to be distinguished from segmental coincidence (not defined via the head): the next section provides an example of COINCIDE satisfied by a segment which occurs in the onset, but this is literally a constraint on the location of a complex segment rather than a morpheme. Of course, evidence from other languages may eventually make it necessary to refine this view.

for example, the following ranking could be used to generate the positional asymmetry regarding vowel length.[24]

(103) MAX-*initial foot*(μ) » *VV » MAX(μ)

A similar analysis could be proposed for the Nootka floating [gl] feature. The important observation for present purposes is that in Beckman's approach, positional licensing is inseparable from faithfulness. But in the case of the Durative allomorphy that we have just seen, phonological faithfulness is not the issue: rather, it is the choice of underlying form (to which faithfulness depends on the phonological context, independent of which allomorph is chosen). It is not at all obvious how the annotation "initial foot" could be added to a faithfulness constraint, or any other well-motivated constraint, to achieve the result that is easily obtained using COINCIDE in (98). It appears from the Kashaya data, then, that only Zoll's approach has sufficient flexibility to account for the full range of facts.[25]

6. Laryngeal increments

An interesting way in which the location of the first foot in the word correlates with other phonological phenomena is found in the distribution of laryngeal increments (Oswalt 1961, 1986). These are glottal segments (/h/ or /ʔ/) which bear a close relationship to the following consonant, but which syllabify in the coda as independent consonants. The verb roots in (104) and (105) show that the underlying presence of an increment is lexically contrastive, and not predictable from the laryngeal features of the "incremented" consonant.

(104)	a.	ca-	'sit (sg)' 161
	b.	-c^{h}a:-	'grasp' 44
	c.	hca-	'fly' 223
	d.	-hc^{h}a-	'knock over' 44
(105)	a.	-ṭat-	'twist' 172
	b.	-ṭ̣an-	'bruise' 170
	c.	-ʔṭa-	'roll up' 45
	d.	-ʔṭ̣aw-	'step on' 39

Discussion and analysis can be found in Buckley (1992, 1994c) and Steriade (1994); here I am primarily concerned with the broader distribution of the increments, rather than their other, more local properties. As we will see, increments occur only preceding the first foot — or in other terms, incremented consonants occur only as the first segment of the first foot of the word.

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[24] Beckman's theory provides a context in which it is simpler to formulate the Nootka COINCIDE constraints in terms of "initial foot" rather than just "foot": since Kashaya requires reference to the initial foot, and Nootka permits it, the simpler overall theory required by the data discussed here is one which excludes reference to feet in general.

[25] Complications arise in extending Smolensky's (1993, 1995) constraint conjunction approach to positional markedness based on foot structure. The analysis entails conjoining two constraint types whose simultaneous violation results in a violation of the conjunction itself. For example, dorsal consonants are more marked than coronals, as expressed by *DORS » *COR. Conjoining each with NOCODA yields the new ranking *DORS & NOCODA » *COR & NOCODA, which predicts that coda dorsals are more marked than coda coronals. Since it is relatively straightforward to interpret both of these constraint types as mediated by the segment — a consonant bears place features and can occupy the coda — it is also straightforward to evaluate whether a particular consonant simulaneously violates both constraints. When dealing with the initial foot, however, we presumably need to conjoin a basic markedness constraint like *MED with one which disfavors noninitial feet, such as ALL-FT-L. But how shall the conjunction *MED & ALL-FT-L be evaluated? It ought to be violated by any word containing *-med* as well as more than one foot, without attending to the location of *-med* within that foot. But if conjunction in some way entails the notion of coincidence, then the approach includes all the power of Zoll's COINCIDE constraint and for the data presented here is a notational variant.

6.1. The Decrement

One of the clearest diagnostics for whether a glottal segment is an increment, as opposed to just another consonant, is the operation of what Oswalt (1961) terms the DECREMENT: a morphologically triggered process which deletes the increment (if any) from the root. This typically occurs in the presence of particular suffixes — primarily plurals and directionals — leading to two forms of the root, depending on whether a decrementing suffix is present. In the following examples, an underline indicates the position where the increment would occur if it were not deleted.

(106)	a.	**ba<u>h</u>c^{h}ital**-ʔ	→	ba<u>h</u>(c^{h}itáɬ)	'string meat' 174
	b.	**ba<u>h</u>c^{h}ital**-aq-ʔ	→	ba_(c^{h}itá:)(laʔ)	'string meat (pl.)' 174
(107)	a.	mu-**<u>h</u>k^{h}uy**-ba	→	mu<u>h</u>(k^{h}úẏ)ba	'after it burned up' T 166
	b.	mu-**<u>h</u>k^{h}uy**-ʔta-w	→	mu_(k^{h}úẏ)(taw)	'burn up (pl.)' 170
(108)	a.	du-**<u>h</u>qoṭol**-ya-e: hni:	→	do<u>h</u>(qoṭól)(yeh)(ni:)	'didn't he help?' T 92
	b.	da-**<u>h</u>qoṭol**-ta-w	→	da_(qoṭól)(taw)	'fail to do (pl.)' 170
(109)	a.	du-**<u>ʔ</u>k̓u**-w	→	du<u>ʔ</u>(k̓úw)	'finish working' 76
	b.	du-**<u>ʔ</u>k̓u**-t-ʔ	→	du_(k̓úʔ)	'finish working (pl.)' 76
(110)	a.	šu-**<u>ʔ</u>p̓an^{h}**-c-iċ-ba	→	šuʔ(p̓án^{h})(ciċ)ba	'having shut' T 56
	b.	šu-**<u>ʔ</u>p̓an^{h}**-ta-w	→	šu_(p̓án)(taw)	'pull closed (pl.)' 170

A more exhaustive set of examples is given in (111), illustrating a single root in a variety of contexts.

(111)	a.	**šo<u>h</u>ko**-mac-ʔ	→	šoh(komáʔ)	'sat down (in there)' T 140
	b.	**šo<u>h</u>ko**-w-ay-ba	→	šoh(kowáẏ)ba	'after sitting down next to' T 216
	c.	**šo<u>h</u>ko**-ala-p^{h}i	→	šo(kola:)(p^{h}í)	'after sitting down' T 206
	d.	**šo<u>h</u>ko**-ad-wad-uced-u	→	šo(koṅ)(wadú:)(cedu)	'be sitting around waiting' T 98
	e.	**šo<u>h</u>ko**-ad-u	→	šo(ko:)(dú)	'remained (sitting)' T 176
	f.	**šo<u>h</u>ko**-ibic-ʔ	→	šo(ko:)(bíʔ)	'sat up' T 140
	g.	**šo<u>h</u>ko**-aduc-ʔ	→	šo(ko:)(dúʔ)	'settled down' T 118

The increment may be initial in the root (with a preceding prefix), or internal to the root, but in all cases shown so far it occurs after the first CV sequence of the word. Since the overall base is at least two syllables long, extrametricality applies and the increment is found immediately before the first foot of the word — or equivalently, the incremented consonant is initial in that first foot.

The next examples show that what matters is being located at the beginning of the first foot, rather than after the initial CV. These verb roots are monosyllabic: no extrametricality applies, and the first foot is at the left edge of the word. In such cases, an increment (if it occurs) must be located at the absolute left of the root.

(112)	a.	**<u>h</u>co**-w	→	<u>h</u>(ców)	'lie still' D
	b.	**<u>h</u>co**-mac-ʔ	→	<u>h</u>(comáʔ)	'enter (container)' D
	c.	**<u>h</u>co**-aduc-ʔ	→	_(co:)(dúʔ)	'spread out' D
	d.	**<u>h</u>co**-ibic-ʔ	→	_(co:)(bíʔ)	'rise up' D
(113)	a.	**<u>h</u>ce**-m-ʔ	→	<u>h</u>(cém̓)	'lies open' D
	b.	**<u>h</u>ce**-ala-w	→	_(ce:)(láw)	'open downward' D
	c.	**<u>h</u>ce**-ht-aloq^{w}-ʔ	→	_(céh)(taloʔ)	'open up this way (pl.)' D

(114)	a.	**ʔda**-maċic-qa-w	→	ʔ(damá:)(ċic^{h})(qaw)	‘go as far as (pl. agt.)’ T 40
	b.	**ʔda**-mac-qa-w	→	ʔ(damác^{h})(qaw)	‘go southeast’ T 126
	c.	**ʔda**-ibic-qa-w	→	_(da:)(bíc^{h})(qaw)	‘set out’ T 106
	d.	**ʔda**-aċ-qa-wela	→	_(daċ)(qawé)la	‘come (here) (pl. agt.)’ T 64

Importantly, alternations of this type are never found later in the word than illustrated here. That is, in a monosyllabic base, the increment is always initial; and in a base of two syllables or more, the alternation never occurs later than the second syllable. (Increments which occur initially in polysyllabic roots are considered below in §6.3.)

Whether a word-initial increment is actually pronounced depends not only on whether the Decrement has applied, but also on whether the phrasal syllable structure makes it possible to realize the laryngeal feature; in particular, the increment sufaces as a coda when a vowel precedes it. The contrast in (112) to (114) between decremented and incremented roots is thus clearly observable only in the appropriate phrasal context. For completeness, the next examples show the same verbs preceded by a vowel-final word.

(115)	a.	ʔahq^{h}a hcow	→	ʔah.q^{h}ah.cow	‘water lies still’ D
	b.	ʔahq^{h}a hcomaʔ	→	ʔah.q^{h}ah.co.maʔ	‘water enters a pool’ D
	c.	ʔahq^{h}a co:duʔ	→	ʔah.q^{h}a.co:.duʔ	‘water spreads out’ D
	d.	ʔahq^{h}a co:biʔ	→	ʔah.q^{h}a.co:.biʔ	‘water rises up’ D
(116)	a.	ʔimo hceṁ	→	ʔi.moh.ceṁ	‘hole lies open’ D
	b.	ʔimo ce:law	→	ʔi.mo.ce:.law	‘hole opens downward’ D
	c.	ʔimo cehtaloʔ	→	ʔi.mo.ceh.ta.loʔ	‘holes open up this way’ D
(117)	a.	mi ʔdamaċic^{h}qaw	→	miʔ.da.ma:.ċic^{h}.qaw	‘they went as far as there’ T 40
	b.	dono: ʔdamac^{h}qaw	→	do.noʔ.da.mac^{h}.qaw	‘went southeast upstream’ T 126
	c.	p^{h}ala da:bic^{h}qaw	→	p^{h}a.la.da:.bic^{h}.qaw	‘set out again’ T 70
	d.	ya daċqawela	→	ya.daċ.qa.we.la	‘we came (here)’ T 64

In every case, the preceding vowel makes syllabification of an increment possible; but in the last two phrases of each set of examples, the increment is nonetheless missing because it has been independently eliminated by the Decrement.

6.2. Analysis: Coincidence of incremented consonants

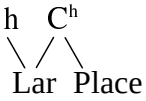
Clearly, increments are a marked structure, not only cross-linguistically (cf. Steriade 1994) but also within Kashaya. As such, their positional restrictions can be expressed as licensing. Since the phenomenon involves two parts, there are two ways to look at the distribution.

(118) a. Increments occur only before the first foot of the word.
b. Incremented consonants occur only as the first segment of the first foot of the word.

While the increment itself is a natural focus of our attention, there is no obvious way to capture the position in (118a) except with alignment, and as noted in §1.1 this is a problematic means to encode licensing. The position in (118b), on the other hand, is actually quite a plausible candidate for a privileged position that can license a marked contrast. Further, it is really the consonant itself which is central to the phenomenon at hand: as noted above, the nature of the increment depends crucially on the laryngeal features of the consonant. When the consonant itself is aspirated or glottalized, in fact, the same feature is what defines the increment.[26]

[26] This diagram roughly follows Buckley (1992). In the Aperture Theory of Steriade (1994), the incremented consonant can be defined as an onset consonant whose closure phase bears a laryngeal feature (and therefore links to the coda). I do not dwell here on the geometric representation of the incremented consonants, but merely note that

(119)



We saw in §1.2 that in Ancient Greek, aspirated vowels occur only as the first segment of a word. The distribution of increments in Kashaya involves a combination of this type of requirement with the one already familiar from long vowels and Durative allomorphy. That is, incremented consonants occur only as the first **segment** of the first **foot** in the word.

(120) *Leftmost*(Segment, *Leftmost*(Foot, Word))

Certainly it is not stress per se that is relevant, since the increment occurs at the beginning of an iambic (right-strong) foot. This embedded function fits into the same licensing constraint we have been using.

(121) COINCIDE(incremented consonant, *Leftmost*(Segment, *Leftmost*(Foot, Word)))
'an incremented consonant occurs as the first segment of the first foot'

(i) $\forall x$(x is incremented $\rightarrow \exists y$(y=*Leftmost*(Segment, *Leftmost*(Foot, Word)) $\wedge$ Coincide (x,y)))
(ii) Assess one mark for each value of x for which (i) is false

Once again, COINCIDE dominates the relevant faithfulness constraint, i.e. IDENT(Lar) which prevents a change in laryngeal specification.[27] This ranking determines the basic distribution of incremented consonants in the language, preventing them from ever surfacing except in this special prominent position. Notice the fate of a hypothetical underlying increment later in the word.

(122)

/da-qohṭol-ta-w/ cf. (108b)	COINCIDE(hC)	IDENT(Lar)
a. da(qohṭol)taw	*!	
b. ☞ da(qoṭol)taw		

Within surface-oriented Optimality Theory, the idea of Richness of the Base (Prince and Smolensky 1993) entails that morpheme structure constraints such as the distribution of underlying increments cannot be expressed on underlying representations themselves. Instead, the same effect can be achieved by means of surface constraints, which is precisely what COINCIDE(hC) does in this instance, ensuring that an incremented consonant can never surface even for a root like in (122).

This example also illustrates the need to refer to the leftmost position in the initial foot, rather than simple location somewhere within the foot as for long vowels (§4) and the Durative (§5). We now turn to two special cases where this licensing constraint is actively enforced, though in quite different ways.

6.3. Blocking of extrametricality

As shown in §3.1, the presence of initial-syllable extrametricality is conditioned by the length of the base, i.e. the root and any prefix which may be present. When the base is two or more

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an adequate analysis must treat the increment as a coda consonant while maintaining some representational distinction between increments and plain glottals.

[27] Depending on the exact analysis of the increments — as an independent segment or as part of a complex segment — the appropriate constraint might be MAX rather than IDENT. The point in the text is unchanged.

syllables long, the first syllable should be excluded from foot structure. But this generalization is systematically violated when the base begins with an increment.[28]

(123)	a.	h(sibó)	*hsi(bo...́)	'three'
	b.	h(comá)	*hco(ma...́)	'feast'
	c.	h(qowíc)-	*hqo(wic...́)	'return' 166
	d.	ʔ(k̓ulú:)-	*ʔk̓u(lu...́)	'cough' 21
	e.	ʔ(dané:)-	*ʔda(ne..́)	'throw away (long object)' 180
	f.	ʔ(dabá:)ne-	*ʔda(bané:)...	'throw away (nonlong object)' 180

Since no prefixes contain increments, these bases are isomorphic with roots. Where the root is just two syllables, stress would fall on the final syllable in any case, so more material is necessary to show clearly that there is no extrametricality. Full examples for some of these roots (where the initial increment may still be deleted according to the phrasal context) are given in (124).

(124)	a.	hsibo maʔyul	→	h(sibó)(maʔyul)	'only three' T 104
	b.	hqowic-iċ-ed-em	→	h(qowí:)(ciċe:)(dem)	'whenever he came home' T 98
	c.	ʔk̓ulu-med-u	→	ʔ(k̓ulú:)(medu)	'be coughing'
	d.	ʔdabane-ba	→	ʔ(dabá:)(neba)	'after throwing away' T 58

Notice that we find second-syllable stress in a word like *h(qowí:)(ciċe:)(dem)* rather than the third-syllable stress that would be expected if there were extrametricality, i.e. **hqo(wicí:)(ċedem)*.

The constraint which rules out **hqo(wicí:)(ċedem)* is, of course, COINCIDE(hC). But another possibility is **qo(wicí:)(ċedem)*, with deletion of the increment in violation of IDENT(Lar). What prevents this? It has to be the case that the constraint NONINITIAL, which enforces extrametricality (Buckley 1997), is the lowest ranked of these three constraints, and therefore the one that is sacrificed when they conflict.

(125)

/hqowic-iċ-ed-em/ (124b)		COINCIDE(hC)	IDENT(Lar)	NONINITIAL
a. ☞	h(qowi:)ciċe:dem			*
b.	hqo(wici:)ċedem	*!		
c.	qo(wici:)ċedem		*!	

At least some of the roots in (123) seem to result historically from the loss of an initial syllable, as in **ohcoma > hcoma* (cf. Oswalt 1960: 90, McLendon 1973: 36, Webb 1971). Presumably that syllable was extrametrical, and the location of stress has been preserved from the earlier form of the word. Synchronically, however, the increment which remains is the only part of the representation to which we can appeal to block extrametricality — i.e. force violation of NONINITIAL by higher-ranking IDENT(Lar) — in a way that is not ad hoc (such as marking stress lexically). Since we have already seen that in the general case incremented consonants are restricted to the beginning of the first foot, the same generalization can also serve to block movement of the foot away from the increment.

[28] There are other roots which have two or more syllables and no increment, but which still fail exhibit extrametricality (as in (79); cf. Buckley 1994c: 229f). Clearly it is necessary to make provision for idiosyncratic exceptionality of this type, but my interest here is in the **systematic** exceptionality of incremented roots, something that Buckley (1994c) was unable to capture.

6.4. Deletion of an increment under prefixation

The second active consequence of the distributional restriction on increments is found with the only two-syllable prefix in the language, *miya-*; it marks third-person possession in the kinship system. The suffix is illustrated below with three relevant roots, together with the shorter prefixes *mi-* and *ma-*, which mark possession by second person and by third person reflexive (Oswalt 1961: 118; 1975).

(126)

	With Increment		*Without Increment*	
a.	mi-hṭʰé	ma-hṭʰé	miyá:-ṭʰe	'mother'
b.	mi-hceyé	ma-hceyé	miyá:-ceye	'son-in-law'
c.	mi-ʔdaqʰáṅ	ma-ʔdaqʰáṅ	miyá:-daqʰaṅ	'wife'

It happens to be the case that *miya-* does not undergo extrametricality, but that fact is not crucial to the loss of the increment.[29] The other two prefixes are perfectly regular, and undergo extrametricality just like all the monsyllabic verb prefixes in §3.1. Consider the foot structures for 'son-in-law'.

(127) a. mih(ceyé)
b. mah(ceyé)
c. (miyá:)(ceye) *(miyáh)(ceye)

The question is why the increment is missing in (127c) and the similar examples in (126). Because increments must occur before the first foot of the word, it is clear that **(miyáh)(ceye)* is not permissible, since the increment is contained in the first foot; the same would be true even if the prefix underwent syllable extrametricality, e.g. **mi(yáh)(ceye)*. Only one syllable can be extrametrical — *LAPSE prevents two consecutive unparsed syllables (cf. Green & Kenstowicz 1995), and is unviolated in Kashaya — so given the length of the prefix, something has to give. When the rule that would create a misplaced increment is phonological, it can be blocked with minimal consequences, as in (123). But when the rule is morphological, blocking is a more serious matter, since in this case it would interfere with the exponence of a morphological category (the person of the possessor). I borrow from Rose (1997) the constraint MORPHEXPR (morphological expression) to prevent the non-realization of a morpheme.

(128)

/miya-hceye/ (126b)	MORPHEXPR	*LAPSE	COINCIDE(*hC*)	IDENT(Lar)
a. ☞ (miya:)ceye				*
b. (miyah)ceye			*!	
c. mi(yah)ceye			*!	
d. miyah(ceye)		*!		
e. h(ceye)	*!			

Phonology is therefore sacrificed to morphology, and the increment is deleted.[30] The fact that partial deletion of the prefix, as in **yah(ceye)*, is not permitted can be attributed to relatively high ranking of MAX, which is consistent with the general pattern of Kashaya, and further supports treating the increment as part of a complex segment with the following consonant — subject to IDENT rather than to MAX.

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[29] McLendon (1973: 94) reconstructs the prefix as **hamíya:-*, so loss of the initial syllable led to the lack of extrametricality, as in §4.3. Since there is no initial increment, however, this exceptionality has to be treated arbitrarily in the synchronic grammar.

[30] The deletion creates an open syllable, enabling iambic lengthening. It is not plausible to claim that the [a:] is underlyingly long, and that the increment is deleted in order to preserve the length, since in all other instances where an increment follows a long vowel, the increment is preserved and closed-syllable shortening occurs (see (117b); cf. Buckley 1994c: 261).

This increment deletion, while reminiscent of the Decrement, can be explained as a consequence of adding a two-syllable prefix, rather than as the stipulative deletion which is required for the idiosyncratic application of the Decrement with the plural and directional suffixes. (It would also be the only case of the Decrement triggered by a prefix.) Together with the blocking of extrametricality in (123), it demonstrates that the distributional restriction on the increments is not just a generalization over lexical entries, but an active and enforced requirement of the grammar. In addition, these phenomena sharpen our understanding of the nature of the distributional requirement on the increment: it is not simply preceding any foot (see (127c)), nor is it simply unfooted (see (123)). Rather, it is necessarily before the **first** foot of the word, a result of the incremented consonant being the first segment of that foot.

7. Conclusion

The diverse phenomena outlined above in Nootkan and Kashaya provide evidence of the foot as a constituent which can license marked structure, and in particular the initial foot as a privileged licenser. The distributions of vowel length and glottal stops in Nootka rely on a foot in initial position in the word, though that position may not be crucial to the analysis. In Kashaya, however, the status of the foot as initial is unambiguous and has to be included in the expression of the patterns discussed. Elision (§4) and Durative allomorphy (§5) — as well as underlyingly floating moras (§3.2) — are conditioned according to whether the relevant vowel or suffix occurs anywhere within the first foot, while laryngeal increments (§6) are restricted to consonants occupying the initial position within that foot. The stress shift outlined in §3.2, where an initial CVV foot, or one that has been flipped from CVV.CV to a canonical iamb, can also be construed as treating the first foot as special: noninitial CVV feet are fully able to bear stress, as shown by examples such as *mi(ku:)(ṭé:)mu* in (73e), and Foot Flipping does not occur in noninitial feet.[31]

While the special status of the initial foot in Kashaya may have originated at a time when it was always the stressed foot, that correlation is no longer true because of the current pattern of stress shift illustrated in §3.2. Kashaya may be unusual in the extent to which it exploits the category "first foot", but the category itself has cross-linguistic precedent. In addition to the examples discussed in this paper — it is a plausible analysis of Guugu Yimidhirr (§1.3) and is compatible with the Nootka facts (§2) — I suspect that many phonological patterns can be analyzed with the same notions. For example, in Menomini iambic lengthening affects only the first foot, while other rules apply outside that domain (cf. Hayes 1995). Further, Macken & Salmons (1997) show that a number of ongoing sound changes in Mixtec can be understood properly only by reference to a right-aligned foot template, whether within the foot or at its left edge. An adequate theory of phonology must be able to make appropriate reference to these categories. I have shown that this role can be filled by the constraint type COINCIDE and the function *Edgemost* (Zoll 1996), situated in a general theory of constraint interaction (Prince & Smolensky 1993).

[31] The fact that a second CVV foot is not skipped could be attributed to the Peripherality Condition, if extrametricality is the device used to encode the stress shift (Buckley 1994b,c).

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