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Weight of CVC can be Determined by Context

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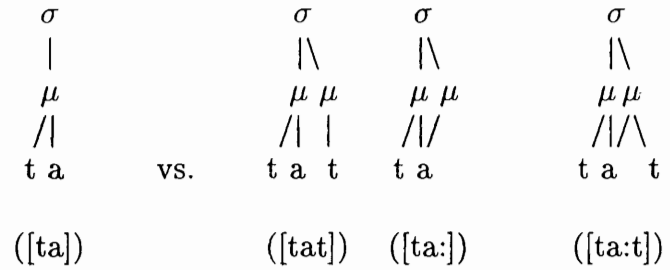
1 Introduction

The contrast of heavy vs. light syllables is central to the phonology of many languages. Typologically, we observe two patterns. In Latin and other languages, both long-voweled (CVV) and closed (CVC) syllables count as heavy, with CV syllables light. In Cahuilla (Seiler 1977) and various other languages, only CVV is heavy, with both CVC and CV light.

Moraic theory (Hyman 1985, McCarthy and Prince 1986, Hayes 1989, Ito 1989, Zec 1988) adapts and formalizes the traditional notion of mora to account for this. Heavy syllables in Latin contain two moras (formalized /μ/ below), light syllables one:

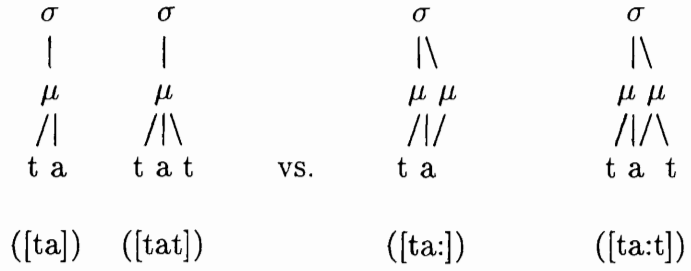
(1) **Latin: CV Light; CVC, CVV, CVVC Heavy**



([ta]) ([tat]) ([ta:]) ([ta:t])

In a language like Cahuilla, the structures are the same, except that CVC is assigned only one mora:

(2) **Cahuilla: CV, CVC Light; CVV, CVVC Heavy**



([ta]) ([tat]) ([ta:]) ([ta:t])

For rules that can create these structures in various languages, see Hayes (1989).

This article addresses a possibility inherent within moraic theory: that the representation for CVC can differ by context within a single language. By this I mean that there can be language-specific rules of the form: "Assign second mora to CVC in context X" or "Remove second mora from CVC in context Y." Such a move has been suggested by Kager (1989) for English; Kager's view is that certain stressless CVC syllables in English and Dutch are light. This results phonetically in vowel reduction and (at least for English) in the formation of syllabic resonants.

Letting CVC vary in weight by context of course increases the expressive power (and thus lessens the predictive power) of phonological theory. I suggest that this is compensated for in two ways: it provides increased insight into prosodic phenomena in various languages, and it allows significant restrictions to be placed on the metrical theory of stress.

I propose that while heavy and light CVC may on occasion form a derived contrast, they never contrast in underlying representation. In this respect, syllable weight resembles syllable division: while a language may syllabify (for example) /VplV/ as /Vp.lV/ in some morphological or phonological contexts and as /V.plV/ in others (cf. English *uplift* vs. *apply*), there appear to be no cases of underlying /Vp.lV/ $\sim$ /V.plV/ contrasts.

While moraic theory provides a straightforward way of describing the distinction of heavy vs. light CVC, it is not the only means of doing so; the theory of syllable constituency proposed by Levin (1985) and similar work could easily be modified in the same direction. This could be done, for example, by placing weight-bearing coda consonants in the syllable nucleus and weightless consonants outside it (cf. Anderson 1984).

2 Metrical Preliminaries

I assume here a theory of foot structure developed by Hayes (1985, 1987) and McCarthy and Prince (1986) and presented more fully in Hayes (forthcoming). The central idea is that the "atoms" of metrical representation, that is, the basic templates for metrical feet, form a very small set: namely moraic trochees, syllabic trochees, and iambs, defined as follows. In the diagrams below, /$\breve{}$/ stands for a light syllable, /–/ for a heavy.

(3) a. **Moraic Trochee:**
two light syllables, first strong: (x .)
$\breve{}\ \breve{}$
or one strong heavy: (x)
$-$

b. **Syllabic Trochee:**
two syllables of any weight, first strong: (x .)
$\sigma\ \sigma$

c. **Iamb:**
two syllables with first light and second strong: (. x)
$\breve{}\ \sigma$
or one strong heavy: (x)
$-$

This seemingly arbitrary set of templates has a basis in an extralinguistic principle, stated below:

(4) **Iambic/Trochaic Law**

i. Elements contrasting in intensity naturally form groupings with initial prominence.

ii. Elements contrasting in duration naturally form groupings with final prominence.

This principle has widespread effects in rhythmic phenomena, for example, perceptual experiments, music and metrics (for discussion see Hayes, forthcoming). The foot templates of (3) are the ones that most clearly satisfy the Iambic/Trochaic Law, while also allowing most syllables in any given string to be parsed into feet.

The inventory of (3) lacks foot templates of the shortest possible type, that is, /$\breve{}$/ in languages that refer to syllable weight and /σ/ in languages where stress is computed solely by syllable count. The role, if any, that such "degenerate" feet should play in metrical theory is a difficult question (for discussion, see Kager 1989 and Hayes, forthcoming). For present purposes, we need only assume that languages tend to avoid creating such degenerate feet, and indeed appear to avoid them entirely in certain contexts.

The ban on degenerate feet allows us to make more sense of the rather disparate-seeming recipe for the iamb: the *canonical form* of the iamb is

/˘ ˊ/; also allowed is anything shorter, but not degenerate. The Iambic/Trochaic Law is most clearly applicable to the canonical form.

From McCarthy and Prince (1986), Prince (1991) and other work, I assume that foot construction is not just a mode of assigning stress, but an organizing principle of the phonology. For example, in various languages the phonological rules appear to have a conspiratorial effect in creating optimal foot structure, for example, by "repairing" feet that have been damaged by segmental rules, or by converting a foot from suboptimum to optimum form. The latter phenomenon is found in iambic feet: conversion of a /˘ ˋ/ iamb to the canonical /˘ ˊ/ shape optimizes it.

With this background, I can now consider three examples of variable-weight CVC.

3 Cahuilla

Cahuilla, a Uto-Aztecan language of Southern California, has been investigated in detail in the work of Seiler (1957, 1965, 1977). Stress in Cahuilla is normally stem-initial, with trains of alternating secondary stresses going outward from the main stress in either direction. The alternation is "quantity-sensitive," in that heavy syllables attract stress and reset the alternating count for strings of light syllables.

Two expository simplifications are adopted here. First, I ignore the cases of stress on prefixes, which are straightforward and do not affect the point at issue. Second, I allow here the creation of degenerate feet of the form /ˋ/ on final syllables when only one syllable is left over in the left-to-right parse. In fact, there are reasons both theoretical and empirical not to do this (Hayes, forthcoming), but the issue is not relevant to present concerns.

With these simplifications assumed, here are the Cahuilla stress rules:

(5) **Cahuilla Stress**

a. Form moraic trochees (cf. (3)) from left to right.
b. Form a higher metrical layer assigning main stress to the leftmost foot.

Since moraic trochees refer to syllable weight, we must define the heavy syllable: in Cahuilla this is normally CVV(C), where VV is a long vowel or diphthong. Consider the forms below. In (6a), the two moraic trochees that are constructed are both of the form /ˋ˘/; whereas in (6b), left-to-right foot parsing creates first /ˊ/, then /ˋ˘/. In either case, the leftmost foot attracts main stress through construction of a higher "word layer."

(6) a. (x .)(x .) b. (x) (x .) foot construction
ᴗ ᴗ ᴗ ᴗ – ᴗ ᴗ
táka lìčem qá:nkìčem

(x) (x) word layer
(x .)(x .) (x)(x .) construction
ᴗ ᴗ ᴗ ᴗ – ᴗ ᴗ
táka lìčem qá:nkìčem

'one-eyed ones' 'palo verde, plur.' (Seiler 1977:27)

It is easy to show that in ordinary circumstances, CVC counts as a light syllable. For example, if CVC were heavy, the word *táxmuʔàt* 'song' (Seiler 1965:57) would be counted as /– ᴗ ᴗ/ and be stressed **táxmùʔat*. The observed stressing follows if *táxmuʔàt* is /ᴗ ᴗ ᴗ/.

The phenomenon of interest to this article is a morphological process of "intensification" (Seiler 1977:58), which applies to stems beginning CVCV or CVCCV. In either case, the second C receives greater length, transcribed by Seiler with consonant doubling.

(7) a. čéxiwèn 'it is clear' b. wélnet 'mean one'
čéxxìwen 'it is very clear' wéllnèt 'very mean one'

Note that *čéxxìwen* is stressed like *qá:nkìčem*, suggesting that it is quantitatively /– ᴗ ᴗ/. Noting this, Seiler (1977:58) characterizes the lengthening as a prosodic (as opposed to purely segmental) phenomenon: "as an invariant we find that the initial syllable receives an extra mora, thus a total value of two morae. As a consequence, the second vowel of the sequence will bear secondary stress." The crucial point is that Intensification is a *weight*-changing phenomenon; it is this that results in shifts in secondary stress. (This also argues against the view that Intensification is somehow extraphonological or paralinguistic.)

Moraic theory provides a straightforward formalization of Seiler's suggestion. I express Intensification as the insertion of an additional mora into the stem-initial syllable. Where the amplified syllable already contains a final consonant, it is this consonant that receives the mora (cf. (8b)). Where there is no final consonant, the inserted mora is linked to the onset of the following syllable, as in (8a).

(8) a.

σ	σ	σ
|	|	|
μ	μ	μ
/|	/|	/|\
č e	x i	w e n

b.

σ	σ
|	|
μ	μ
/|	/|\
w e l	n e t

input form, syllabification (without Intensification, → *čéxiwèn*, *wélnet*)

σ	σ	σ	σ	σ
|\	|	|	|\	|
μ μ	μ	μ	μ μ	μ
/ |	⋱ /|	/|\	/| ⋮	/|\
č e	x i	w e n	w e l	n e t

Intensification

The stress pattern of intensified forms follows straightforwardly from the syllable weights that have been assigned, shown in (9).

(9) a.

(x)	(x .)	
σ	σ	σ
|\	|	|
μ μ	μ	μ
/|	\ /|	/|\
č e	x i	w e n

b.

(x)	(x)
σ	σ
|\	|
μ μ	μ
/|	/|\
w e l	n e t

stress assignment

(= *čéxxìwen*, *wéllnèt*)

That is, *čéxxìwen* is stressed as /– ◡ ◡/, while *wéllnèt* is stressed like ordinary /– ◡/ words.

Two loose ends must be cleared up. First, I state in (10) the principles that link up the inserted moras in the right places.

(10) **Stray Mora Association (Cahuilla)**

Stray moras associate with
(a) non-moraic syllable-final consonants, if present; else
(b) the onset of the following syllable.

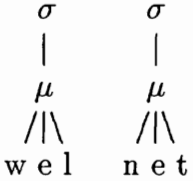
I will not speculate on to what extent such principles can be made universal. A cautionary fact in this respect is that the linkings appear to vary across dialects of Cahuilla. The rules stated above hold for the Desert dialect described by Seiler; in contrast, in the Mountain dialect, intensification takes the form of vowel lengthening. For example, the intensified forms analogous to those of (7) are *čé:xiwe* and *wé:lnet* (data from Pamela Munro

(p.c.), to whom many thanks). It appears that in Mountain Cahuilla, the inserted mora is always linked to the vowel.

The other issue concerns the phonetic interpretation of the output forms in (9)—are we entitled to transcribe the moraic /l/ of (9b) as [ll], despite the fact that it is only singly linked? The suggestion here is that linkage of a segment to its own mora implies greater phonetic length. This is intuitively plausible, since the mora is a timing unit, and a consonant without its own mora must share with the preceding vowel.

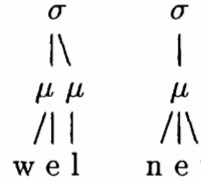
Summing up, Cahuilla shows a fairly clear derived contrast between heavy and light CVC syllables. In particular, the regular vs. intensive forms of *welnet* form a minimal pair in this respect, as in (11).

(11) a.



= [welnet]

b.



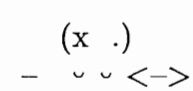
= [wellnet]

The evidence for contextually weighted CVC in Cahuilla is twofold: the extra mora induces an audibly distinct durational pattern, and the heavy CVC syllables behave just like heavy CVV for purposes of stress assignment.

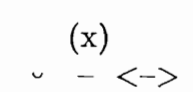
4 Latin

As I have analyzed it (Hayes 1987, forthcoming), the normal metrical foot of Latin is the moraic trochee, that is, /⏜⏝/ or /–/. This foot is assigned at the right edge of the stress domain, after an earlier rule that marks final syllables as extrametrical (in the sense of Hayes 1982). This gives the typical pattern of antepenultimate stress where the penult is light and penultimate stress where the penult is heavy. The data below are from Allen 1973:155). Angle brackets surround extrametrical syllables.

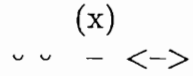
(12) a.



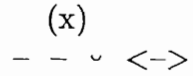
b.



c.



d.



This proposal in fact follows a very early foot-based analysis of Allen (1973:177), a work from which much of the following account is taken.

A curious corner of the Latin stress system is the treatment of words that had the quantitative shape /⏑ –/. In the terminology of Hayes (forthcoming), these exhibit the "unstressable word syndrome." That is, the final syllable is extrametrical and cannot be stressed, and the preceding light syllable is too short to constitute a well-formed foot. In general, languages appear to adopt a wide variety of strategies to resolve "unstressable words." The strategies that Latin uses are the following. (a) Revoke extrametricality, so that the final heavy syllable can serve as a foot, as in (13a). It is likely that this option was taken in Latin when a /⏑ –/ word occupied phrase-final position (Allen 1973:186-188). (b) A process of "incorporation" applies, whereby the final /–/ syllable is made a weak member of a foot whose head is the preceding light, as in (13b).

(13) a. **Revocation of Extrametricality**

				(x)
⏑ <–>		⏑ –		⏑ –
e go:	→	ego:	→	e gó:

b. **Incorporation**

		(x)		(x .)
⏑ <–>		⏑ <–>		⏑ –
e go:	→	e go:	→	é go:

The incorporation strategy creates feet that, although outside the permitted forms for moraic trochees, are at least not degenerate. It is the incorporation strategy that I will focus on here.

The output of incorporation was often subsequently "repaired" by the application of an optional segmental rule. This is the so-called "Iambic Shortening" of the early Classical period (Allen 1973:179-185), which had precisely the effect of converting /⏑́–/ words into /⏑́⏑/, a canonical moraic trochee. For example, *égo:* 'I' became *égo*, with the /⏑́⏑/ output pattern; similarly *béne:*, *dúo:* became *béne*, *dúo*. I express the rule in moraic terms in (14a), with an example of its application in (14b).

(14) a. **Latin Iambic Shortening**

(x .)		(x .)
σ σ	→	σ σ
| | \		| |
μ μ μ		μ μ

b.

(x .)				(x .)
σ σ				σ σ
| |		→		| |
μ μ μ				μ μ
| /|/				| /|
e g o				e g o

Note that words whose feet were *already* canonical did not undergo shortening.

(15) a. (x) b. (x) c. (x .)

–		–	–		–	⏑	⏑	–
ám	<bo:>		lon	<ge:>		simu		<la:>

/CVCV:/ was not the only possible segmental configuration that would give rise to /⏑ –/ quantity in Latin; the same would be expected of /CVCVC/. What is of interest here is evidence suggesting that Iambic Shortening applied to these words as well. This of course cannot be detected in the orthographic record, but is supported by evidence from Latin metrics.

Latin verse was quantitative, in that a well-formed line consisted of a particular sequence of heavy and light syllables. From verse of the period, it can be determined that CVC syllables in the Iambic Shortening environment were frequently scanned as light, as in the following cases from Allen (1973:182–183).

(16)

a.	⏑	⏑	–		– –	b.	⏑	⏑	–	–	metrical scansion
	úter		wostró:rum				dédit		dó:no:		verse text

In fact, such scansions follow from the analysis as stated so far, virtually without alteration. Iambic Shortening would remove the second mora from the final syllable of a CVCVC word, as in (17b). I assume further that a consonant stranded in this way is reaffiliated within its own syllable, as shown in (17c).

(17)

a.	(x	.)				b.	(x	.)			c.	(x	.)		
	σ	σ					σ	σ				σ	σ		
	|	|\		→			|	|		→		|	|		
	μ	μ	μ				μ	μ				μ	μ		
	|	/|	|				|	/|				|	/|⋱	
	u	t	e	r			u	t	e	r		u	t	e	r

I conclude that Latin had surface minimal pairs for the weight of CVC. CVC not affected by Iambic Shortening was heavy, whereas CVC to which the rule had applied was light. Latin being dead, we cannot know what phonetic correlates this weight distinction had, but from the analogy of living languages (English, Dutch, and Cahuilla, above; and Yupik, below) we can surmise that light CVC was phonetically shorter.

5 Yupik

The prosodic systems found in the Yupik Eskimo languages have attracted a great deal of interest from metrical phonologists, thanks to the absorbing descriptions and analyses published by Woodbury (1981, 1987), Jacobson (1985), Miyaoka (1985), Leer (1985), and other scholars of Yupik. Here, I only skim over a small part of the topic, focusing on the evidence for light vs. heavy CVC. The reader may find these claims integrated into a fuller analysis in Hayes, forthcoming.

To a very rough approximation, it may be said that most Yupik languages stress all heavy syllables, and every even numbered member of a string of light syllables, counting from left to right. This is a rather common type of stress pattern (for numerous parallels see Hayes, forthcoming, Chap. 6). Formally, I treat the pattern as the result of parsing the word from left to right into iambs (cf. (3c)). This analysis will be illustrated below.

The criterion of syllable weight used in Yupik is unusual, and varies across dialects. In the Norton Sound dialect of Central Alaskan Yupik, I assume that *word-initial* CVC is heavy, whereas elsewhere CVC is light. In terms of the proposal here, we would say that CVC syllables are syllabified as bimoraic initially, monomoraic elsewhere. CVV is heavy across the board.

Given this, the stress pattern of many words follows straightforwardly, as in the following example.

(18)	a.	μμ μ μ μ aŋ yaχ pa ka	syllabification (initial CVC heavy) 'my big boat' (Krauss 1985:21)
	b.	(x)(. x) μμ μ μ μ aŋ yaχ pa ka	construction of iambs from left to right

That is, since /ˊ/ and /˘ ˊ/ are legal iambs (and /ˊ/ is not), we get stress on the first and third syllables.

The output form in (18b) is in fact not a surface form. A rule that is found throughout Yupik lengthens vowels when they occur in the stressed position of a disyllabic foot. I state this rule as in (19).

(19) **Iambic Lengthening:**

$$\emptyset \rightarrow \mu \; / \; \begin{matrix} (. & x) \\ \sigma & \sigma \\ | & |\backslash \\ \mu & \mu \; \mu \end{matrix} \; \_\_$$

Iambic Lengthening completes the derivation of (18), as shown in (20).

(20)

(x) (.	x)	Iambic Lengthening
$\mu\mu$ μ	$\mu\mu$ μ	
áŋ yaχ	pá: ka	

Iambic Lengthening is of interest as an example of a segmental rule that enforces canonical foot structure: the /˘ ˊ/ feet that result from it obey the Iambic/Trochaic Law.

The syllable quantity pattern of Norton Sound Yupik is a simple example of the quantity of CVC varying by position, that is, heavy initially vs. light non-initially. In fact, it is not a fully convincing example, since one might just as well add a special rule that *stresses* initial CVC rather than weighting it (cf. Woodbury 1987:695). Further examples, perhaps more persuasive, follow.

Some background will be needed: all of the Yupik languages have Iambic Lengthening, and all have a pervasive phonemic vowel length contrast, found in both initial and non-initial syllables. It can be noted from examples like (21) below that vowel length is often involved in minimal pairs, which realize crucial grammatical contrasts. One wonders, then, what the effect of a length neutralization rule like Iambic Lengthening would be on the intelligibility of utterances. *A priori*, it would be expected to wipe out crucial contrasts when a short vowel in even position contrasts with a long vowel.

In fact, such neutralizations are almost always avoided. The various dialects all show some means of keeping underlying /V:/ distinct from iambically-lengthened [V:]. For example, older speakers of Siberian Yupik (Krauss 1975) lengthen underlying /V:/ to [V::] (an overlong vowel) whenever it occurs on the right side of a foot. This maintains the distinction: the underlying distinction /V/ vs. /V:/ is realized phonetically either as [V́:] vs. [V́::] or as [V] vs. [V́:], depending on the odd-even count established by foot structure.

In Central Alaskan Yupik, a rather different solution to the neutralization problem is taken, namely: (a) the syllable *preceding* the underlying long vowel is given a stress; and (b) where this syllable is underlyingly light, it is made heavy by gemination of the following consonant. I will refer to

this process as "Pre-Long Strengthening." Examples of it (from Jacobson 1985:30-31) are given below.

(21) a. /qayap**ix**kani/ → qayápixkáni
→ qayá:**pix**ká:ni
'his own future authentic kayak'

b. /qayap**ix**ka:ni/ → qayá:**píx**ká:ni
'in his(another's) future authentic kayak'

c. /**qa**yani/ → **qa**yá:ni
'his own kayak'

d. /**qa**ya:ni/ → **qá**yyá:ni
'in his (another's) kayak'

The boldface syllables precede an underlying long vowel in (21b,d), and so undergo Pre-Long Strengthening. Examples (21a,c) are given for contrast; the boldface syllables do not precede an underlying long vowel and thus surface unchanged.

To formalize Pre-Long Strengthening, we must consider two problems. First, it can be shown that Pre-Long Strengthening cannot apply before stress assignment. The reason is that it respects the same left-to-right alternating count that governs the stress rule. In (22) the boldface syllable is an *even*-numbered member of a light-syllable string. It does not undergo Pre-Long Strengthening (which would yield **maqíkká:txun*); rather, it undergoes Iambic Lengthening instead.

(22)

(. x)(x)		(. x) (x)	'with their (other's)
μ μ μμ μ		μ μμ μμ μ	future steambath material'
ma **qi** ka:t xun	→	ma qí: ká:t xun	Jacobson (1985:37)

In contrast, for the examples of (21b,d), the boldface syllable is an *odd*-numbered member of a light-syllable string, and it undergoes Pre-Long Strengthening.

Since Pre-Long Strengthening makes use of the same left-to-right alternating count of light syllables as the stress rule, it would make sense to order Pre-Long Strengthening after stress. But this seems problematic, since Pre-Long Strengthening itself is stress-assigning, as was seen in (21b,d).

A second difficulty with Pre-Long Strengthening is its apparently heterogeneous structural change: it adds both a stress and, where necessary, gemination. Given the general goal of constraining the class of possible phonological rules, it would seem unfortunate to adopt a rule that includes two separate structural changes.

The currently standard approach in treating these two problems is one developed in work by Leer (1985), Woodbury (1987), Weeda (1989, 1990), and Halle (1990). These analyses differ in various important respects, but deal with the Pre-Long Strengthening problem in a similar way. The basic idea is to implement a new type of iambic foot for Yupik, whose possible structures are outlined in (23).

(23) a. Possible feet: (x) –; (. x) ˘ ˘; (x) ˘ b. Impossible: (. x) * ˘ –

Because /˘ ˊ/ is not a foot, a /˘ –/ sequence encountered in a parse is made into two feet instead of one, as in (24b) (note that /ˊ/ feet are allowed). This gives the stressing effect of Pre-Long Strengthening. Where a CV syllable is made into a foot by this process, it is then bulked by a later rule to /–/, as shown in (24c).

(24)a. ˘ – ˘ qa ya:ni → **Foot Parsing** b. (x) (x) ˘ – ˘ qa ya:ni → **Bulking of CV** c. (x) (x) – – ˘ qayya:ni

This ingenious account solves the ordering paradox noted above, since the effects of Pre-Long Strengthening emerge from the stress rule itself. Moreover, we need not posit that a single rule can do two separate things, since the bulking of stressed CV syllables is done by a separate rule.

Nonetheless, there are serious objections to this account. First, it requires use of a foot construction algorithm ((23)) that plays no role in other languages, as far as I am aware. This means that the general theory of foot structure must be weakened solely to cover the Yupik facts. Second, under this theory it is puzzling that the segmental phonology (i.e., Iambic Lengthening, (19)), should conspire to create precisely the /˘ ˊ/ feet that the basic foot inventory excludes, as in (25).

(25) (. x) ˘ ˘ ˘ qayani → (. x) ˘ – ˘ **qaya:ni** = (21c)

Moreover, the /⏑́/ feet, which are assumed to be well-formed at the underlying level, all get repaired; because of the rule of Syllable Bulking illustrated in (24c), none of them actually reach the surface.

Summing up, the standard analysis has negative implications for the theory of foot typology (or at least for the one advocated here) and requires us to suppose that the basic metrical system and the segmental system work at cross-purposes.

The alternative account of Pre-Long Strengthening I argue for here is based on two ingredients. First, I assume as before that CVC may vary in its weight according to context. Second, I assume (cf. Hayes forthcoming, Myers 1991) that in some languages foot construction is "persistent," in the sense that the parsing algorithm continually reapplies to insure well-formedness whenever syllable count or quantities are altered by segmental rules.

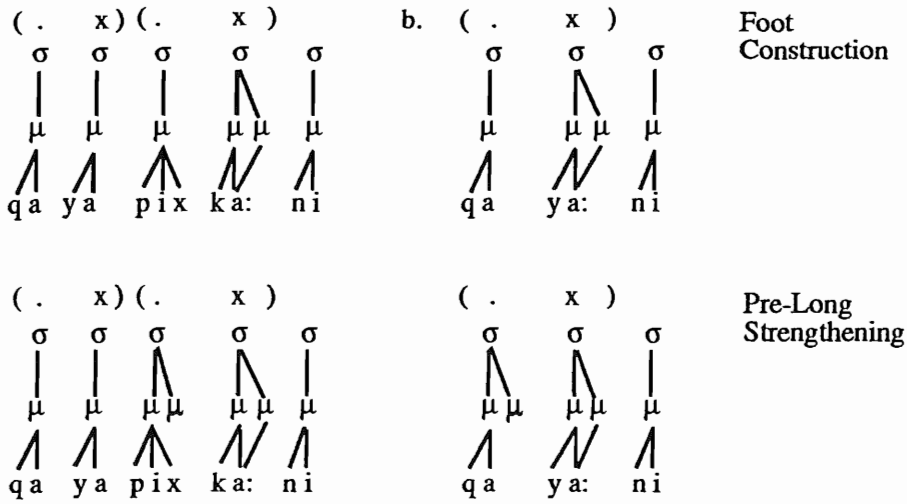
In the proposed analysis, I assume that Yupik uses the same iambs found in many other languages of the world (cf. (3c)); in particular, /⏑–/ is allowed as an iambic foot. Pre-Long Strengthening is construed as affecting syllable weight, rather than metrical structure. In particular, whenever a syllable precedes a long vowel within the same foot, it is made heavy by the addition of a mora.

(26) **Pre-Long Strengthening**

$$\emptyset \rightarrow \mu \;/\; \begin{matrix}(\,. & \mathrm{x}\,) \\ \sigma & \sigma \\ |\ddots & |\backslash \\ \mu & \mu\ \mu \\ & |/ \\ & \text{[-cons]}\end{matrix} \;\_\_$$

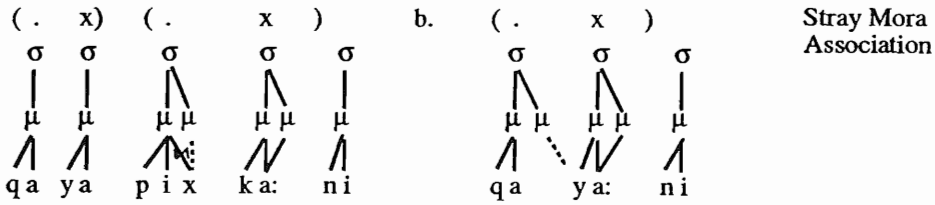
This is illustrated in the derivations in (27).

(27)



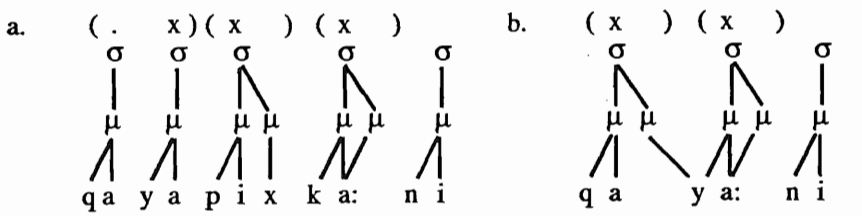
The algorithm for filling a stray mora is similar to that stated for Cahuilla above: stray moras associate with (a) non-moraic syllable final consonants, if present; else (b) stressed vowels (this is needed for Iambic Lengthening); else (c) the onset of the following syllable. Provision (a) applies to (28a) below, provision (c) to (28b).

(28)



Pre-Long Strengthening creates ill-formed feet of the shape /– ˊ/. Since these are disallowed as possible iambs, and since footing is hypothesized to be persistent, the /– –/ sequence is reparsed as two /–/ feet.

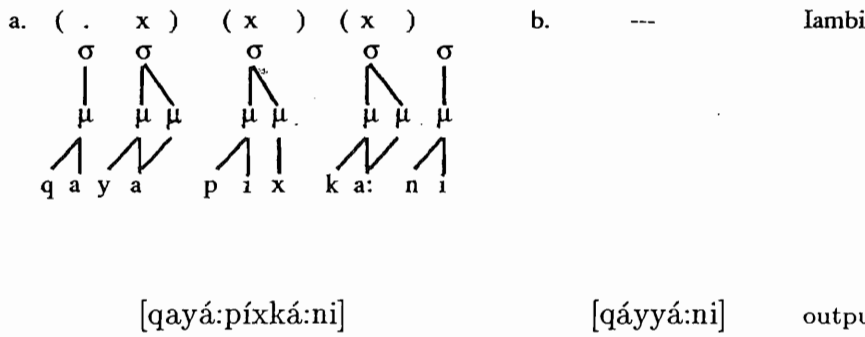
(29)



It is this reparsing that gives rise to the stressing effects of Pre-Long Strengthening; stressing is not part of the rule itself.

The final outcomes are then determined by Iambic Lengthening.

(30)



Note that this analysis crucially depends on the distinction between heavy and light CVC. For example, the second syllable of (20) and the third syllable of (30a) are light and heavy respectively, though both are CVC. In fact, this claim appears to be supported by phonetic evidence. Woodbury (1981:46) observes that for the Chevak dialect, the coda consonant of the CVC syllables that I have analyzed as bimoraic is phonetically longer; and Woodbury (p.c.) notes that this pattern in fact holds for the rest of Alaskan Yupik. Note that the phonetic facts agree with those of Cahuilla, where coda consonants are likewise phonetically longer when they bear their own mora.

The distinction between mora-bearing and mora-sharing coda consonants has other phonetic consequences as well. In particular, Woodbury (1981:46-49) observes that when a continuant consonant is in the coda and (in my terms) has its own mora, it is realized as extra strident; for example, /y/ with its own mora is realized as [ʒ].

Note finally that heavy CVC syllables derive from other sources as well, for instance, from the rule illustrated under (18) that creates heavy initial CVC, or indeed from Iambic Lengthening.

(31)

(.	x)	(.	x)			(.	x)	(.	x)	
μ	μ	μ	μ	μ	→	μ	μμ	μ	μμ	μ
qa	yaχ	paŋ	yux	tuq		qa	yáχ	paŋ	yúx	tuq

'he wants to get a big kayak' (Jacobson 1985:30)

Given my formulation of Iambic Lengthening in (19), it is predicted to apply to CVC syllables as well, producing the characteristic phonetic outcomes for heavy CVC.

To sum up this section: I have taken a new approach to the problem of Pre-Long Strengthening in Yupik, suggesting that it is basically a quantitative rather than a metrical process, with additional stress effects attributed to persistent footing. The benefits of doing this are as follows. First, we can assume that the iambic feet of Yupik are just like those found in the rest of the world's iambic systems. Second, under the new analysis, segmental phonology respects foot structure; indeed, through Iambic Lengthening the segmental rules enforce canonical (/⏑ –/) iambic form.

6 Conclusion

The argument made here for variable weight in CVC syllables is based on three things. First, variable weight is audible, with straightforward durational correlates in living languages. Second, variable CVC weight lets us make sense of phonological patterns that would otherwise seem puzzling. Third, variable CVC provides alternative analyses for cases which would otherwise require weakening of metrical stress theory.

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