Variations on a Latin theme*

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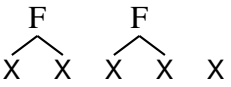
Idsardi (1992) introduced the idea that footing is carried out by a sequence of delimiter insertion operations. Halle and Idsardi (1995) further elaborated Idsardi's proposal. I will call this the H&I theory. Delimiters are one-sided and real phonological objects, not diacritics to indicate some other kind of real object, a foot for example. Feet in the theory are derived entities, created by the process of delimiter insertion.

Some diagrams might help make this clear. (1a) is a standard way to represent feet. The parentheses are taken to be diacritics, not phonological entities in their own right. (1a.1) is a shorthand for (1a.2), with real 'foot objects' which live on a separate line of foot objects. In the H&I theory, (1b), the foot delimiters are taken to be the primitive phonological entities; there is no line of foot objects.

(1) a. 1. (X X)(X X) X

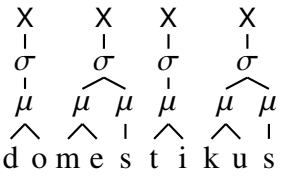


b. X X ⟩ X X ⟩ X

What are feet in the H&I theory? Say that a beat is *directly footed* if it is in the environment / __⟩ or the environment / ⟨__. Two kinds of objects populate the beat line, beats and foot delimiters. In (1b), the second and third beats are not adjacent; they are separated by a delimiter. Say that beats x and y satisfy $x \sim y$ if they are adjacent or there is z such that $x \sim z \sim y$. A set of beats F is called a foot is there is a directly footed beat x and F is the set of all y such that $y \sim x$. The line of beats and delimiters, as in (1b) for example, is called the beat line. *Feet are derived from the distribution of foot delimiters on the beat line*.

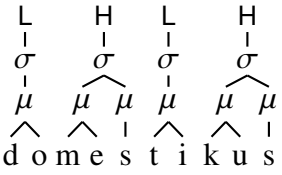
What are the beats is the beat line? In syllable-counting languages, they correspond to syllables; in mora-counting languages to moras. H&I take them to be projected from vowels. I assume that they are projected from syllables in syllable-counting languages, as in (2), from Latin.

* Thanks to Morris Halle for introducing me to phonology and for all the fun we had arguing about various aspects of it. I regret that we did not get to argue about this paper. Thanks also to Sam Gutmann for helping me argue with Morris.

(2)


Some researchers take them to be syllables, not projections of syllables, but there are good reasons to keep the metrical personas of syllables distinct from the syllables themselves. In some languages, there can be 'extrametrical syllables'. In those languages it is much more straightforward to deal with missing beats than some such device as coloring some syllables green and others red and making rules sensitive to syllable color.

Beats can have properties. In this paper, heaviness and edge properties. In Latin, for example, we can write (2) as (3).

(3)


H represents a beat with the HEAVY property; one projected from a bimoraic syllable. L represents a beat which doesn't have the HEAVY property; one projected from a monomoraic syllable. X will represent a beat which may or may not have the HEAVY property.

Section 1. Latin

We start from some data, given in the first columns of (4) and (5) below. The second columns are a proposal about how delimiter delimiter insertion groups the beats into feet and how stress is assigned. Delimiter insertion rules which produce this footing will be given shortly, in (6).

(4)
a.	*mén.sa*	(H́) L
b.	*a.mí:.cus*	L (H́) H
c.	*ad.mi.nís.tro*	(H L)(H́) H
d.	*tá.bu.la*	(Ĺ L) L
e.	*ví.de.o:*	(Ĺ L) H
f.	*do.més.ti.cus*	L (H́ L) H
g.	*ab.bré.vi.o*	(H)(Ĺ L) L
h.	*a.du.les.cén.tu.la*	(L L)(H)(H́ L) L

(5)
a.	*cá.ma*	(Ĺ) L
b.	*bré.vis*	(Ĺ) H
c.	*quá:*	(H́)

To complete (5), it should be noted that there are no monosyllabic words consisting of single light syllable.

I assume that there is a single stress in Latin words. That is, there is no secondary stress. The single stressed syllable is the leftmost syllable in the rightmost foot. The representation of stress and the stress assignment rule will be discussed later. In fact, I will

delay the discussion until after Tübatulabal is discussed. A comparison of the footing rules and stress assignment rules in Latin and Tübatulabal will clarify both systems.

The system of footing rules (6) produces the foot structures in (4) and (5). There is a non-iterative rule, what H&I called a *marking rule*, and a directional iterative rule. In (6) at the right, the marking rule and the subrules of the iterative rule are given names. They are needed in discussing derivations.[1]

(6) $X \rightarrow \rangle X \;/\; \_\_ \#$ $(GF^{X}_{\#})$

$\left[\begin{array}{ll} H \rightarrow \langle H & \\ X \rightarrow \langle X \;/\; \_\_ X & \end{array}\right]_{RL}$ (GB_{H}) (GB)

The rule scheme applies in the usual way. When the scheme targets a beat, if the first rule is applicable, it applies, otherwise if the second rule is applicable, it applies. If neither applies the focus of the iterative rule moves to the next beat to the left.

The system (6) is close to the proposal of H&I, but modifies it in an important way. I will comment on the differences later, but first we show that it produces the desired footing. First, consider the derivations (7). I indicate foot delimiters by angled brackets and reserve paired parentheses to indicate foot diacritics, as in the last lines below. The last lines are intended to show the feet that result from the derivation, not to be part of the derivation itself.

(7) a.

	L	L
$GF^{X}_{\#}$	L	⟩ L
	(L	) L

b.

	L	H
$GF^{X}_{\#}$	L	⟩ H
	(L	) H

c.

	H	X
$GF^{X}_{\#}$	H	⟩ X
GB_{H}	⟨ H	⟩ X
	(H	) X

d.

	H
GB_{H}	⟨ H
	(H)

Why doesn't (7b) continue as (8)?

(8)

	L	H
$GF^{X}_{\#}$	L	⟩ H
GB_{H}	L	⟩⟨ H
	(L	)(H)

Prince's (1985) proposed the Free Element Condition (FEC), as a principle of footing, that if a beat enters into a foot, it is not free to join a different foot later in the derivation. The FEC is routinely violated in the H&I framework. (9) is perfectly valid.

1. A note about the naming conventions: GB (Group Back) rules group beats back towards the starting edge, the right edge in this case. GF (Group Forward) rules group beats away from starting edge. The x-superscript indicates that the target of the rule is excluded from the foot which the insertion creates.

(9) ⟪ X X X X X → ⟪ X X ⟩ X X X → ⟪ X X ⟩ X X ⟩ X

The 3rd beat goes from being in a foot (of 5 beats), to being unfooted, to being in a foot of 2 beats.

However, there is an analogous condition which is valid in the delimiter insertion footing framework. We can partition the line of beats into those that have been acted upon by a delimiter insertion rule and those that have not been. The latter will be called *free beats* and the former *inactive beats*. In place of the FEC, I propose (10).

(10) *Free Beat Condition* (FBC): Footing rules apply only to free beats.

The FBC is the explanation of why (7b) does not continue as (8). After $GF^{X}_{\#}$ applies to the right-edge beat, GB_{H} cannot apply to the right-edge beat. Latin gives a good example of the effect of the FBC, but there are similar examples in other systems, Manam and Winnebago, for example.

Some illustrative derivations are given below. Note that a cursor is not introduced until after the marking rules apply. Marking rules are not directional and do not employ a cursor. A marking rule could apply at the left edge even if footing is right to left.[2] Initially the cursor is at the rightmost free beat and at each stage in the iteration moves to the next free beat to the left. It is assumed that the iterative rule applies at each step in the iteration since it always affects the current representation even if the only effect is moving the cursor. In order to make it easier for the reader to understand the course of derivations, delimiters inserted by marking rules is doubled. This is for the reader only; the grammar makes no distinction between delimiters inserted by marking rules and those inserted by the iterative rule.

(11)

a.	*a.mí:.cus*	b.	*sí.mu.la:*	c.	*do.més.ti.cus*	d.	*ab.bré.vi.o*
	L H H		L L H		L H L H		H H L L
$GF^{X}_{\#}$	L H⁄ ⟫ H	$GF^{X}_{\#}$	L L⁄ ⟫ H	$GF^{X}_{\#}$	L H L⁄ ⟫ H	$GF^{X}_{\#}$	H H L⁄ ⟫ L
GB_{H}	L⁄ ⟨ H ⟫ H		L⁄ L ⟫ H†		L H⁄ L ⟫ H†		H H⁄ L ⟫ L†
	L ⟨ H ⟫ H†	GB	⟨ L L ⟫ H‡	GB_{H}	L⁄ ⟨ H L ⟫ H	GB_{H}	H⁄ ⟨ H L ⟫ L
					L ⟨ H L ⟫ H†	GB_{H}	⟨ H ⟨ H L ⟫ L

† Neither subrule of the iterative rule is applicable because GB_{H} requires the context H and GB requires the context __ X.

‡ The first subrule of the iterative rule scheme, GB_{H}, does not apply so the second subrule, GB, applies since the context allows it.

2. See an example in Frampton (2024b) from Indonesian.

1.1 H&I's account

As I said above, the account above is a direct descendent of H&I's account. A comparison of the rule systems is given in (12).

(12) a. Halle and Idsardi (1995)

$$\begin{array}{ll} \mathsf{X} \rightarrow \rangle\!\rangle\, \mathsf{X} \;/\; \underline{\quad}\,\# & (GF^{X}_{\#}) \\ \mathsf{H} \rightarrow \langle\, \mathsf{H}\; ;\; *\rangle\langle & (GB_{H}) \\ \left[\, \mathsf{X\,X} \rightarrow \langle\, \mathsf{X\,X} \,\right]_{RL} & (GB) \end{array}$$

b. (6) on page 3

$$\begin{array}{ll} \mathsf{X} \rightarrow \rangle\!\rangle\, \mathsf{X} \;/\; \underline{\quad}\,\# & (GF^{X}_{\#}) \\ \left[\begin{array}{l} \mathsf{H} \rightarrow \langle\, \mathsf{H} \\ \mathsf{X} \rightarrow \langle\, \mathsf{X} \;/\; \underline{\quad}\,\mathsf{X} \end{array}\right]_{RL} & \begin{array}{l}(GB_{H}) \\ (GB)\end{array} \end{array}$$

GB_H in (12a) is a marking rule with a derivational constraint, written after the semi-colon. Both systems are empirically adequate. The differences seem relatively minor, but they are not.

The key difference is the formulation of the iterative rule. Conceptually, it has the advantage that the target is a natural entity. X X has no ontological status, particularly at the point that GB applies; essentially it is a 'foot in waiting'. Once the iterative rule is formulated as $\mathsf{X} \rightarrow \langle \;/\; \underline{\quad}\mathsf{X}$, both the marking rules and the iterative rule are rules of the same type. They apply to a beat and insert a delimiter adjacent to the target. Since all the delimiter insertion rules are of the same type, targeting beats, it is possible to impose the general FBC, making a derivational constraint on GB_H unnecessary. An explanation of the seeming inertness of the final beat is possible, rather than stipulating a derivational constraint to achieve an empirically adequate account.

The formulation of the iterative rule as the iterative targeting of beats from right to left also makes possible the organization of GB_H and GB into a rule scheme. The advantage for Latin is modest, a single RL scan rather than one scan to apply the GB_H marking rule and another to apply the RL iterative iterative rule. However, in some ternary languages, GB_H as a marking rule is not empirically adequate. In Estonian and Tripura Bangla, the iterative rule must be a scheme and GB_H must be a subrule of the scheme.[3] In fact, I assume that marking rules apply ATB.

3. Frampton (2024a).

1.2 Latin enclitics

The success and elegance of the Halle and Idsardi (1995, p. 426–30) reanalysis of the stress properties of Latin enclitics proposed by Steriade (1988) was strong evidence in support of their approach to word prosody. It is important here to show that that analysis is not compromised by the modifications that have been introduced. The fact that must be explained is that: "When the enclitic is added to a word, stress shifts onto the last syllable of the host word regardless of the length of the host or the clitic." (p. 426)

(13)	a.	*u.bi*	'where'	*u.bí-li.bet*	'wherever'
	b.	*muː.sa*	'the muse'	*muː.sá-que*	'and the muse'
	c.	*li.mi.na*	'thresholds'	*li.mi.ná-que*	'and thresholds'
	d.	*siː*	'if'	*síː-quan.doː*	'if ever'
	e.	*sub*	'under, near'	*súb-in.de*	'immediately afterward'

What must be explained is why we don't get *múː.sa.que, li.mí.na.que, si.quán.doː* and *su.bín.de*. Following Steriade, I assume that the stem undergoes metrification in a cyclic block of rules, then the enclitic is conjoined, then a post-cyclic block of rules applies. The post-cyclic block keeps the marking rule of the cyclic block, but not the iterative rule, so it consists of only the rule $\mathrm{GF}^{\mathrm{x}}_{\#}$.

Polysyllabic stems have the shape $\cdots\rangle\!\rangle\,\mathsf{X}$ and monosyllabic stems have the shape $\langle\,\mathsf{H}$. The enclitic can be X or XX. So there are 4 possibilities. The four possible cases are shown below,

(14)	stem	$\cdots\rangle\!\rangle\mathsf{X}$	$\cdots\rangle\!\rangle\mathsf{X}$	$\langle\mathsf{H}$	$\langle\mathsf{H}$
	enclitic	X	XX	X	XX
	concatenation	$\cdots\rangle\!\rangle\mathsf{X}$ X	$\cdots\rangle\!\rangle\mathsf{X}$ X X	$\langle\mathsf{H}$ X	$\langle\mathsf{H}$ X X
	post-cyclic computation	$\cdots\rangle\!\rangle\acute{\mathsf{X}}\rangle\!\rangle\mathsf{X}$	$\cdots\rangle\!\rangle\acute{\mathsf{X}}$ X$\rangle\!\rangle$X	$\langle\acute{\mathsf{H}}\rangle\!\rangle\mathsf{X}$	$\langle\acute{\mathsf{H}}$ X$\rangle\!\rangle$X

In each case, the final syllable of the stem is stressed.

* * * * * * * * *

In the next 4 sections, a series of stress systems will be analyzed. All are syllable-counting and trochaic. Klamath, Tübatulabal and Aklan use exactly the same iterative rule that Latin uses. Footing differs from Latin footing only in the marking rules which are adopted. The last, Bani-Hassan Arabic, uses a left to right version of the Latin iterative rule.

Section 2. Tübatulabal

Here is some representative data, from Voegelin (1935). The numbers at the right are page references to Voegelin.

(15)	a.	*íct*	‘coyote’	56
	b.	*píːl*	‘the breast’	56
	c.	*áː.máʔ*	‘he touched’	59
	d.	*e.lèː.gɨ́*	‘he is looking’	57
	e.	*pɔ̈̀.nih.wɨ́n*	‘his own skunk’	65
	f.	*tàː.hà.wi.láːp*	‘in the summer’	72
	g.	*hat.dàː.wà.ha.bí*	‘you may cross’	116
	h.	*ɨ̈̀ː.ʔɨ̈̀ː.ʔàː.ni.cá*	‘he will meat-fast’	59
	i.	*pï.tɨ̈̀.pï.tɨ̈̀ː.di.nát*	‘he is turning it over repeatedly’	73
	j.	*à.na.ŋàː.li.lɔ̀ː.gɔ.pɨ̀.ga.nán*	‘he is the one going along pretending to cry’	75

If it is assumed that CVV syllables are heavy and the others light, the examples above are predicted by a slight modification of the Latin system. The marking rule $\mathsf{X} \rightarrow \rangle\!\rangle \mathsf{X} \,/\, \underline{\quad}\#$ in Latin is replaced by $\mathsf{X} \rightarrow \langle\!\langle \mathsf{X} \,/\, \underline{\quad}\#$ in Tübatulabal.

(16) $\mathsf{X} \rightarrow \langle\!\langle \mathsf{X} \,/\, \underline{\quad}\#$ ($\mathrm{GB}_{\#}$)

$$\left[\begin{array}{ll} \mathsf{H} \rightarrow \langle \mathsf{H} & \\ \mathsf{X} \rightarrow \langle \mathsf{X} \,/\, \underline{\quad}\mathsf{X} & \end{array}\right]_{\mathrm{RL}}$$ (GB_{H}) (GB)

The initial syllable in every foot is stressed (trochaic foot stress); main stress in the rightmost foot, otherwise secondary stress.

(16) yields (17) for the (15) data, as desired.

(17)	a.	*(íct)*	$\langle\!\langle \mathsf{L}$
	b.	*(píːl)*	$\langle\!\langle \mathsf{H}$
	c.	*⟨àː)(máʔ)*	$\langle \mathsf{H} \langle\!\langle \mathsf{L}$
	d.	*e⟨lèː)(gɨ́)*	$\mathsf{L} \langle \mathsf{H} \langle\!\langle \mathsf{L}$
	e.	*⟨pɔ̈̀.nih)(wɨ́n)*	$\langle \mathsf{L}\ \ \mathsf{L} \langle\!\langle \mathsf{L}$
	f.	*⟨tàː⟨hà.wi)(láːp)*	$\langle \mathsf{H} \langle \mathsf{L}\ \ \mathsf{L} \langle\!\langle \mathsf{H}$
	g.	*hat⟨dàː⟨wà.ha)(bí)*	$\mathsf{L} \langle \mathsf{H} \langle \mathsf{L}\ \ \mathsf{L} \langle\!\langle \mathsf{L}$
	h.	*(ɨ̈̀ː)(ʔɨ̈̀ː)(ʔàː.ni)(cá)*	$\langle \mathsf{H} \langle \mathsf{H} \langle \mathsf{H}\ \ \mathsf{L} \langle\!\langle \mathsf{L}$
	i.	*pï(tɨ̈̀.pï)(tɨ̈̀ː.di)(nát)*	$\mathsf{L} \langle \mathsf{L}\ \ \mathsf{L} \langle \mathsf{H}\ \ \mathsf{L} \langle\!\langle \mathsf{L}$
	j.	*(à.na)(ŋàː.li)(lɔ̀ː.gɔ)(pɨ̀.ga)(nán)*	$\langle \mathsf{L}\ \ \mathsf{L} \langle \mathsf{H}\ \ \mathsf{L} \langle \mathsf{H}\ \ \mathsf{L} \langle \mathsf{L}\ \ \mathsf{L} \langle\!\langle \mathsf{L}$

2.1 Stress in Latin and Tübatulabal

In most trochaic languages, the first step in building the prosodic grid over the footed beat line is projecting the foot-initial beats to the bottom row of the grid. For example,

(18) a. Latin: *(ab)(bre.vi)o* (H)(L L) L

b. Tübatulabal: *(taː)(ha.wi)(laːp)* (H)(L L)(H)

The line will be called Line 1 and the projections 1-beats.

Almost all the trochaic languages which initially project all the foot-initial beats to Line 1 single out one of the 1-beats (*main stress*) by enhancing its relative stress. Latin and Tübatulabal both single out the rightmost 1-beat. Latin does it by deleting the other 1-stresses on Line 1. Tübatulabal does it by projecting the rightmost 1-stress to a higher grid line, Line 2.

(19) a. Latin: *(ab)(bré.vi)o* (H)(L L) L → (H)(L L) L

b. Tübatulabal: *(tàː)(hà.wi)(láːp)* (H)(L L)(H) → (H)(L L)(H)

Section 3. Klamath

The data is from Barker (1963, 1964). Most of it is in Hayes (1995, pp. 279-80), but page references are to Barker (B63 or B64). Many words are stressed correctly if the Latin footing and stress assignment rules are assumed and the light/heavy syllable weight distinction is made as in Latin. V is used below to represent a heavy syllable with a long vowel nucleus since we will see that V-syllables play a special role in Klamath word prosody.

(20) Klamath words which the Latin rules correctly stress

a.	*⟨gaː⟨móː⟩⟩la*	⟨V⟨V́⟩⟩L	‘finishes grinding’	35, B64
b.	*na⟨q’áːq⟩⟩bli*	L⟨V́⟩⟩L	‘puts a flat object back on one’s lap’	35, B64
c.	*⟨čá.w’i⟩⟩ga*	⟨Ĺ L⟩⟩L	‘is crazy’	36, B64
d.	*bó⟩⟩č’o*	Ĺ⟩⟩L	‘wild celery’	37, B64
e.	*ɢlé⟩⟩gatk*	Ĺ⟩⟩H	‘dead’	38, B64
f.	*⟨ʔáp.ʔa⟩⟩ta*	⟨H́ L⟩⟩L	‘promises’	36, B64
g.	*⟨gat⟨bám⟩⟩bli*	⟨H⟨H́⟩⟩L	‘returns home’	36, B64

There are two categories of words which are not stressed correctly by the Latin rules.

(21) Klamath words in which the rightmost V-syllable is not penultimate

a.	*⟨n'is⟫q'á:k*	⟨H⟫V́	'little girl'	37, B64
b.	*ga⟨bá:⟨tam⟫bli*	L⟨V́⟨H⟫L	'goes back to shore'	36, B64
c.	*ča⟨t'á:⟨wip⟫ga*	L⟨V́⟨H⟫L	'is sitting in the sun'	35, B64
d.	*ga⟨w'í:⟨nap⟨gab⟫li*	L⟨V́⟨H⟨H⟫L	'is going among again'	37, B64

Stress is on the rightmost V-syllable, not as predicted by the Latin rules.

(22) Klamath monosyllabic words consisting of a single light syllable

a.	*bí*	Ĺ	'bile'	63, B63
b.	*bló*	Ĺ	'fat, grease'	65, B63
c.	*tmó*	Ĺ	'grouse'	409, B63

These words are not footed by the Latin footing rules and therefore would not be stressed.

There are two alternatives on how to proceed. The first is to maintain the idea that main stress is an enhancement of foot level stress, as it is in Latin and Tübatulabal. This requires modifying the footing rules in such a way that V-syllables are footed, even if they are word-final, and monosyllabic words are footed, even if the syllable is light. Two marking rules must be added to the Latin system.

(23)
$$\mathsf{V} \rightarrow \langle\langle\, \mathsf{V} \,/\, \_\_\# \qquad (GB_{V\#})$$
$$\mathsf{X} \rightarrow \rangle\rangle\, \mathsf{X} \,/\, \_\_\# \qquad (GF^{x}_{\#})$$
$$\mathsf{X} \rightarrow \langle\langle\, \mathsf{X} \,/\, \_\_\# \qquad (GB_{X\#})$$
$$\left[\begin{array}{ll} \mathsf{H} \rightarrow \langle\, \mathsf{H} & \\ \mathsf{X} \rightarrow \langle\, \mathsf{X} \,/\, \_\_\, \mathsf{X} & \end{array}\right]_{RL} \qquad \begin{array}{l}(GB_{H})\\(GB)\end{array}$$

It also requires involving syllable shape in the main stress rule.

(24) Main stress rule

a. Project the foot-initial beats to Line 1.

b. Main stress rule: If there is a V-beat, project the rightmost V-beat to Line 2, otherwise project the rightmost beat to Line 2.

c. Delete Line 1.

The idea (24c) of deleting the entire Line 1 as a way to account for the absence of secondary stress was introduced by Halle and Kenstowicz (1991) and called 'conflation'.

Below are some illustrative derivations of examples in (20), (21), and (22). The first example is done in more detail, which is intended to be a guide to the more abbreviated derivations given in the other examples,

(25) [21b] L V H L $\xrightarrow{\text{Marking}}$ L⟪V H⟫L $\xrightarrow{\text{Iteration}}$ L⟪V⟨H⟫L $\xrightarrow{\text{Line 1}}$ L⟪V⟨H⟫L

$\xrightarrow{\text{MSR}}$ L⟪V⟨H⟫L $\xrightarrow{\text{Conflation}}$ L⟪V⟨H⟫L = L⟪V⟨H⟫L

[20g] H H L → ⟨H⟨H⟫L $\xrightarrow{\text{MSR}}$ ⟨H⟨H⟫L $\xrightarrow{\text{Conflation}}$ ⟨H⟨H⟫L

[21a] H V → ⟨H⟪V $\xrightarrow{\text{MSR}}$ ⟨H⟪V $\xrightarrow{\text{Conflation}}$ ⟨H⟪V

[22a] L → ⟪L $\xrightarrow{\text{MSR}}$ ⟪L $\xrightarrow{\text{Conflation}}$ ⟪L See note 1.

Note 1. $\text{GF}^{\text{x}}_{\#}$ cannot apply because foot delimiters must group a beat. So $\text{GB}_{\text{X}\#}$ can apply.

The other alternative is to give up the assumption that main stress is always the enhancement of foot level stress, as it is in Latin and Tübatulabal. See the Frampton (2021) analysis of the complex word stress system of Nanti for an example of this approach to the location of main stress. Some technical preliminaries will be needed before we can proceed.

3.1 Prominence relations

A prominence relation on a set S is a binary relation $\mathcal{R}$ on S such that 1) $x\,\mathcal{R}\,y$ is defined for all x and y in S; and 2) if $x\,\mathcal{R}\,y$ and $y\,\mathcal{R}\,z$, then $x\,\mathcal{R}\,z$ (transitivity). Complex prominence relations are usually constructed by combining simple prominence relations.

(26) a. We say $x = y$ with respect to $\mathcal{R}$ if neither $x\,\mathcal{R}\,y$ nor $y\,\mathcal{R}\,x$ is true, and say $x > y$ with respect to $\mathcal{R}$ if $x\,\mathcal{R}\,y$ is true and $y\,\mathcal{R}\,x$ is false.

b. If $\mathcal{R}_1, \ldots, \mathcal{R}_n$ is an ordered list of prominence relations, then $[\![\mathcal{R}_1, \mathcal{R}_2, \ldots, \mathcal{R}_n]\!]$ is the prominence relation defined by $x\,[\![\mathcal{R}_1, \mathcal{R}_2, \ldots, \mathcal{R}_n]\!]\,y$ if and only if $x > y$ with respect to $\mathcal{R}_1$, or $x = y$ with respect to $\mathcal{R}_1$ and $x\,[\![\mathcal{R}_2, \ldots, \mathcal{R}_n]\!]\,y$ is true.

c. If C is a condition on S then $\mathcal{P}_C$ is the prominence relation defined by $x\,\mathcal{P}\,y$ if and only if $C(x)$ is true and $C(y)$ is false.

d. $[\![\ldots, C, \ldots]\!]$, C a condition, is interpreted as $[\![\ldots, \mathcal{P}_C, \ldots]\!]$.

Aside from Left and Right, which have their obvious meanings, all of the simple prominence relations which will be used to build complex prominence relations are of the form $\mathcal{P}_C$.

The *global maxima of a prominence relation* $\mathcal{R}$ is the set of x in S such that $x\,\mathcal{R}\,y$ for all y in S. The set of global maxima will be non-empty if S is finite. An *asymmetric prominence relation* is one in which it is never the case that $x \neq y$, $x\,\mathcal{R}\,y$, and $y\,\mathcal{R}\,x$ are all true. If $\mathcal{R}$ is an asymmetric prominence relation, then there is a *unique* $\mathcal{R}$*-max*. If any of

the $\mathcal{R}_j$ are asymmetric, then $\mathcal{R} = [\![\mathcal{R}_1, \ldots, \mathcal{R}_n]\!]$ is asymmetric. Since RIGHT and LEFT are asymmetric, it follows that if either is a component of $\mathcal{R}$, then $\mathcal{R}$ is asymmetric and there is a unique $\mathcal{R}$-max.

If S is a finite line, like the line of syllables, or a line of stresses, the *local maxima of* $\mathcal{R}$ is the set of x in S such that $x\,\mathcal{R}\,y$ for all y adjacent to x. The local $\mathcal{R}$-submax is the set of x in S such that $y\,\mathcal{R}\,x$

(27) a. *Reduction of a line to the $\mathcal{R}$-max*: ATB delete the local $\mathcal{R}$-submax; iterate until there are no $\mathcal{R}$-submax.

b. *Projection of the $\mathcal{R}$-max on a line to a higher line*: ATB project the local $\mathcal{R}$ max to a new higher line. Reduce that line to the $\mathcal{R}$-max, where $\mathcal{R}$ on the higher line is understood in the obvious way.

3.2 Prominence in Klamath

We can replace (23) and (24) by (28).

(28) $\mathsf{X} \rightarrow \rangle\!\rangle\, \mathsf{X} \;/\; \_\_\,\#$ $\quad (\mathrm{GF}^{\mathrm{X}}_{\#})$

$\left[\begin{array}{ll} \mathsf{H} \rightarrow \langle\, \mathsf{H} & \\ \mathsf{X} \rightarrow \langle\, \mathsf{X} \;/\; \_\_\,\mathsf{X} & \end{array}\right]_{\mathrm{RL}}$ $\quad (\mathrm{GB}_{\mathrm{H}})$ $\quad (\mathrm{GB})$

Project the [[LONGVOWEL, FOOTINITIAL, RIGHT]]-max on the beat line to line 1.

The way in which the $\mathcal{P}$-max is projected is important, because global computations are in general computationally difficult. The computation is carried out by the iterative computation of local maxima. For example, *ga.wíː.nap.gab.li* is computed as shown in (29).

(29) $\mathsf{L}\langle\mathsf{V}\langle\mathsf{H}\langle\mathsf{H}\rangle\!\rangle\mathsf{L} \overset{\text{LOCALMAX}}{\rightarrow} \overset{*}{\mathsf{L}}\langle\mathsf{V}\langle\overset{*}{\mathsf{H}}\langle\mathsf{H}\rangle\!\rangle\mathsf{L} \overset{\text{LOCALMAX}}{\rightarrow} \overset{*}{\mathsf{L}}\langle\mathsf{V}\langle\overset{\not *}{\mathsf{H}}\langle\mathsf{H}\rangle\!\rangle\mathsf{L}$

There is a subtlety. The first local maximum computation projects the local beat line maxima to line 1. The second deletes the submaximal 1-beats.

None of the derivations in (25) require iterating the local max computation.

(30) [21b] $\mathsf{L}\langle\!\langle\mathsf{V}\;\;\mathsf{H}\rangle\!\rangle\mathsf{L} \overset{\text{LOCALMAX}}{\rightarrow} \mathsf{L}\langle\!\langle\overset{*}{\mathsf{V}}\langle\mathsf{H}\rangle\!\rangle\mathsf{L}$

[20g] $\langle\mathsf{H}\langle\mathsf{H}\rangle\!\rangle\mathsf{L} \overset{\text{LOCALMAX}}{\rightarrow} \langle\overset{*}{\mathsf{H}}\langle\mathsf{H}\rangle\!\rangle\mathsf{L}$

[21a] $\langle\mathsf{H}\rangle\!\rangle\mathsf{V} \overset{\text{LOCALMAX}}{\rightarrow} \langle\overset{*}{\mathsf{H}}\langle\!\langle\mathsf{V}$

[22a] $\mathsf{L} \overset{\text{LOCALMAX}}{\rightarrow} \overset{*}{\mathsf{L}}$

3.3 Latin and Tübatulabal stress assignment revisited

(31) 1. Project the [[FootInitial]]-max to line 1.

2. Latin: Delete the [[Right]]-submax on Line 1.
   Tübatulabal: Project the [[Right]]-max to line 2.

Section 4. Aklan

The source of the data is the dissertation of Chai (1971). Hayes (1980) analyzes Aklan using metrical trees with iambic feet. In Hayes (1995, p. 265) he suggests that this analysis is incorrect and that an analysis along the lines of Tübatulabal might be possible. This section will give an analysis that is a modification of the Tübatulabal footing and stress assignment system. The examples in this section are from Hayes (1980), but the page references are to Chai.

There are only CV and CVC syllables. CVC syllables are metrically heavy. For the most part, CV syllables are metrically light, but there are a few morphemes with phonologically CV exponents which act as if they are metrically heavy; ***ga-*** and ***ka-*** in this paper.[4] To make them recognizable, they will be set in bold type. I will assume that they are subject to a $X \rightarrow \langle X$ marking rule. They act as if they are metrically heavy because the marking rule makes them foot initial.

Some Aklan words are footed and stressed correctly by the Tübatulabal footing rules (32).

(32) $X \rightarrow \langle X \,/\, \_\_\,\#$ ($GB_{\#}$)

$\left[H \rightarrow \langle H \right]$ (GB_{H})

$\left[X \rightarrow \langle X \,/\, \_\_\, X \right]_{RL}$ (GB)

Foot initial beats are projected to Line 1.

Main stress is projected to Line 2 from the [[Right]]-max beat on Line 1.

The words (33) are footed and stressed exactly as predicted by (32).

4. Hayes (1995, p. 305), on the basis of (Isidore Dyen, p.c.) suggests that these two affixes may actually be lexically long-voweled prefixes. If this is indeed the case, the marking rule proposed is not needed

(33)	word	gloss	prediction	page
a.	*gàsta-hún*	'will be spent'	*⟨gàs.ta⟪hún*	159
b.	*ʔasìrta-hí́*	'be lucky'	*ʔa.⟨sìr.ta⟪hí*	36
c.	*s-uɣ-ùguʔ-ún*	'servant'	*su⟨ɣù.gu⟪ʔún*	223
d.	*na-**gà**-pà-n-abún*	'goes soaping'	*na⟨**gà**⟨pà.na⟪bún*	144

The first 2 columns are taken directly from Chai. In all the examples she gives, the morpheme structure and stress pattern in is given in same entry, along with a gloss. The meanings and functions of the various morphemes used in the construction of each derived word are explained in Chai in accompanying text. The page number is given, along with the prediction that the theory presented here makes. In general, I follow Chai's orthography, except that ɣ is substituted for g̃, ʔ for ?, and ŋ for ng. Where Chai writes na-g-p-in-ag̃-ng-isda?, for example, I will write na-g-p-in-aɣ-ŋ-isdaʔ 'went (pl.) fishing continuously' (p. 151).

4.1 P-effects (Penultimateness effects)

Heaviness effects are features of stress systems which promote heavy syllable stress. The inclusion of $\mathsf{H} \rightarrow \langle \mathsf{H}$ as the primary subrule of the Latin and Tübatulabal iterative rules is a heaviness effect. Aklan also has P-effects, modifications of the (32) system which have the effect of promoting penultimate syllable stress. One effect promotes penultimate foot stress to main stress rather than promoting final syllable stress. The other is a marking rule which applies to some lexically determined words which puts the penultimate beat in foot initial position.

4.1.1. Main stress

In Tübatulabal, main stress is on the rightmost foot initial beat, which is the final beat. In Aklan, main stress is on the penultimate syllable if it is foot initial, otherwise on the rightmost foot initial beat, which is the final beat.

(34)	word	gloss	prediction	page
a.	*sùgar-úɣ*	'gambler'	*⟨sù.ga⟪rúɣ*	35
b.	*l-in-ágnàt*	'had fever'	*li⟨ŋág⟪nàt*	35
c.	*pà-ng-awáy*	'go fighting'	*⟨pà.ɣa⟪wáy*	31
d.	*pa-ŋ-áblìt*	'go touching'	*pa⟨ŋáb⟪lìt*	31
e.	*bìra-há*	'pull'	*⟨bì.ra⟪há*	36
f.	*ma-símbà*	'will go'	*ma⟨sím⟪bà*	47

4.1.2. P-words

There is a class of words, called here P-words, which trigger a marking rule which results in penultimate stress on the word. As a first approximation, a word is a P-word if and only if its root is a P-word. (32) is revised to (35). Many roots are P-roots (roots which are P-words).

(35) X → ⟨ X if X is ***ga-*** or ***pa-*** (GB_{ga})
X → ⟨ X / __ X #, applies to P-words (GB_{P})
X → ⟨ X / __ # ($GB_{\#}$)
$\left[\begin{array}{l} H \rightarrow \langle H \\ X \rightarrow \langle X \,/\, \_\_\, X \end{array}\right]_{RL}$ (GB_{H}) (GB)

Foot initial beats are projected to Line 1.
Main stress is projected to Line 2 from the [[Penult, Right]]-max beat on Line 1.

Compare with Tübatulabal 32.

We first look at two roots which do not trigger GB_{P}. The root *bisá* does not have penultimate stress, so we know it is not a P-root. The root *kúrti* does have penultimate main stress but this does not show it is a P-root because all words with a heavy penult have penultimate main stress. (36d) shows that *kúrti* is not a P-root. Otherwise *kùrti-hí* would be a P-word and would have penultimate main stress.

(36)

	word	gloss	prediction	page
a.	*bisá*	'kiss'	*bi⟪sá*	36
b.	*bìsa-hí*	'kiss (imp.)'	*⟨bí.sa⟪hí*	36
c.	*kúrti*	'cut'	*⟨kúr⟪ti̯* †	36
d.	*kùrti-hí*	'cut (imp.)'	*⟨kùr.ti⟪hí*	36

† The predicted secondary stress on the final syllable does not surface. Here, and it what follows, this will be indicated by a cursor.

Aklan has extensive destressing of clashing secondary stress. Accounting for Aklan destressing is taken up in §4.2. Until then, predicted secondary stresses that do not show up in the surface forms that Chai gives will simply be pointed out with a cursor.

We now consider some P-roots. Note that the penultimate main stress on in (37e) does not necessarily mean that the root is a P-root; penultimate heavy syllables always get main stress. But the affixed form in (37g) has a penultimate light main stress, which shows that the root is a P-root.

(37)	word	gloss	prediction	page
a.	*básа*	‘read’	*《bá《sà*	43
b.	*basá-hì*	‘read’	*ba《sá《hì*	43
c.	*híkut*	‘cook’	*《hí《kùt*	43
d.	*hikút-ì*	‘cook’	*hi《kú《tì*	43
e.	*hámbaɣ*	‘speak’	*《hám《bàɣ*	146
f.	*ma-hámbàɣ*	‘will speak’	*ma《hám《bàɣ*	146
g.	*h-aɣ-àmbáɣ-un*	‘that which should be said’	*ha〈ɣàm《bá《ɣùn*	178

The first marking rule will result in penultimate stress on P-words. The main stress rule in Aklan will therefore result in penultimate main stress on any word with a heavy penult or any P-word.

4.2 Destressing

I did not exhaustively search the thousands of examples that Chai gives, but in the hundreds of examples that I did consider, there was only one in which there was a stressed syllable which was not foot initial with respect to the footing rules (35); *k-in-à-máty-an* ‘place of death’ (p. 161). The prediction is *〈kí.na〈mát《yàn*. We have already seen instances in (36) and (37) of predicted secondary stresses that do not surface. There will be many more.

There are different approaches to an explanation. One is that the rules (35) are much too simple and need to be modified to make the correct predictions. The other is that those rules are correct, but that the rules which realize the surface form are more complex than simply producing secondary stress on all the foot initial syllables that do not get main stress. I will pursue the latter approach and work out ‘destressing rules’.

The instances of destressing above all involved a secondary stress in clash with an adjacent main stress. There are cases of secondary stress in clash with another secondary stress, but in those cases destressing appears to be optional. We begin with the predictable cases.

(38) In words with penultimate stress, there is obligatory destressing of secondary stress

a. in bisyllabic words;

b. on stressed initial syllables in trisyllabic words; and

c. on clashing final syllables in longer words.

In all cases, the destressed syllable is in clash. If the final syllable has secondary stress, main stress must be penultimate.

(36c) and (37a,c,e) illustrate (38a).

(37g) illustrates (38b), as do the examples in (39). (38b) does not apply in (39a–d) because the word does not have penultimate stress, but it does in (39e–h), all of which are trisyllabic and have penultimate stress.

(39)	word	gloss	prediction	page
a.	*ʔàmirúɣ*	‘fabric starch’	⟨*ʔà.mi⟪rúɣ*	24
b.	*sàŋkurút*	‘little’ (amount)	⟨*sàŋ.ku⟪rút*	24
c.	*ɣàŋkugáʔ*	(a sweet delicacy)	⟨*ɣàŋ.ku⟪gáʔ*	24
d.	*sùbar-á*	‘swallow’	⟨*sù.ba⟪rá*	34
e.	*ma-g-káʔùn*	‘ate’	⟨*mà▲g⟪ká⟪ʔùn*	221
f.	*ma-g-mánghù*	‘two persons sibling to each other’	⟨*mà▲g⟨máŋ⟪hù*	169
g.	***ka*-súdl-àn**	‘entrails’	⟨***kà*▲⟨súd⟪làn**	163
h.	*pa-g-kánʔ-à*	‘was eaten’	⟨*pà▲g⟨kán⟪ʔà*	108

The examples (40) illustrate (38c).

(40)	word	gloss	prediction	page
a.	*ma-kì-g-hámbaɣ*	‘will initiate to talk’	*ma⟨kìg⟪hám⟪bà▲ɣ*	146
b.	*h-aɣ-àmbaɣ-ún-un*	‘maxim’	*ha⟨ɣàm.ba⟪ɣú⟪nù▲n*	178
c.	*baɣày-báɣay*	‘small/humble house, doll house’	*ba⟨ɣày⟪bá⟪ɣà▲y*	148
d.	*k-in-à-tawú-han*	‘place of birth’	*ki⟨nàta⟪wú⟪hà▲n*	161
e.	*p-ìn-a-**kà**-ma-bákas*	‘fastest’	*⟨pì.na⟨**kà**.ma⟪bá⟪kà▲s*	199

The destressing rule (41) applies optionally.

(41) Secondary stress to the left of the main stress and not in the initial foot is subject to optional destressing.

(41) applies after the rules in (38).

In the illustrative examples (42), a ▪-mark is under the syllables to which the obligatory destressing rule (38c) applies; a ▲-mark is under the syllables to which (41) applies; and the ▵-mark is under the syllables to which (41) might apply, but does not.

(42)	word	gloss	prediction	page
a.	*na-**gà**-buɣ-balígya?*	‘sort of selling’	*na⟨**gà**⟨bùɣ.ba《líg.《yà?*	148
b.	*hùɣ-h-il-in-ámbaɣ*	‘sort of speak (pl.) continuously’	*⟨hùɣ⟨hì.li⟨nám《bàɣ*	151
c.	*nà-g-?aradù-?arádu*	‘sort of sing’	*⟨nàg⟨?à.ra⟨dù.?a《rá《dù*	149
d.	*nà-g-**ka**-sákay*	‘become co-passengers’	*(nàg⟨**kà**《sá《kày*	142
e.	*ma-**kà**-ka?ùn-ká?un*	‘sort of eat’	*ma⟨**kà**.ka⟨?ùn《ká《?ùn*	191
f.	*mà-?-uɣ-ugtás-un*	‘fussy’	*⟨mà.?u⟨ɣùg《tá《sùn*	187
g.	*nà-g-p-in-àɣ-ŋ-ísda?*	‘went (pl.) fishing continuously’	*⟨nàg.pi⟨nàɣ⟨ŋís《dà?*	151
h.	*na-**gà**-pà-n-abún*	‘goes soaping’	*na⟨**gà**⟨pà.na《bún*	144
i.	*mà-t-in-amar-ún*	‘being lazy’	*⟨mà.ti⟨nà.ma《rún*	188
j.	*na-**gà**-pà-n-abún*	‘goes soaping’	*na⟨**gà**⟨pà.na《bún*	144
k.	*p-ìn-a-**kà**-ma-bákas*	‘fastest’	*⟨pì.na⟨**kà**.ma《bá《kàs*	199

Finally, two examples which we do not have an account of. The first was already mentioned. The second syllable in (43a) is stressed, but it is not foot initial. The initial syllable of (43b) is destressed, but (41) does not apply in the initial foot. It doesn’t make sense to weaken (41) to allow destressing in the initial syllable because (43b) is the only example, among many, in which the leftmost foot initial syllable is not stressed on the surface.

(43)	word	gloss	prediction	page
a.	*k-in-à-máty-an*	‘place of death’	*⟨kì.na⟨mát《yàn*	161
b.	*na-g-?ùɣ-?arádu*	‘sort of plow’	*⟨nàg⟨?ùɣ.?a《rá《dù*	149

4.3 A P-suffix and an anti-P-suffix

Hayes points out that there is a suffix that makes a word a P-word, even if the root is not P-root, and another suffix which has the property that the word which it forms is not a P-word even if the root is a P-root. See the discussion of this in Hayes (1980, pp. 53–55). The phenomena support the idea that there is a ±P feature on some roots which percolates up to the derived word. In general, suffixes are not marked for this feature, but exceptionally there can be suffixes which are marked for ±P. +P suffixes mark the word as +P whether or not there is a percolating +P feature. Some suffixes can be marked −P, which blocks percolation of a P-feature from the root.

Section 5. Bani-Hassan Arabic (BHA)

BHA was the subject of a series of important papers by Kenstowicz (1983, 1986) and Irshied and Kenstowicz (1984). The analysis below relies on their work.

It is a stretch to view the word stress system of BHA as a variation on a Latin theme, but it is an instructive exercise to do so. In a trochaic system, the simplest modification of the basic RL binary footing rule $[\mathsf{X} \rightarrow \langle \mathsf{X} \,/\, \_\_\, \mathsf{X}]_{\mathrm{RL}}$ which promotes heavy syllable stress is

(44) $\begin{bmatrix} \mathsf{H} \rightarrow \langle \mathsf{H} \\ \mathsf{X} \rightarrow \langle \mathsf{X} \,/\, \_\_\, \mathsf{X} \end{bmatrix}_{\mathrm{RL}}$

This was the iterative rule in Latin and Tübatulabal.

In a trochaic system, the simplest modification of the basic LR binary footing rule $[\mathsf{X} \rightarrow \mathsf{X}\rangle \,/\, \mathsf{X}\_\_]_{\mathrm{LR}}$ which promotes heavy syllable stress is

(45) $\begin{bmatrix} \mathsf{H} \rightarrow \langle \mathsf{H} \\ \mathsf{X} \rightarrow \mathsf{X}\rangle \,/\, \mathsf{X}\_\_ \end{bmatrix}_{\mathrm{LR}}$

We will show below that this is the iterative rule in BHA. In fact, it is the only rule.

It assumes that BHA is syllable-counting, metrical beats are associated with syllables; and assumes the common Arabic light/heavy syllable weight division; non-final (C)VC and final (C)VCC syllables are heavy, others light. (46) shows how, given these assumptions, the iterative rule (45) accounts for the BHA data. The last column is the page reference.

(46) data from Irshied and Kenstowicz (1984)

a.	*ʔal.lam*	⟨H́ L⟩	*ʔál.lam*	‘he taught’	117
b.	*ʔal.la.mat*	⟨H́ L⟩L	*ʔál.la.mat*	‘she taught’	117
c.	*ʔal.la.ma.tuh*	⟨H̀ L⟩Ĺ L⟩	*ʔàl.la.má.tuh*	‘she taught him’	117
d.	*ʔal.la.muːk*	⟨H̀ L⟩⟨H́	*ʔàl.la.múːk*	‘they taught you (m. sg.)’	128
e.	*ʔal.la.mu*	⟨H́ L⟩L	*ʔál.la.mu*	‘they taught’	128
f.	*ʔa.tal.lam*	L⟨H́ L⟩	*ʔa.tál.lam*	‘be taught’	110
g.	*sa.hab*	Ĺ L⟩	*sá.hab*	‘he pulled’	130
h.	*ʔal.lamt*	⟨H̀⟨H́	*ʔàl.lámt*	‘I taught’	128
i.	*ši.baːb*	L⟨H́	*ši.báːb*	‘youth’	128
j.	*sa.ha.ba.tak*	L L⟩L L⟩			
	→ *sha.ba.tak*	L̀⟩Ĺ L⟩	*shà.bá.tak*†	‘she pulled you (m. sg.)’	130
k.	*sahabat*	L L⟩L			
	→ *sha.bat*	Ĺ⟩L	*shá.bat*	‘she pulled’	130

† Kenstowicz’s (1983) explanation of how the underlying form comes to be realized as a stressed light syllable in stress clash with another light syllable was (and still is) very important. It is simply a timing question. Vowel deletion occurs after footing, before stress assignment. Later, the attraction of autosegmental phonology led Kenstowicz and many others down the rabbit hole of ‘floating stress’.

The identification of BHA as a syllable counting language answers a question first raised by Kenstowicz (1983). He noted that there was a systematic difference is the placement of main stress between BHA and Palestinian Arabic, which needed an account. His account was in terms of the direction of iteration, but a more satisfactory account is in terms of syllabic beats versus moraic beats. The same point can be made by comparing BHA and Cairene Arabic (CA). The difference shows up for HLL and HLLL sequences: BHA *ʔál.la.mu* versus CA *qat.tá.la*, and BHA *ʔal.la.má.tuh* versus CA *ʔin.ká.sa.ra*. This difference is a direct reflection of the difference between syllable-counting BHA and mora-counting CA. Neither Cairene nor Palestinian exhibit secondary stress.

(47)

Bani-Hassan Arabic		Cairene Arabic	
$\left[\begin{array}{lll} \mathsf{H} & \rightarrow & \langle\, \mathsf{H} \\ \mathsf{X} & \rightarrow & \mathsf{X}\,\rangle \;/\; \mathsf{X}\_\_ \end{array}\right]_{\mathrm{LR}}$		$\left[\begin{array}{lll} \mu & \rightarrow & \langle\, \mu \;/\; \_\_ \smile \mu \\ \mu & \rightarrow & \mu\,\rangle \;/\; \mu \_\_ \end{array}\right]_{\mathrm{LR}}$	
(ʔál.la)mu	⟨H́ L⟩L	*(qat)(tá.la)*	⟨ μ⌣μ ⟩μ́ μ ⟩
(ʔàl.la)(má.tuh)	⟨H̀ L⟩Ĺ L⟩	*ʔin.ká.sa.ra*	⟨ μ⌣μ ⟩μ́ μ ⟩μ

The μ symbols represent moraic beats, with $\smile$ a diacritic indicating that the beats it connects typographically are cosyllabic in the obvious sense. The differences are minimal, aside from the association of metrical beats with moras or with syllables.

Section 6. Summary

This paper has been an exercise in illustrating how formally minor variation in delimiter insertion can lead to substantial surface variation. The most complex variation is in the Main Stress Rule.

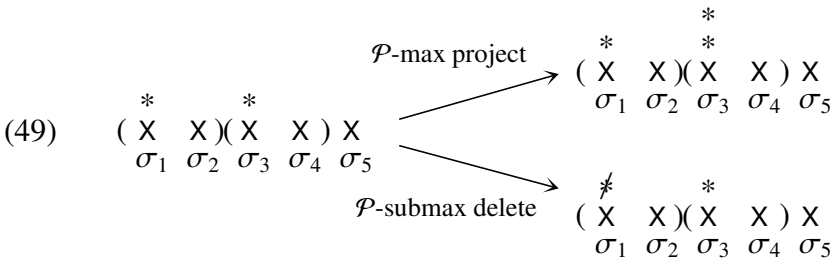
6.1 Main Stress

In *strictly trochaic* syllable-counting languages, the bottom line of the prosodic grid (Line 1) is initially formed by projecting the foot initial beats on the beat line.

(48)

					projection					Line 1
(	X	X)(	X	X)	X	⟶	(	X	X)(	X	X)	X
	σ_1	σ_2	σ_3	σ_4	σ_5			σ_1	σ_2	σ_3	σ_4	σ_5

In the strictly trochaic languages analyzed in this paper, main stress is determined by an asymmetric prominence relation $\mathcal{P}$ on Line 1. Either the $\mathcal{P}$-max is projected to Line 2 or the $\mathcal{P}$-submax are deleted from Line 1. Either way, a single beat (main stress) remains on the top line of the grid. The two possibilities are illustrated below for $\mathcal{P} = [\![\textsc{Right}]\!]$.

(49)


If the $\mathcal{P}$-max projects from Line 1, the stress beats on Line 1 that do not project surface as secondary stresses. If the $\mathcal{P}$-submax are deleted, there are no secondary stresses.

In strictly trochaic systems, the precedence relation cannot favor foot-initial beats since $\mathcal{P}$ compares Line 1 beats and all the Line 1 beats are foot-initial. But there are systems with an asymmetric precedence relation $\mathcal{P}$ *on the beat line* that does favor foot-initial beats. The systems could be called *loosely trochaic systems*. Line 1 then has a single beat, the projection of the $\mathcal{P}$-max.

6.2 Summary of the variations

Language	Marking rule(s)	Iterative rule	Main stress rule
Latin:	X → ⟩X / __#	[H → ⟨H; X → ⟨X / __X]$_{RL}$	[[RIGHT]] reduce Line 1
Tübatulabal:	X → ⟨X / __#	[H → ⟨H; X → ⟨X / __X]$_{RL}$	[[RIGHT]] project from Line 1
Klamath:	X → ⟩X / __#	[H → ⟨H; X → ⟨X / __X]$_{RL}$	[[LONGVOWEL, FOOTINITIAL, RIGHT]] project from beat line
Aklan:	X → ⟨X (***ga***,***pa*** prefixes) X → ⟨X / __X# (P-words) X → ⟨X / __#	[H → ⟨H; X → ⟨X / __X]$_{RL}$	[[PENULTSYL, RIGHT]] project from Line 1
BHA:	(*none*)	[H → ⟨H; X → X⟩ / X__]$_{LR}$	[[RIGHT]] project from Line 1

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