A re-evaluation of 'disjoint' footing

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1 Introduction

It has sometimes been suggested that a single language can make use of two distinct, but co-existent systems of foot structure:

- One system of foot structure to determine rhythmic stress placement.
- Another system of foot structure to determine phonological processes (vowel reduction, epenthesis, etc.) or allomorph selection.

Stress feet:		$(\sigma_s$	$\sigma_w)$	$(\sigma_s$	$\sigma_w)$	$(\sigma_s$	$\sigma_w)$
	pa	pa	pa	pa	pa	pa	pa
Process feet:	$\{\sigma_s$	$\sigma_w\}$	$\{\sigma_s$	$\sigma_w\}$	$\{\sigma_s$	$\sigma_w\}$	

Table 1: Co-existent metrical tiers (schematically)

- See Archangeli (1984), Rappaport (1984), Halle & Vergnaud (1987:66), Parker (1998a), Aion (2003), and González (2007) for some articulations of this view.

Huariapano, an extinct Amazonian language, is claimed to instantiate exactly this sort of pattern.

I will argue that this conclusion is premature: the prosodic phonology of Huariapano can be unified within a single system of metrical footing.

Second part of the talk:

- Provide typological support for the proposed analysis of Huariapano.
- Speculate about how to analyze other putative cases of 'disjoint' footing within a strict monoplanar framework.

2 Huariapano

Huariapano (= [wa.ɾi.a.pá.no]) is an extinct Panoan language, spoken in the Peruvian Amazon until the death of its last known speaker in 1991 (Parker 1994, Loos 1999).

The phonology of Huariapano exhibits two rhythmic phenomena:

- Alternating secondary stress:

  (1) [jò.mɯ.rà.no.ʂí.ki] 'he is going to hunt'

- Alternating epenthesis of coda [h]:

  (2) [pìh.ka.tíh.kãj̃] 'they ate'

Both of these processes are plausibly foot-based.

But the feet needed to determine rhythmic stress appear to be distinct from the feet needed for coda [h] epenthesis (Parker 1994, 1998a,b, González 2005, 2007).

(3) a. [pàh.tˢaj.níh.kãj̃] 'they are washing'

b. [ih.kàʂ.t͡ʃaŋ.ká.ti] 'you would shake with fear'

The proposal: stress and [h] epenthesis *can* be integrated within a single system of footing, if we accept:

(i) A more flexible theory of language-internal variation in foot construction.

(ii) A richer view of how foot structure interacts with segmental phonotactics.

3 Phonology of Huariapano

Data and basic generalizations taken from Parker (1994, 1998a,b) and Parker (p.c.).

Transcriptions are altered from Parker (1994, 1998a,b) to better match IPA standards.

3.1 Syllable structure

Maximally [CGVC] (G = glide) and minimally [V].

(4) a. [hwín.ti] 'heart'

b. [í.wi] 'stingray'

3.2 Stress placement

3.2.1 Primary stress (quantity-sensitive)

Primary stress falls on the final syllable if heavy (= closed):

(5) a. [ja.wíʃ] 'opossum' [LH́]

b. [hon.tˢís] 'claw; fingernail' [HH́]

Otherwise, main stress falls on the penult:

(6) a. [á.tˢa] 'manioc' [Ĺ L]

b. [wín.ti] 'oar, paddle' [H́L]

(7) Quantity-sensitive primary stress placement in Huariapano

a. /... σ H/ → [... σ H́]

b. /... σ L/ → [... σ́ L]

There are a small number of exceptions to this basic pattern:

(8) a. [jo.βɯ́] 'witch' [LĹ]

b. [βwi.ní.kãj̃] 'they are taking, carrying' [LĹH]

c. [βɯ́ɪ.ma.na] 'face (noun)' [ĹLL]

3.2.2 Secondary stress (quantity-insensitive)

Unlike primary stress, secondary stress is **always quantity-insensitive** in Huariapano.

- Two distinct patterns of secondary stress assignment.
- Variation is lexical, not phonological (see Parker 1998a, Bennett 2012 for details).

Regular secondary stress (the most frequent pattern):
Assign secondary stress to every *odd-numbered* syllable, counting from the left.

(9) Regular secondary stress: [σ̀$_1$ σ$_2$ σ̀$_3$ σ$_4$ σ̀$_5$ σ$_6$ ...]

a. [mà.na.páj.ri] 'I will wait' σ̀σH́ L

b. [wà.nɯɪ.ki.ráŋ.ki] 'they have returned' σ̀σσH́L

c. [jò.mɯɪ.rà.no.ʂí.ki] 'he is going to hunt' σ̀σσ̀σĹL

Irregular secondary stress:
Assign secondary stress to every *even-numbered* syllable, counting from the left

(10) Irregular secondary stress: [σ_1 $\grave{\sigma}_2$ σ_3 $\grave{\sigma}_4$ σ_5 $\grave{\sigma}_6$ . . .]

a. [hi.màŋ.ko.ʃó] 'species of ant' $\sigma\grave{\sigma}$LĹ

b. [a.rì.βah.káŋ.ki] 'they repeated' $\sigma\grave{\sigma}\sigma$Ĥ L

c. [βis.mà.noh.kò.no.ʂí.ki] 'I forgot' $\sigma\grave{\sigma}\sigma\grave{\sigma}\sigma$ĹL

Stress clashes are completely disallowed.

(11) No clash in Huariapano

a. [jò.mɯ.rà.no.ʂih.kã́j̃] 'they will hunt' $\grave{\sigma}\sigma\grave{\sigma}\sigma\sigma$ĤH

b. *[jò.mɯ.rà.no.ʂ̀ih.kã́j̃] *$\grave{\sigma}\sigma\grave{\sigma}\sigma\grave{\sigma}$ĤH

3.3 Coda [h] epenthesis

Coda [h] is allowed in Huariapano, but must satisfy a handful of phonotactic constraints. (See Parker 1994, 1998a,b, de Lacy 2001, and Bennett 2012 for exhaustive discussion).

(i) Coda [h] must appear before a voiceless obstruent (coda [h] ≈ preaspiration)

(12) a. [poh.ʂój] 'I open'

b. [ka.móʂ] 'species of venomous snake'
c. *[kah.móʂ]

(ii) Coda [h] never appears in a coda cluster (because complex codas are prohibited)

(13) a. [βoʂ.ká] 'head'

b. *[βohʂ.ká], *[βoʂh.ká]

(iii) Coda [h] is *rhythmic*. Counting L → R:

- Coda [h] appears in all eligible odd-numbered syllables,
- and never appears in even-numbered syllables.

(14) Coda [h] in odd-numbered syllables only (counting L → R)

a. [pàh.tˢaj.níh.kãj̃] 'they are washing' (✓ 1st, 3rd σ coda [h])

b. [pi.ní.kãj̃] 'they are eating'
c. *[pi.níh.kãj̃] (X 2nd σ coda [h])

Coda [h] is obligatory wherever these conditions are met.

(15) a. [àh.kom.pá.na] 'rattlesnake'

b. *[à_.kom.pá.na]

Coda [h] is **always epenthetic** rather than underlying.

- Distribution of coda [h] is non-contrastive, completely predictable, and rule-governed.

Important observation: coda [h] has the same basic distribution as regular secondary stress (odd-numbered syllables).

- Suggests an underlying structural unity between the two processes.

4 Disjoint footing in Huariapano?

Multiplanar account of the rhythmic phonology of Huariapano first proposed by Parker (1998a).

- Also found in Parker (1998b) and González (2007) (cf. Parker 1994, González 2003, 2005, McGarrity 2003, Blumenfeld 2006, Vaysman 2009, Wolf 2012).

I call this approach the MULTIPLANAR ANALYSIS OF HUARIAPANO (or the MAH).

Motivation for the MAH:

- Coda [h] epenthesis appears to be foot-based (it is rhythmic).
- If [h] epenthesis depends on the same foot structure that determines stress, epenthesis should:
  - Always target stressed syllables (strong branch of foot), or
  - Always target unstressed syllables (weak branch of foot).
- This is incorrect:

(16) Epenthesis in stressed syllables (σ_h = σ closed by coda [h])

a. [pàh.tˢaj.níh.kãj̃] 'they are washing' $\grave{\sigma}_h\ \sigma\ \acute{L}_h\ L$

b. [t͡ʃìh.kɯ.na.máŋ] 'corner' $\grave{\sigma}_h\ \sigma\ L\ \acute{H}$

c. [jò.mɯ.ràh.ka.tíh.kãj̃] 'they hunted' $\grave{\sigma}\ \sigma\ \grave{\sigma}_h\ \sigma\ \acute{L}_h\ L$

(17) Epenthesis in unstressed syllables

a. [ma<u>h</u>.tˢó.te] 'broom' σ_h Ĺ L

b. [βis.mà.no<u>h</u>.kò.no.ʂí.ki] 'I forgot' σ σ̀ σ_h σ̀ σ Ĺ L

(18) Failure of epenthesis in stressed, even-numbered syllables

a. [pa<u>h</u>.tˢá.kɯ] 'we washed' σ_h Ĺ L

b. *[pa<u>h</u>.tˢá<u>h</u>.kɯ] *σ_h Ĺ$_h$ L

CONCLUSION: stress and epenthesis are both foot-based, but stress feet ≠ epenthesis feet.

- Therefore the prosodic phonology of Huariapano employs multiple metrical tiers.

5 A unified account of Huariapano

The MAH assumes that coda [h] epenthesis is determined by an autonomous metrical system, over and above the footing needed for stress placement.

Some critiques:

- No independent language-internal support.
  - The epenthesis tier is process-specific, and has no phonological consequences apart from epenthesis itself.
  - "It is a rule of thumb of practical ontology that a thing exists to the extent that other things interact with it, make use of it." (Prince 1983:31)
- Does not meaningfully capture distributional parallels between stress and coda [h] epenthesis.
  - If stress and epenthesis depend on completely orthogonal metrical systems, any similarities must be treated as accidental (or perhaps historical, e.g. Bach & Harms 1972; see also González 2003, 2007).
- Not very restrictive:
  - No underlying theory of multiplanarity (Hayes 1995).
  - Predicts improbable interactions between e.g. stress and vowel reduction.

STRESS:	(pə́	ka)	(tə́	ki)	(pə́	tu)
V REDUCTION:	{σ_w	σ_s}	{σ_w	σ_s}	{σ_w	σ_s}

A unified account of rhythmic phenomena in Huariapano *is* possible, if we accept that:

(a) The headedness of feet is variable, but the position of foot boundaries is not.

(b) Coda [h] epenthesis targets *foot-initial syllables* — it is demarcative.

5.1 Stress placement: uniform parsing, variable headedness

5.1.1 Primary stress

I assume that the foot bearing main stress is **always bisyllabic** in Huariapano.

(19) Penultimate stress: right-aligned bisyllabic trochee

a.	[(βɯ́.na)] 'male'	/...LL/	→	[...(ĹL)]
b.	[(máj.ti)] 'hat'	/...HL/	→	[...(ḾL)]

Final stress is the result of a *rhythmic reversal*: footing becomes iambic in order to stress a final heavy syllable.

(20) Final stress: right-aligned bisyllabic iamb

a.	[(ja.wíʃ)] 'opossum'	/...LH/	→	[...(LḾ)]
b.	[(hon.t^{s}ís)] 'claw; fingernail'	/...HH/	→	[...(HḾ)]

Evidence that final primary stress is assigned in a bisyllabic foot:

- **Argument 1**: There are no trisyllabic words with word-final main stress and initial secondary stress (though the facts are complicated; see Bennett 2012).

  (21) a. [pa.βi.kín] 'ear'

  b. *[pà.βi.kín]

- Lack of secondary stress in (21) is surprising if final primary stress is assigned in a moraic trochee.

  (22)

a.	Iamb:	[pa(βi.kín)]	L(LḾ)#
b.	Trochee:	*[(pà.βi)(kín)]	*(ÌL)(Ḿ)#

- **Argument 2**: weight-based rhythmic reversals are attested in closely-related Panoan languages, some of which were mutually intelligible with Huariapano (Parker 1994, Loos 1999, Elias-Ulloa 2006)

5.1.2 Regular secondary stress (odd syllables)

Regular secondary stress stems from L → R, QI trochees.

(23) Regular secondary stress: L → R syllabic trochees

a. [(mà.na)(páj.ri)] 'I will wait' $\overrightarrow{(\grave{\sigma}\ \sigma)}(\acute{\text{H}}\ \text{L})$

b. [(jò.mɯ)(rà.no)(ʂih.kã́j̃)] 'they will hunt' $\overrightarrow{(\grave{\sigma}\ \sigma)(\grave{\sigma}\ \sigma)}(\text{L}_h\ \acute{\text{H}})$

5.1.3 Irregular secondary stress (even syllables)

I assume that irregular secondary stress parses out QI *iambs*, not trochees.

(24) Irregular secondary stress: L → R syllabic iambs

a. [(ʃɯ.nà)(ko.ʂón)] 'spider' $\overrightarrow{(\sigma\ \grave{\sigma})}(\text{L}\ \acute{\text{H}})$

b. [(βis.mà)(noh.kò)no(ʂí.ki)] 'I forgot' $\overrightarrow{(\sigma\ \grave{\sigma})(\sigma_h\ \grave{\sigma})}\sigma(\acute{\text{L}}\ \text{L})$

Evidence for iambic secondary stress: even-parity words with a medial stress lapse.

(25) a. [βɯ.t͡ʃà.na.naŋ.ká.ti] 'I found myself (face to face with the jaguar)'

b. [o.nà.ja.ma.káŋ.ki] 'they don't know (how to speak Huariapano)'

c. L → R iambic parse: ✓ $(\sigma\ \grave{\sigma})\ \sigma\ \sigma\ (\acute{\sigma}\ \text{L})$

d. Trochaic parse (MAH): * $(\grave{\sigma}\ \sigma)(\grave{\sigma}\ \sigma)(\acute{\sigma}\ \text{L})$

Variability in stress placement is always due to variability in the headedness of feet (iambic vs. trochaic).

- **The slogan**: foot *headedness* is variable in Huariapano; foot *boundaries* are not.

5.2 Coda [h] epenthesis

Footing is *always bisyllabic* in Huariapano, and *always left-to-right* (for secondary stress).

- An important consequence: **odd-numbered syllables are always foot-initial.**

(26) $[\ (\sigma_1\ \sigma_2)(\sigma_3\ \sigma_4)(\sigma_5\ \sigma_6)\ \ldots\ ]$

Coda [h] epenthesis targets foot-initial syllables, even when unstressed.

Epenthesis is **initial strengthening** at the level of the foot.
(cf. Fougeron & Keating 1997, Beckman 1998, Smith 2005, Becker et al. 2011, etc.)

5.3 When stress and epenthesis align

Epenthesis lines up with stress whenever:

(i) Footing is exhaustive (no stray unfooted syllables)

(ii) All feet are trochaic (so that stress is foot-initial)

(27) Regular secondary stress: L → R syllabic trochees

a. [pàh̲.tˢaj.níh̲.kãj̃] 'they are washing' $(\grave{\sigma}_h\ \sigma)(\acute{\text{L}}_h\ \text{L})$

b. [t͡ʃìh̲.kɯ.na.máŋ] 'corner' $(\grave{\sigma}_h\ \sigma)(\text{L}\ \acute{\text{H}})$

c. [jò.mɯ.ràh̲.ka.tíh̲.kãj̃] 'they hunted' $(\grave{\sigma}\ \sigma)(\grave{\sigma}_h\ \sigma)(\acute{\text{L}}_h\ \text{L})$

5.4 Mismatches under iambic footing

Mismatches between stress and coda [h] epenthesis arise whenever footing is iambic (stress is foot-final).

5.4.1 Final primary stress (iambic head foot)

When main stress is word-final, epenthesis can occur in an unstressed penult.

(28) [nah̲.ká] 'manioc beer'

Follows directly if feet are always bisyllabic: $(\sigma_h\ \acute{\sigma})\#$

(29) a. [nah̲.ká] 'manioc beer' $(\text{L}_h\ \acute{\text{L}})$

b. [jò.mɯ.rà.no.ʂih̲.kə́j̃] 'they will hunt' $(\grave{\sigma}\ \sigma)(\grave{\sigma}\ \sigma)(\text{L}_h\ \acute{\text{H}})$

Foot boundaries are fixed, so differences in iambic vs. trochaic main stress do not affect the position of epenthesis.

5.4.2 Irregular secondary stress (iambic non-head feet)

Stress and epenthesis often diverge under irregular secondary stress.

- Stress: foot-final → even-numbered syllables
- Epenthesis: foot-initial → odd-numbered syllables

(30) a. [ih̲.kàʂ.t͡ʃaŋ.ká.ti] 'you would shake with fear' $(\sigma_h\ \grave{\sigma})\sigma(\acute{\text{L}}\ \text{L})$

b. [βis.mà.noh̲.kò.ja.máj] 'I have forgotten' $(\sigma\ \grave{\sigma})(\sigma_h\ \grave{\sigma})(\text{L}\ \acute{\text{H}})$

5.5 Mismatches due to underparsing

If feet are always bisyllabic, then underparsing should occur whenever primary stress is preceded by an odd number of syllables.

(31) Underparsed antepenults: $(\grave{\sigma}\sigma)(\grave{\sigma}\sigma)\,\boxed{\sigma}\,(\acute{\sigma}\sigma)$

The present account wrongly predicts that epenthesis should be blocked in these underparsed syllables.

(32) a. [jò.mɯ.raȟ.ká.no] 'let's go hunting' $(\grave{\sigma}\ \sigma)\,\boxed{\sigma_h}\,$(Ĺ L)

b. [ha.jà.jiȟ.káŋ.ki] '(they) possessed, had' $(\sigma\ \grave{\sigma})\,\boxed{\sigma_h}\,$(Ĥ L)

To remedy this problem, I propose that the antepenults in (32) *are* in fact footed — but not in the usual way.

Specifically: underparsed antepenults are **recursively adjoined to the foot bearing primary stress**.

(33) Recursively adjoined antepenults in Huariapano

a. [jò.mɯ.raȟ.ká.no] 'let's go hunting' $(\grave{\sigma}\ \sigma)(\sigma_h\ (\acute{L}\ L))$

b. [ha.jà.jiȟ.káŋ.ki] '(they) possessed, had' $(\sigma\ \grave{\sigma})(\sigma_h\ (\acute{H}\ L))$

Recursive adjunction of underparsed syllables solves the undergeneration problem.

- The problematic antepenults are no longer unfooted — instead, they are initial within a recursive foot.
- Epenthesis is correctly predicted to apply.[1]

My claim: recursive adjunction is a **last-resort strategy** for ensuring exhaustive parsing.

- Without recursive footing, antepenultimate syllables in odd-parity words would be prosodically 'trapped' (Mester 1994), and left unfooted.
- Recursive adjunction thus serves to foot otherwise unfootable syllables.
- Independent evidence that Huariapano prefers exhaustive parsing: the existence of iterative secondary stress!

[1] The recursion-based analysis I offer here could be straightforwardly recast using Hyde's (2002, 2007, 2012) theory of overlapping feet. I opt for recursive feet instead because there is some independent evidence that Huariapano exploits recursive prosodic structure at other levels of the prosodic hierarchy (Bennett 2012). See also Martínez-Paricio (2012, in prep.).

Recursive footing of this sort has been proposed many times in previous literature.

- 'Stray syllable adjunction' (e.g. Prince 1976, Liberman & Prince 1977, Selkirk 1980, Hayes 1981, etc.)
- Ternary stress (Rice 1992, 2007, Caballero 2008, Martínez-Paricio 2012, in prep.)
- Prosodic morphology (McCarthy 1982, Yu 2004)
- Segmental phonotactics (Hammond 1997, Jensen 2000, Davis & Cho 2003, Harris 2013, Martínez-Paricio in prep.)
- Tonal distributions (Morén-Duolljá 2013, Martínez-Paricio in prep.)

An additional problem: stressed *penults* are not eligible for coda [h] epenthesis when preceded by an odd # of σs.

(34) No coda [h] epenthesis in stressed penults preceded by odd # of σs.
   a. [pah.tˢá.kɯ] 'we washed' (σ_h (Ĺ L))
   b. *[pah.tˢáh.kɯ] *(σ_h (Ĺ$_h$ L))

Both penults and antepenults should be foot-initial in trisyllabic words.

- Epenthesis wrongly predicted to occur in both positions, rather than just the antepenult.

These facts can be explained if epenthesis only targets *maximal* feet (Jensen 2000, Yu 2003, Itô & Mester 1992/2003, 2009, 2010, et seq.).

(35) MAXIMAL FOOT (FT$_{MAX}$; see Partee et al. 1990):
A foot not dominated by any other foot.

(36) Coda [h] epenthesis only targets initial syllables of FT$_{MAX}$
   a. [pah.tˢá.kɯ] ($_{MAX}$ σ_h ($_{MIN}$ Ĺ L))
   b. [rah.kɯ̀.t͡ʃa.í.ki] ($_{MAX}$ σ_h $\grave{\sigma}$)($_{MAX}$ σ ($_{MIN}$ Ĺ L))

The intuition: epenthesis is limited to syllables that are *strictly* foot-initial.

- Coda [h] epenthesis in Huariapano is a segmental cue to boundaries between successive feet.
- Similar phenomena are observed in English and Yupik languages (section 7.2).

6 Are epenthetic [h]s moraic?

If coda [h] epenthesis is foot-initial strengthening, how exactly does it contribute to the prominence of foot-initial syllables?

- One possibility (to be rejected): epenthetic [h]s are moraic (Parker 1994, 1998a,b)
- On this view, [h] epenthesis renders foot-initial syllables bimoraic: $(\sigma_h\ \sigma) = (\sigma_{\mu\mu}\ \sigma)$.
- Roughly analogous to stressed-syllable vowel lengthening or gemination.

But assuming a moraic basis for [h] epenthesis is untenable:

- If coda [h] is moraic, epenthesis must derive profoundly ill-formed feet.

(37) a. [nah.ká] 'manioc beer' (H_h Ĺ)

b. [poh.ṣój] 'I open' (H_h Ĥ)

- Unstressed, foot-internal H̆ is actively *avoided* in many languages, not sought out (e.g. Hayes 1981, 1995, Prince 1991, Prince & Smolensky 1993/2004, Bennett 2012).

My counterproposal: coda [h] is *not* moraic in Huariapano.

- This derives from a more general property of the phonology:

  Only word-final consonants are moraic.

- Precedent: WEIGHT-BY-POSITION-BY-POSITION (Rosenthall & van der Hulst 1999)

What does this buy us?

- It *derives* the fact that only primary stress is quantity-sensitive:
  - Heavy syllables are restricted to final position.
  - Only the rightmost foot — the main stress foot — can contain a heavy syllable.
  - Secondary stress is trivially quantity-insensitive, because all non-final syllables are light.
  - No [...(Ĥ L)] or [...(H Ĥ)] feet (cf. structures in section 5.1.1).
- There are no moraic/final [h]s in Huariapano, so coda [h] epenthesis never subverts the quantitative well-formedness of feet.[2]

[2]Parker (1998b) conducts a phonetic study that purports to show that coda [h] is moraic in Huariapano. What Parker (1998b) actually establishes, however, is that coda [h]s are prosodically 'the same' as regular medial coda consonants — he does not in fact demonstrate that *any* medial codas are moraic. His phonetic findings are thus consistent with my claim that medial codas are non-moraic in Huariapano.

But if coda [h] is non-moraic, how does it augment foot-initial syllables?

Claim: coda [h] epenthesis increases the prominence of foot-initial syllables by maximizing the amount of segmental material those syllables contain.

- That is: epenthesis increases overall syllable duration, but in a non-moraic fashion.
- [CVh] syllables do have greater phonetic duration than open [CV] in Huariapano (though not quite as long as other [CVC] syllables; Parker 1998b).
- There is independent evidence for a pressure to 'pack' as many segments as possible into prominent syllables (e.g. Beckman 1998, Hall 2000, Bye 2005, Bye & de Lacy 2008, González 2003, Munshi & Crowhurst 2012, Ryan 2013).

Coda [h] epenthesis in Huariapano is thus a prosodically-determined but non-moraic strengthening process.

See Bennett (2012) for an OT implementation of these proposals.

7 Typological evidence for foot-initial prominence

Huariapano is not alone in treating foot-initial syllables as phonologically prominent.

Typological evidence suggests that foot-initial syllables may be subject to a range of strengthening phenomena.

7.1 Foot-internal gemination

Canela (Jê; Central/NE Brazil): intervocalic onset consonants undergo lengthening in stressed syllables, provided the pre-tonic vowel is short (Popjes & Popjes 1971, 1986).

Vowel length is contrastive, though it doesn't carry a high functional load.

(38) Contrastive vowel length in Canela

a. [mɐ̃] (benefactive)
b. [mɐ̃ː] 'rhea' (species of bird)

c. [ka.t͡swa] 'night'
d. [kaː.t͡swa] 'salt'

(39) Stressed onset lengthening: /CVC$_x$V/ → [CVC$_x$.ˈC$_x$V]

a. / kuhe / → [kuh.ˈhe] 'abcess'
b. / kɐpi / → [kɐp.ˈpi] 'try'
c. / kumɤ̃ kuhehnɔ̃ ŋõ / → [kum.ˈmɤ̃ kuh.ˈheʔ.ˈnɔ̃ gõ] 'give him another bow'

(40) No gemination after long vowels : /CVːCV/ → [CVː.ˈCV]
a. / kuːhe / → [kuː.ˈhe] 'bow'
b. / kɐːpɔ̃ / → [kɐː.ˈpɔ̃] 'sweep'
c. / haːklun / → [haː.ˈkɪun] 'he danced'

Stress is uniformly word-final in Canela (at least in nouns and verbs), which points toward iambic footing.

(41) a. [(kuh.ˈhe)] 'abcess'
b. [(ka.ˈt͡swa)] 'night'
etc.

Interaction with preceding vowel suggests that lengthening yields a true ambisyllabic geminate.

- [CVːC] syllables are independently banned in Canela.

The analysis: gemination provides a coda for pretonic /CV/, thereby increasing the segmental content of foot-initial syllables

- Exactly analogous to Huariapano: foot-initial [CV] syllables are augmented with a closing coda.

  (42) / kɐpi / → [(kɐp.ˈpi)] 'try'

- There are even languages where gemination and preaspiration co-exist as strategies for closing stressed syllables (see Hayes 1995, González 2003, Bye & de Lacy 2008, Baal et al. 2012).

Foot structure provides a rationale for why stressed onsets lengthen in the first place.

- It's clear that these geminates are ambisyllabic, not 'pure' moraic onsets (cf. Topintzi 2008).
- Onset gemination does not change the structure or content of the stressed syllable itself.
- So gemination cannot be driven by a pressure to augment stressed syllables (cf. Bye & de Lacy 2008).
- If gemination is structurally motivated, it must be determined by foot structure rather than syllable structure or stress alone (cf. Giavazzi 2010).

Very similar cases of stressed onset gemination can be found in Karo and Kaapor, two unrelated Amazonian languages (Bennett 2012).

7.2 Non-quantitative fortition

Yupik languages are well-known for having fortition processes that demarcate foot edges (Leer 1985a,b,c, Jacobson 1985, Hayes 1995, van de Vijver 1998, etc.)

Norton Sound Yupik:

- Iambic footing (L → R parsing)
- Phonemic contrast between voiced fricatives / v z ɮ / and approximants / w j l /.

(43) a. / qa̲jani / → [qa.ˈja̲ː.ni] 'his own kayak'

b. / ku̲vluni / → [ˈku̲v.lu.ni] 'it spilling'

Voiced fricatives and approximants **neutralize to voiced fricatives in foot-initial position**.

(44) Foot-initial fortition in Norton Sound Yupik[3]

a. / w j l / → [v z ɮ] / ($_{\text{FT}}$ __ . . .)

b. [(ma.ˈjuɣ)(vik)] 'place to go up'
c. [(ˈat)(xaɣ.wik)] 'place to go down'

d. [(ma.ˈjuɣ)(zux.tuq)] 'he wants to go up'
e. [(ˈat)(xaɣ.jux)(tuq)] 'he wants to go down'

A species of stricture-increasing (or sonority-decreasing) fortition (e.g. Smith 2005).

The context for fortition can (almost) be stated in terms of stress: approximants become voiced fricatives in post-tonic syllables.

- But typologically, post-tonic position is a locus for *weakening*, not strengthening (Lavoie 2001, González 2003, Gurevich 2004).

Foot structure *rationalizes* fortition.

- Foot-initial position is phonologically prominent.
- Fortition targets phonologically prominent positions:
  - Cf. Guyabero: /w/ → [β] in onset of a stressed syllable (Lavoie 2001:43)

[3]Word-final syllables do not receive stress in Norton Sound Yupik, even when the distribution of foot-sensitive fortition indicates that they are parsed as the strong branch of an iambic foot. See Hayes (1995), van de Vijver (1998), and references therein.

For an exactly parallel fortition process in a different variety of Yupik, Leer (1985b:84) observes that "systematically and phonetically, word-initial consonants are fortis".

- Word-initial ≠ post-tonic.
- The foot-based analysis of Yupik fortition eliminates the need for an uninformative disjunctive context.

Other instances of non-quantitative foot-initial strengthening include:

- Allophonic aspiration in English (Jensen 2000, Davis & Cho 2003)
- Low-level phonetic lengthening in Japanese affricates (Shaw 2007).

7.3 Expanded inventories

7.3.1 Dynamic reduction

In Russian, unstressed [ă] is only permitted in immediately pre-tonic syllables (Halle & Vergnaud 1987, Suzuki 1998, Crosswhite 2000, 2001, Padgett & Tabain 2005, Iosad 2012, etc.).

(45) Pre-tonic [ă] in some Central Russian dialects (Crosswhite 2000)

a. [ˈsa̲t] 'garden (nom. sg.)'

b. [sə̲.da.ˈvot] 'gardener (nom. sg.)'

c. [ˈda̲tʲ] 'to give'

d. [da̲.ˈvatʲ] 'to give (iterative)'

Consistent with iambic footing and foot-sensitive vowel reduction: ($\underline{\sigma}$ $\acute{\sigma}$).

(46) a. [sə̲(da.ˈvot)]

b. [(da̲.ˈvatʲ)]

- See Gouskova (2010) for an overview of past proposals along these lines.

Low vowel [a] is relatively sonorous, and tends to be licensed in phonologically prominent positions (de Lacy 2002, 2004, 2007).

- Another plausible case of foot-initial prominence.
- Otherwise, this pattern goes against the clear typological preference for *low*-sonority vowels in unstressed, footed syllables.[4]

[4]See e.g. Kager (1989:312-17), Kenstowicz (1994, 1997), de Lacy (2002, 2004, 2007), Gouskova (2003), Blumenfeld (2006), McCarthy (2008), Itô & Mester (2011a), Bennett & Henderson (to appear).

In some dialects, the vowel inventory of pre-tonic syllables interacts with the following stressed vowel: pre-tonic [ă] is disallowed when the stressed vowel is non-high.

(47) 'Dissimilative' vowel reduction in some Southwest Russian dialects (Nesset 2002)
a. / pʲa̲tʲ + ak / → [pʲi̲.ˈtak] 'five-kopeck coin'
b. *[pʲa̲.ˈtak]

Cf.
c. / pʲa̲tʲ + i / → [pʲa̲.ˈtʲi] 'five (gen. sg.)'

- More evidence for a rhythmic grouping of pre-tonic and tonic vowels.

Pretonic vowel is also phonetically prominent (Crosswhite 2000:116, Padgett & Tabain 2005)

- Resists deletion and devoicing in fast speech.
- Longer in duration than other unstressed vowels of the same quality.

The distribution of vowel quality in Russian provides more evidence that foot-initial unstressed syllables are phonologically prominent.

7.3.2 Static contrast

Static phonotactics also suggest that foot-initial syllables license a greater range of contrasts than other unstressed syllables.

- San Martín Itunyoso Trique (DiCanio 2008:Ch. 2,5; tones omitted):
  - Fixed word-final stress → iambic footing

(48) a. [(nu.kwa̋ʔ)] 'word'
b. [sma(te.ʔé)] 'rat'
c. [ru(t͡ʃi.já̋)] 'pomegranate'

  - Asymmetric consonant licensing:
    - Final (stressed) [σ(σσ̲́)]: 29 contrastive consonants
    - Pretonic (foot-initial) [σ(σ̲σ́)]: 15 contrastive consonants
    - Antepenult (unfooted) [σ̲(σσ́)]: 10 contrastive consonants

- Exactly analogous positional restrictions hold for the distribution of contrastive vowel qualities and contrastive tone.

8 Other cases of 'disjoint' footing

Ingredients for a monoplanar account of rhythmic phonology in Huariapano:

- Consistent foot parsing
- Flexible foot-form (variable headedness, recursion, etc.)
- A structurally-determined foot-based phonotactic (e.g. foot-initial prominence).

Can this basic approach be generalized to other putative cases of 'disjoint' footing?

8.1 Eastern Mari

Eastern (or 'Meadow') Mari seems to dissociate stress and footing (Vaysman 2009):

- Stress falls on the rightmost full vowel (49a-c), otherwise the initial vowel (49d).

(49) a. [jó.ŋə.ləš] 'mistake'
b. [pu.šáŋ.gə] 'tree'
c. [kö.gör.čén] 'dove'
d. [βá.ɲər] 'canvas'

- Word-final /ə#/ 'vocalizes' to a full vowel **iff in an even-numbered syllable**.

(50) a. [téŋ.gəz-lə] 'naval'
b. [šóŋ.gə.lək-lo] 'senile'

- Syllable-counting character of vocalization suggests conditioning by foot structure.

(51) a. / teŋgəz-lə / → [(téŋ.gəz)lə̲]
b. / šoŋgələk-lə / → [(šóŋ.gə)(lək.lo̲)]

- An opacity issue not dealt with here: vocalized /ə/ does not attract stress.
- I also abstract away from some morphological factors and vowel harmony.

Vaysman (2009:87,97):

> "Metrical boundaries and [the] position of stress do not match... prominence and constituency [are] two different entities in the grammar"

But "differs from" is too strong here: Mari has stress that is *indifferent to default footing*, not distinct from footing altogether.

- Constraints on the location of primary stress simply outweigh preferences for particular types of foot structure.

(52) Parsing L → R bisyllabic feet:
FTBIN ≫ PARSE(σ) ≫ ALLFTL ≫ ALLFTR

/ pareŋə-na-sə /	FTBIN	PARSE(σ)	ALLFTL	ALLFTR
a. ☞ (pa.re)(ŋə.ná)sə		*	**	* ***
b. (pa.re)ŋə(ná.sə)		*	***! W	*** L
c. (pa.ré)ŋə.na.sə		**!* W	L	*** L
d. (pa.re)(ŋə.ná)(sə)	*! W	L	** *** W	* ***

[pa.re.ŋə.ná.sə] 'the one who is our potato'

(53) Rightmost underlying full vowel stressed: ENDRULER and IAMB

a.

/ peledəš /	ENDRULER	IAMB
a. ☞ (pe.lé)dəš		
b. (pé.le)dəš		*! W

[pe.lé.dəš] 'flower'

b.

/ ojləmaš-lə /	ENDRULER	IAMB
a. ☞ (oj.lə)(máš.lo)		*
b. (ój.lə)(maš.lo)	*! W	*

[oj.lə.máš.lo] 'fictional'

Avoidance of stressed [ə́] is due to a licensing constraint on low-sonority prosodic word heads.

(54) COINCIDE([ə́], σ_1):
Assign one violation for every instance of [ə́] outside the word-initial syllable.
(cf. Zoll 1997, 1998, de Lacy 2002, 2007, Vaysman 2009)

(55) Stress attracted to full vowels over /ə/:
COINCIDE([ə́], σ_1) ≫ ENDRULER ≫ IAMB

a.

/ kugužan-əškə /	COINCIDE([ə́], σ_1)	ENDRULER	IAMB
a. ☞ (ku.gu)(žá.nəš)kə			*
b. (ku.gu)(ža.náš)kə	*! W		L
c. (ku.gú)(ža.nəš)kə		*! W	L

[ku.gu.žá.nəš.kə] 'princess (illative sg. non-possessive)'[5]

b.

/ joŋələš-lə /	COINCIDE([á], σ_1)	ENDRULER	IAMB
a. ☞ (jó.ŋə)(ləš.lo)		*	*
b. (jo.ŋə)(láš.lo)	*! W	L	*

[jó.ŋə.ləš.lo] 'wrong'

COINCIDE([á], σ_1) also captures default-to-opposite behavior (initial stress) in words without any full vowels (see (62) below).

Preference for iambs and rightmost main stress is not strong enough to affect foot parsing.

(56) Parsing imperatives take precedence over default headedness

a. PARSE(σ) ≫ IAMB

/ kugužan-əškə /	COINCIDE([á], σ_1)	PARSE(σ)	AFL	ENDR	IAMB
a. ☞ (ku.gu)(žá.nəš)kə		*	**		*
b. ku(gu.žá)nəš.kə		**!* W	* L		L

b. PARSE(σ) ≫ ENDRULER

/ joŋələš-lə /	COINCIDE([á], σ_1)	PARSE(σ)	AFL	ENDR	IAMB
a. ☞ (jó.ŋə)(ləš.lo)			**	*	*
b. (jó.ŋə)ləš.lə		*!* W	L	L	*

What about final stress?

- The analysis doesn't yet account for final stress in odd-parity words:

  (57) [kö.gör.čén] 'dove'

- Final syllable in (57) should be unfooted, and therefore unstressed.

  (58) Predicted structure: [(kö.gör)čén]

Additional mechanism needed: some constraint favoring right-aligned main stress.

(59) ANCHOR-R($\acute{\sigma}$):
Assign one violation if main stress falls on a non-final syllable.
(cf. McCarthy & Prince 1993, Pater 2000, McCarthy 2003, Vaysman 2009)

[5] Underlying / -əškV$_{\text{MID}}$ / is transcribed with final [ə] here to show that this suffix does not attract stress. This illative suffix does not participate in /ə#/ vocalization.

(60) Imperfectly aligned feet allowed under duress:
ANCHOR-R($\acute{\sigma}$) ≫ ALLFTL

/ kögörčen /	ANCHOR-R($\acute{\sigma}$)	FTBIN	PARSE(σ)	ALLFTL
a. ☞ kö(gör.čén)			*	*
b. (kö.gő̀r)čen	*! W		*	L
c. (kö.gör)(čén)		*! W	L	** W

- When stress falls on an underlying, word-final full vowel, /ə#/ vocalization is not at issue.
- Building an imperfectly aligned foot in these words has no consequences for the surface distribution of [ə].

Underlying /ə/ can't bear stress on the surface.

- Nothing is gained by constructing a misaligned foot when the final vowel is /ə/.
- Foot parsing will follow the default L → R pattern in such cases.
- This correctly predicts the distribution of /ə#/ vocalization.

(61) Misaligned feet under final stress only

a. Odd-parity words: no vocalization of /ə#/

/ mardež-lə /	ANCHOR-R($\acute{\sigma}$)	FTBIN	PARSE(σ)	ALLFTL
a. ☞ (mar.déž)lə	*		*	
b. mar(déž.lo)	*		*	*! W
c. (mar.déž)(lo)	*	*! W	L	**

[mar.déž.lə] 'windy'

b. Even-parity words: vocalization of /ə#/ occurs

/ üremə-lə /	ANCHOR-R($\acute{\sigma}$)	FTBIN	PARSE(σ)	ALLFTL
a. ☞ (ü.ré)(mə.le)	*			**
b. ü(ré.mə)lə	*		**! W	* L
c. (ü.ré)mə.lə	*		**! W	L

[ü.ré.mə.le] 'street (adj.)'

Default-to-opposite behavior: when all vowels are /ə/, stress is word-initial.

- Already captured by COINCIDE([ə́], σ_1).

(62) Stressed [ə́] must be word-initial: COINCIDE([ə́], σ_1) undominated

/ pərəs /	COINCIDE([ə́], σ_1)	ANCHOR-R($\acute{\sigma}$)	IAMB
a. ☞ (pə́.rəs)		*	*
b. (pə.rə́s)	*! W	L	L

[pə́.rəs] 'cat'

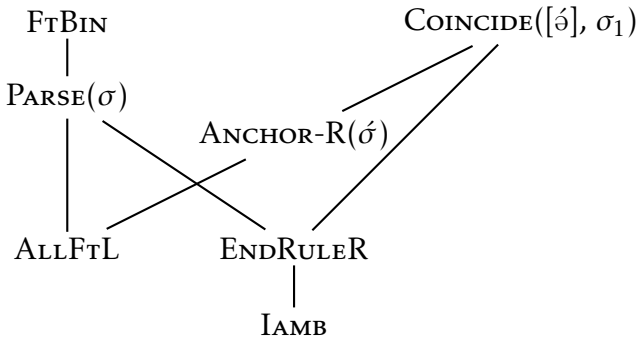

Figure 1: Hasse diagram for active constraints in reanalysis of Eastern Mari

As Vaysman (2009:65,95) observes:

> "stress assignment... does not seem to take the foot structure into account, but is rather based on different principles... stress can be placed on either [the] right or left syllable of a foot, and there are feet without a stressed syllable in them at all"

Vaysman interprets this result as unequivocal evidence that stress and footing depend on distinct representational systems (see also Blumenfeld 2006:129-132).

But the preceding analysis shows (*pace* Vaysman 2009) that stress and footing in Eastern Mari can be captured within a single representational system.

- Eastern Mari once again demonstrates that segmental phonotactics can refer directly to metrical structure rather than stress.
- It does not follow that metrical constituency is distinct from stress assignment in the grammar.
  - Foot-sensitive phonotactics may be indifferent to stress placement, if based on linear position within the foot (as in Huariapano and Eastern Mari).
  - Predicts little or no correspondence between stress and segmental patterning.

- Eastern Mari shares some crucial properties with Huariapano:
  - Foot-parsing is (roughly) uniform.
  - Foot-headedness is variable, as conditioned by extraneous phonological and morphological factors.
  - A segmental process (/ə#/ vocalization) depends on constituency rather than stress.
  - This creates a spurious 'mismatch' between stress and foot structure.
  - All of this is *predicted* by free permutation of independently-needed constraints.

- Eastern Mari requires the additional assumption that feet can be unstressed, or 'covert'.
  - Also true of Vaysman's (2009) account...
  - ...and there is ample cross-linguistic evidence for covert footing anyway (e.g. Hayes 1995, Crowhurst 1996, Hyde 2002, McCarthy 2003, Buckley 2009, Itô & Mester 2011b, Bennett 2012, and references cited there).

8.2 Tübatulabal

Not all apparent cases of disjoint footing can be resolved by recourse to flexible footing.

The interaction of stress and vowel length in Tübatulabal (= [tɨ.bá.tu.la.bál]) is less amenable to a monoplanar analysis.

- The problem: it seems that two strikingly different systems of footing are co-existent in the phonology.

Alternating Length (AL):

Vowel length is phonemic:[6]

(63) a. [kin.nan] 'to bring it for him'
b. [pu.waːn] 'to irrigate it for him'
c. [haː.yaːn] 'to stir it for him'

[6]Examples are from Voegelin (1935a,b), Swadesh & Voegelin (1939), and Voegelin (1958), but are re-transcribed according to the conventions and analysis of McCawley (1969) and Heath (1981). The effects of a 'late rule' of allophonic consonant gemination are not shown, because it would obscure important interactions between vowel length and underlying geminates.

See also Lightner (1971), Crowhurst (1991), Manaster Ramer (1992), Hayes (1995), Aion (2003) and sources cited there. Voegelin & Voegelin (1977) mention that the prosody of Tübatulabal, which has been moribund for several decades, has changed drastically since the early 20th century.

Rhythmic vowel lengthening (slightly simplified):

- /CV/ → [CVː] in odd-numbered syllables, counting from left-to-right, unless the vowel is word-final.
- AL also apples in odd, word-final /CVC/ syllables, depending on the coda.

(64) Alternating Length (AL): L → R alternation

a. [taː.wɨ.giː.na.naː.la] 'to go along causing him to see'
b. [ʔaː.da.wiː.gi.naː.na.la] 'he went along causing him to see'

c. [tɨk.ka.maː.la] 'let us eat'
d. [tɨk.ka.laː.ma.la] 'let us go eat'
e. [tɨk.ki.loː.go.maː.la] 'let us go and pretend to eat'

f. [ʔeː.we.haːn] 'to lick for him'
g. [ʔɨt.tɨ.šiː.ban] 'to scrape for him'

AL does not apply in syllables that are adjacent to an underlying /CVː/ syllable:

(65) / ppihiːn- /

a. [pi.hiː.ni.watt] 'it is breaking (when he pulls it)'
b. *[piː.hiː.ni.watt]
c. *[pi.hiː.niː.watt]

Cf. / ppolloŋa- /

d. [ʔop.pol.loː.ŋan] 'to beat it for him (perfective)'

Possible analysis: AL targets the heads of bimoraic trochees, parsed L → R.

- Heavy syllables restart the count as a kind of abstract clash avoidance.

GLOSS	'he is causing him to see'	'he is causing him to talk'
/UR/	/ tawɨka-(i)na-tt /	/ alaːw-(i)na-tt /
Footing	(ta.wɨ)(gi.natt)	ʔa(laː)wi(natt)
AL	(taː.wɨ)(giː.natt)	—
[SR]	[taː.wɨ.giː.natt]	[ʔa.laː.wi.natt]

Figure 2: Possible foot-based derivation of Alternating Length in Tübatulabal

But stress assignment follows a different set of principles (see Prince 1983, Hayes 1995).[7]

- Stress falls on the final vowel,
- and on every long vowel,
- and on even-numbered short vowels, counting *right to left* from the final syllable and from stressed heavy syllables.

(66) Stress: [V́ː] and R → L alternation

a. [tɨ́k.kap.pɨ́.ga.nán] 'the one who was eating'

b. [pɨt.tɨ́t.pɨt.tɨ́ː.di.nát] 'he is turning it over repeatedly'

c. [t͡sɨ́ː.mɨ.mɨ́ː.ʔát] 'it shines (from being polished)'

d. [nóː.ʔát.t͡siŋ.wán] 'his partner in turning back'

AL transparently feeds stress assignment, but the two processes apparently make use of different feet.

(67) / tɨkk-amala / 'let us eat'

a. AL: [(tɨk.ka)(maː.la)]

b. STRESS: [(tɨ́k.ka)(máː)(lá)]

(68) / no-at͡siŋwa-n / 'his partner in turning back'

a. AL: [(noː.ʔat)(t͡siŋ.wan)]

b. STRESS: [(nóː)(ʔát.t͡siŋ)(wán)]

It seems unlikely that AL and stress assignment can be reconciled within a single system of footing.

So what analytic options remain?

1. Accept the existence of disjoint footing (as Aion 2003 does).
2. Attempt a derivational solution (as Heath 1981 does).
3. Deny, deny, deny: re-examine the empirical basis of AL.

[7] Some nouns have fixed stress, including fossilized compounds that deviate from the normal stress assignment rules (Voegelin 1935a:78, Heath 1981:211). Heath (1981:211) points out that certain coda clusters may attract stress as well. There is some uncertainty over the location of primary stress; see Hayes (1995) for discussion.

Tübatulabal prosody in derivational terms:

- AL transparently feeds stress assignment.
- So why not order AL before stress assignment in a serial derivation?

Gloss	'let us eat'	'his partner in turning back'
/UR/	/ tɨkk-amala /	/ no-a͡tsiŋwa-n /
Footing	(tɨ́k.ka)(má.la)	(nó.ʔa)(t͡sí̱ŋ.wan)
AL	(tɨ́k.ka)(má꞉.la)	(nó꞉.ʔa)(t͡sí̱ŋ.wan)
Re-footing	(tɨ́k.ka)(má꞉)(lá)	(nó꞉)(ʔá.t͡siŋ)(wán)
[SR]	[tɨ́k.ka.má꞉.lá]	[nó꞉.ʔá.t͡siŋ.wán]

Figure 3: Possible serial analysis of Tübatulabal prosody

If the derivational approach is correct, then the Tübatulabal facts may help us evaluate the merits of different serial frameworks.

- Not all derivational theories are equally well-equipped to deal with changes in foot parsing.
- Stumbling block: the Free Element Condition (or other similar principles).
  - The idea that metrical structure, once built, may not be changed.
  - Strong versions of the FEC present serious difficulties for a serial analysis of AL and stress in Tübatulabal.
  - See Kiparsky (1982, 1993), Prince (1985), Halle (1990), Halle & Kenstowicz (1991); and Pruitt (2010), Wolf (2012) on Harmonic Serialism and OT-CC.
- Other languages that might require two independent stages of foot parsing:
  - Tiberian Hebrew (Rappaport 1984, Churchyard 1999, Dresher 2009)
  - Onondaga and other Lake Iroquoian languages (Michelson 1988)
  - Jarawara (Dixon 2004:§§2.6, 2.9)

But the truth may be more mundane:

- There is reason to suspect that AL was no longer synchronically productive at the time of Voegelin's fieldwork.
- Evidence: the application of AL is both highly irregular and massively opaque (see Sanders 2003 for related discussion of Polish).

Rampant exceptions (see also Manaster Ramer 1992):

• Underapplication:

(69) Underapplication in initial syllables

a. [ši.doʔ.doːʔ] 'to slide'
b. [ʔu.gan] 'the patch (of plants)'
c. [ʔu.gan.wɨt] 'to get ready'
d. [to.go.goː] 'it is popping'
e. [t͡sɨ.bi.biːʔ] 'it shines (reflected light)'
f. [ʔi.giš.pil] 'small amount'
g. [ka.bo.baːʔ] 'it is rattling'
h. [mɨ.gɨ.tih] 'mythical character'
i. [nɨ.baʔ] 'it is snowing'
j. [tɨ.bat] 'pine nuts'
k. [ʔo.gon] 'empty word'
l. [pi.gat] 'the stone knife'
m. [pi.d͡ʒa.t͡sa] 'the water is splashing'
n. [po.goh] 'the borrowing owl'

(70) Underapplication in medial syllables

a. [tɨk.kap.pɨ.ga.nan] 'the one who was eating'
Cf. [ʔa.na.biː.wat] 'he is being thrown'

b. [ʔiː.šiw.ga.nat] 'he is combing his hair for him'
Cf. [taː.wɨ.gaː.nat] 'he is seeing for him'

• Wrong syllable targeted:

(71)
a. / ʔʔɨw-an / → [ʔɨ.waːn] 'to trap for him'
b. / pin-an / → [pi.naːn] 'to bring it for him'
c. / ʔʔop-an / → [ʔo.baːn] 'to dive for him'
Cf.
d. / taŋ-an / → [ta.ŋan] 'it rains for him'
e. / noh-an / → [no.han] 'to roast in the ground for him'

• Variable blocking by singleton [ʔ] (Swadesh & Voegelin 1939, McCawley 1969):

(72)
a. [ha.ʔɨt] 'to hear'
b. [ʔa.ʔay] 'to pick it from the ground
c. [ʔɨ.ʔɨ.dɨ.ʔa] 'to loan'
Cf.
d. [neː.ʔin] 'to depend on him'
e. [ʔɨː.ʔɨ.ma] 'to tie bands'

- Other consonants and clusters have a sporadic, lexically-specific blocking effect as well (Heath 1981:209-10).

A few exceptions involve the "synchronically deviant behavior of certain morphemes. . . of foreign origin" (Manaster Ramer 1992:fn.11).

- Suggests that AL was not productively extended to loanwords.

Some of these counter-examples can probably be explained away, but not all of them.

- Extant solutions involve abstract URs of dubious synchronic validity:
  - Underlying long vowels and geminates that always surface as short (Swadesh & Voegelin 1939, Heath 1981).
  - Underlying consonants that never surface at all (Swadesh & Voegelin 1939, Manaster Ramer 1992).
  - Underlying /VʔV/ sequences that always surface as 'fused' [V] (Swadesh & Voegelin 1939).

Massive opacity:
The regular application of AL is rendered opaque by several different processes:

- Syncope:

(73) a. / RED-poha-n / → [ʔop.haːn] 'to smear for him'
b. *[ʔo.po.haːn]
c. *[ʔop.han]

- High vowel epenthesis, /yʔ/ → [yiʔ] (Lightner 1971):

(74) a. / bayʔgi-la / → [ba.yiʔ.gi.la] 'to go along turning'
b. *[ba.yiʔ.giː.la]

- Gemination of final plosives:

(75) a. / šak / → [šaːkk] 'to roast it'
Cf.
b. / RED-palakk / → [ʔa.pa.lakk] 'to throw it (perfective)'
c. *[ʔa.pa.laːkk]

(76) a. / RED-tišip / → [ʔi.ti.šiːpp] 'to scrape deer-skin (perfective)'
Cf.
b. / patwanapp / → [paː.twa.napp] 'three o'clock'
c. *[paː.twa.naːpp]

The derivational solution almost works because it recapitulates the historical development of Tübatulabal.

- AL represents a phonologically restructured reflex of an earlier stress system (Heath 1977, 1981).
- AL *literally* preceded the current system of stress assignment.
  - Lengthened vowels correspond to vowels that previously carried stress.
  - Some exceptional instances of AL correspond to morphemes that bore exceptional stress in the earlier stress system.

A more appropriate synchronic analysis may be morpho-lexical in character.

- Variation in stem shape under reduplication → stem suppletion (cf. Heath 1981:205).
  - Vowel length alternations for reduplicated stem are only semi-systematic.
  - The same is true for vowel length in the reduplicant prefix itself.

(77) Alternating stem
  a. / yaːyaŋ- / 'be timid (durative)'
  b. / ʔaːyayan- / 'be timid (durative)'

(78) Non-alternating stems
  a. / ʔaːga- / 'open one's mouth (durative)'
  b. / ʔaʔaːga- / 'open one's mouth (punctual)'
  c. / ʔuːda- / 'untie (durative)'
  d. / ʔuːʔuːda- / 'untie (punctual)'

- Suffix variation → prosodically conditioned allomorph selection (e.g. Mascaró 1996, Paster 2006, Wolf 2008, etc.).

(79) Absolute object case suffix [-la(ː)]:
  (i) Select /-laː/ after a light syllable: / tahawi-laː-p / 'in the summer'
  (ii) Select /-la/ after a heavy syllable: / haniː-la-p / 'in the house'

- Exceptional cases reduce to lexically-determined allomorphy.

My claim: once the stress system of Tübatulabal changed, it was *inevitable* that AL would cease to be part of the productive, synchronic phonology.

- Languages are only alloted one system of metrical representation.
- Natural language phonologies lack the expressive power to generate a non-local pattern like AL, unless it can be reconciled with the foot structure needed for stress.
- But AL is *not* compatible with the stress system of Tübatulabal.
- In the absence of a lengthening-specific foot tier, AL would have become literally unlearnable, at least as a phonological process (e.g. Newport & Aslin 2004; cf. the critical view in Hansson 2011:§7).
- See Werle (2002) for a potentially similar case in Makah.

A worry: is an allomorphy solution appropriate for highly agglutinating languages?

> "It is probably not an exaggeration to estimate that any particular stem may enter into 300 suffix combinations and that some suffixes may occur in 25,000 stem-suffix combinations."
>
> Swadesh & Voegelin (1939:10)

A second worry: processes of limited scope and productivity may still be phonologically determined.

- Exceptional application is a defining trait of 'early' lexical phonology (Kiparsky 1982, Kaisse & Shaw 1985, Coetzee & Pater 2011, Bermúdez-Otero 2012, etc.).

(80) a. *serene* [səɹíːn] → *serenity* [səɹɛ́ːnɨɾi]
b. *obese* [o͡ʊbíːs] → *obesity* [o͡ʊbíːsɨɾi]

- Some non-productive, lexically-restricted alternations may still be conditioned by purely phonological factors.
  - E.g. [V] ~ [∅] (yer) alternations in the Russian nominal system (Gouskova 2012, Gouskova & Becker to appear).

9 Conclusion

Huariapano is one of the most plausible cases of a phonological system that employs two independent metrical tiers.

I have argued that this conclusion is premature.

- An analysis of Huariapano making use of just one system of footing actually provides a *better* account of the prosodic phonology of this language.

- No need for process-specific metrical structure: epenthesis depends on the feet used to assign stress.
    - Stress and coda [h] epenthesis *sometimes* coincide because they are determined by the same system of foot structure.
    - But stress does not directly condition epenthesis, so the correlation is only imperfect.

- Parallelisms between stress and epenthesis exist because both phenomena are conditioned by the same underlying feet.
    - On multiplanar accounts of Huariapano, such parallelisms remain unexplained.

If the phonology of Huariapano can be captured with a single system of footing, this casts doubt on the existence of distinct, co-existing metrical systems in any language (see also Churchyard 1999).

- Some putative cases may be analyzable using the same sort of flexible footing that I proposed for Huariapano (e.g. Eastern Mari).
- Other cases are more intransigent, and may require a derivational solution.
    - But: any such examples should be carefully inspected, since they may be non-productive or morphological in character (e.g. Tübatulabal).
    - Even if derivations are ultimately needed to account for conflicting metrical parses in some language, that doesn't force us to the conclusion that distinct parses can *co-exist* in the same phonological representation.

I am advocating for a restrictive view of metrical phonology: **process-specific metrical structure does not exist** (cf. Blumenfeld 2006, Vaysman 2009, and section 1).

The Uniformity of Footing Hypothesis

> Within a single language, there are no discrepancies between the feet that condition stress placement and the feet needed to explain foot-sensitive segmental processes.[8]

I also identified a novel source of prominence effects in prosodic phonology: the augmentation of foot-initial syllables.

[8] This idea also appears in Dresher & Lahiri (1991) under the name *metrical coherence*.

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