Class 10
Infixation and Phonologically Conditioned Affix Order

12/7/23

1 Infixation

- **Infixes** are morphemes that (at least some of the time) attach **inside of morphological constituents**, rather than to the edge of a morphological constituent.
  - See Blevins (2014) for a recent overview, focusing on derivational infixes but applicable generally.

- Most of the time, people analyze infixation as being driven by phonological conditions on the position of the morpheme (see especially Yu 2007).

- Just like with allomorphy, mobile affixation, and phonologically conditioned affix order (PCAO; see below), there is a debate in the literature about how these phonological conditions should be implemented:
  - **Subcategorization** (Yu 2007, Paster 2009, Kalin 2022, Kalin & Rolle 2022)
  - **P $\gg$ M** (McCarthy & Prince 1993, Wolf 2008, *a.o.*; cf. Zukoff 2023)

- The arguments for and against are similar to those in the other domains:
  - Many infixal distributions seem to be governed by optimizing phonotactics, so P $\gg$ M.
  - Some infixal distributions seem to be non-/anti-optimizing, so Subcategorization.

- Kalin's (2022) arguments from the interaction between allomorphy and infixation are nuanced and novel, and may help untangle some of the persistent problems in adjudicating between the theories.
- But Zukoff's (2023) introduction of alignment-driven (in addition to phonotactically-driven) infixation may re-complicate some of the questions.

1.1 Tagalog

- The classic case of (alleged) phonologically-driven infixation is *um*-infixation in Tagalog:
  → In Tagalog (Austronesian, Philippines), the actor focus (AF) morpheme /um/ alternates between a prefix and an infix (Schachter & Otanes 1972), seemingly to optimize syllable structure.

⋆ There has been a long debate about the data and the analysis. Here's how it went:

1.1.1 McCarthy & Prince's (1993) analysis

- McCarthy & Prince (1993:101) (following Prince & Smolensky [1993] 2004:§4.1) assume the following data:

(1) **Distribution of Tagalog AF -*um*- morpheme** (according to McCarthy & Prince 1993)

a.	V-initial root:	/abot/	'reach for'	→	[<**um**>abot]
b.	C-initial root:	/sulat/	'call' (v.)	→	[s<**um**>ulat]
c.	CC-initial root:	/gradwet/	'graduate' (v.)	→	[gr<**um**>adwet]

- When the root is underlyingly vowel-initial (1a), the AF morpheme surfaces as a prefix.
- However, when the root begins in a consonant (1b,c), the AF morpheme surfaces as an infix.
  - With initial single consonants (6b), the AF morpheme surfaces after the root-initial C.
  - With initial clusters (6c), the AF morpheme surfaces after the cluster.

- McCarthy & Prince (1993:103–104) argue that this distribution can be explained in full by the ranking:

(2) **M&P's Tagalog Ranking:** NoCoda ≫ Align-AF-L

- When there's a single root-initial consonant (3):
  - Prefixation puts the [m] of /um/ in coda position (3a), violating NoCoda.
  - Infixing past the root-initial /s/ (3b) allows that [m] to surface as an onset, creating no codas beyond the root-final one.
    - Codas can't be gotten rid of (3f) by an unfaithful phonological mapping (Faith-IO ≫ NoCoda), so the root-final coda has to stay.
    - This also means that you can't delete the AF /m/ (3e).
  - Since Align-AF-L is evaluated gradiently, infixing any further into the word (3c,d) will incur unnecessary violations.
  - The winning candidate violates Contiguity-IO because the root is interrupted by the AF morpheme, so Align-AF-L ≫ Contig-IO.

(3) **Infixing past the first C to avoid a NoCoda violation:** *s<um>ulat* (1b)

/sulat, um/	Faith-IO	NoCoda	Align-AF-L	Align-Root-L	Contig
a. .<**um**>.su.lat.		**!		**	
b. ☞ .s<**u.m**>u.lat.		*	*		*
c. .su.l<**u.m**>at.		*	**!*		*
d. .su.la.t<**um**>.		*	**!***		
e. .<**u**>.su.lat.	*!	*		*	
f. .s<**u.m**>u.la.	*!		*		*

- This analysis predicts that /um/ will infix past an entire initial cluster (4c), because infixing past just the first consonant (4b) will create a coda.
  - ∗ Assume rising-sonority clusters are parsed as complex onsets.

(4) **Infixing past the first CC to avoid a NoCoda violation:** *gr<um>adwet* (1c)

/gradwet, um/	NoCoda	Align-AF-L	Align-Root-L	Contig
a. .<**um**>.gra.dwet.	**!		**	
b. .g<**um**>.ra.dwet.	**!	*		*
c. ☞ .gr<**u.m**>a.dwet.	*	**		*
d. .gra.dwe.t<**um**>.	*	***!***		

- This analysis also predicts that you will not get infixation (5b,c), but rather prefixation (5a) for vowel-initial roots, because prefixation does not create a new coda in this case.
  - Since prefixation and infixation are equivalent with respect to the relevant markedness constraint, the preferred alignment is able to surface.
  - This (i.e. (5a) ≻ (5c)) requires Align-AF-L ≫ Align-Root-L , the normal situation for a "prefix".

(5) **Prefixation when it doesn't violate NoCoda:** *<um>abot* (1a)

/abot, um/	NoCoda	Align-AF-L	Align-Root-L	Contig
a. ☞ .<**u.m**>a.bot.	*		**	
b. .a.<**um**>.bot.	**!	*		*
c. .a.b<**u.m**>ot.	*	*!*		*
d. .a.bo.t<**um**>.	*	*!***		

1.1.2 Revising the data

- However, subsequent work showed that this isn't the whole story about the data:
  - Orgun & Sprouse (1999:204) find that, for CC-initial roots, at least some speakers exhibit variation in the site of infixation, between post-C_1 and post-C_2 (6c).
  - McCarthy (2003:91) clarifies, following the original description by Schachter & Otanes (1972), that all "vowel-initial" words surface with an epenthetic initial glottal stop (6a).

(6) **Distribution of Tagalog AF *-um-* morpheme**

a.	V-initial root:	/abot/	'reach for'	→	[ʔ<**um**>abot]
b.	C-initial root:	/sulat/	'call'	→	[s<**um**>ulat]
c.	CC-initial root:	/gradwet/	'graduate'	→	(i) [g<**um**>radwet] ∼ (ii) [gr<**um**>adwet]

> ∗ We could alternatively assume that the initial glottal stops are underlying, which would simply collapse the (a) cases with the (b) cases. This may become useful later...

⋆ These facts transform the analysis from being driven by NoCoda to having to be driven by Onset.

- When the root begins in a single consonant (7):
  - Onset rules out full left-alignment of the affix (7a).
  - If Dep-C is next highest-ranked, it will rule out repairing that Onset violation via epenthesis (7b) as long as other candidates remain.
  - Since there are candidates (7c–e) that avoid these two problems at the expense just of Align-AF-L, the evaluation selects the infixal order where the affix is closest to the left (7c), i.e. after C_1.

(7) **Infixing past the first C to avoid an Onset violation:** *s<um>ulat* [.su.mu.lat.] (6b)

/sulat, um/	Onset	Dep-C	Align-AF-L	NoCoda	Align-Root-L	Contig
a. .<**um**>.su.lat.	*!			**	**	
b. .ʔ<**um**>.su.lat.		*!	*	**	***	
c. ☞ .s<**u.m**>u.lat.			*	*		*
d. .su.l<**u.m**>at.			**!*	*		*
e. .su.la.t<**um**>.			**!***	*		

- When the root is underlyingly vowel-initial (8):
  - There's no way to avoid an Onset violation w/o epenthesis, because both morphemes are vowel-initial.
    - Both prefixation (8a) and phonotactically well-formed infixation (8d) yield an Onset violation.
    - As long as Onset ≫ Dep-C, it will be preferable to do epenthesis.
  - Since the desire to satisfy these two constraints is what motivates infixation (Align-AF-L violation), prefixation + epenthesis (8b) is optimal here.

(8) **No infixation if it doesn't fix Onset:** *<um>abot* [.ʔu.ma.bot.] (6a)

/abot, um/	Onset	Dep-C	Align-AF-L	NoCoda	Align-Root-L	Contig
a. .<**u.m**>a.bot.	*!			*	**	
b. ☞ .ʔ<**u.m**>a.bot.		*	*	*	***	
c. .ʔa.ʔ<**um**>.bot.		**!	***	**	*	*
d. .a.b<**u.m**>ot.	*!		**	*		*
e. .ʔa.b<**u.m**>ot.		*	**!*	*	*	*
f. .ʔa.bo.t<**um**>.		*	**!***	*	*	

- For roots beginning in two consonants, just like those beginning in one, infixation can avoid violation of both Onset and Dep.

  → The variable outputs can be derived if we have a variable ranking between the two lower-ranked constraints, NoCoda and Align-AF-L.

- When ALIGN-AF-L ≫ NOCODA (9):
  - It will be preferable to align the affix closer to the left (9c), even though it creates a coda, than to place it after the cluster (9d), which avoids the coda at the expense of an extra ALIGN violation.

(9) **Variable infix position in CC-initial roots:** ALIGN-AF-L ≫ NOCODA → *g<um>radwet* (6c.i)

/gradwet, um/	ONSET	DEP-C	ALIGN-AF-L	NOCODA	ALIGN-ROOT-L	CONTIG
a. .<**um**>.gra.dwet.	*!			**	**	
b. .ʔ<**um**>.gra.dwet.		*!	*	**	***	
c. ☞ .g<**um**>.ra.dwet.			*	**		*
d. .gr<**u.m**>a.dwet.			**!	*		*
e. .gra.dwe.t<**um**>.			***!***	*		

- On the other hand, when NOCODA ≫ ALIGN-AF-L (10), the reverse will be true:

(10) **Variable infix position in CC-initial roots:** NOCODA ≫ ALIGN-AF-L → *gr<um>adwet* (6c.ii)

/gradwet, um/	ONSET	DEP-C	NOCODA	ALIGN-AF-L	ALIGN-ROOT-L	CONTIG
a. .<**um**>.gra.dwet.	*!		**		**	
b. .ʔ<**um**>.gra.dwet.		*!	**	*	***	
c. .g<**um**>.ra.dwet.			**!	*		*
d. ☞ .gr<**u.m**>a.dwet.			*	**		*
e. .gra.dwe.t<**um**>.			*	***!***		

- This works, as long as we assume that medial rising sonority clusters are always parsed as complex onsets.
  - The activity of NOCODA (≫ *COMPLEXONSET) means that we generate medial complex onsets.
  - If we needed to generate heterosyllabic parsing ([VC.CV] not [V.CCV]), we'd need *COMPLEXONSET to rank higher than NOCODA.
  - → This would categorically result in the post-C_1 outcome (✓(9c)/✗(10c)), contrary to fact.

∗ Klein (2005:968–969) accounts for the variation in (6c) by positing a variable ranking between NOCODA and ***COMPLEXONSET**.
  - This predicts covariation between infix placement (post-C_1 vs. post-C_2) and the syllabification of medial clusters ([...d]$_\sigma$[w...]$_\sigma$ vs. [...]$_\sigma$[dw...]$_\sigma$): [g**um**.rad.wet] vs. [gr**u.m**a.dwet].
  - There's no evidence for *variable syllabification*, so we should prefer the analysis with variation involving ALIGN.

⋆ Indeed Zuraw (2007:298–299, fn. 27) asserts that medial clusters are **always heterosyllabic** in Tagalog.
  - → This would break the analysis.
  - But other sources (e.g. Schachter & Otanes 1972, French 1988) aren't super clear on Tagalog's syllabification, so maybe it's still viable.

1.1.3 Zuraw (2007)

- Regardless of the syllabification issues, Zuraw (2007) adduces additional evidence that leads to a slightly different analysis, which sidesteps syllabification entirely.

- Zuraw (2007:esp. 295) finds that different types of initial clusters have different frequency distributions (based on both corpus frequencies and wug-test data) for the two different infix positions:
  - For ST clusters (and /sm/), speakers prefer the post-C_2 position to the post-C_1 position (11a).
  - But for CR clusters (except /sm/), speakers prefer the post-C_1 position to the post-C_2 position (11b).

(11) **Preferred infix site by cluster type**
  a. **ST:** #ST<**um**>V... > #S<**um**>TV...
  b. **CR:** #C<**um**>RV... > #CR<**um**>V...

- She proposes using CONTIGUITY constraints relativized to different cluster types to capture this difference.

- One way to capture frequency-based variation is by using **weighted constraints** in Harmonic Grammar (Legendre, Miyata, & Smolensky 1990, Smolensky & Legendre 2006), where the weights are fitted to the data using a Maximum Entropy (**MaxEnt**) model (Goldwater & Johnson 2003, Hayes & Wilson 2008).
  - Heuristically, the *relative weights* of the constraints determined by MaxEnt for the variable outputs would map onto the *relative rankings* of the constraints in OT if the differences were categorical.

→ So, abstracting away from the variation and assuming categorical outputs, we can derive the distribution by ranking a constraint against splitting ST clusters (CONTIG-ST) *above* ALIGN-AF-L.
  - ∗ Kie calls the relevant constraints ANCHOR rather than ALIGN, but they're doing the same thing.

- When there's an initial ST cluster (12):
  - The high ranking of ONSET and DEP-C continue to rule out left-aligning /um/ (12a,b).
  - The minimal infixation candidate (12c) is now ruled out by relatively high-ranking CONTIG-ST.
    - This used to be ruled out by NOCODA, but syllable structure constraints are no longer relevant.
  - For these clusters, the least displaced possible infixal candidate is thus (12d), where the /um/ lands after the initial cluster.

(12) **Post-C_2 position for ST-initial roots:** (nonce) *sp<um>in* (11a)

/spin, um/	ONSET	DEP-C	CNTG-ST	ALN-AF-L	ALN-ROOT-L	CNTG-CR
a. <**um**>spin	*!				**	
b. ʔ<**um**>spin		*!		*	***	
c. s<**um**>pin			*!	*		
d. ☞ sp<**um**>in				**		
e. spin<**um**>				***!*		

- When there's an initial CR cluster (13):
  - ONSET and DEP-C still rule out left-aligning /um/ (13a,b).
  - But now, the fact that the minimal infixation candidate (13c) splits the cluster is not fatal, because it violates only low-ranked CONTIG-CR.
  - ALIGN-AF-L is now able to rule out all but the minimal infixation candidate: (13c) ≻ (13d–g).

(13) **Post-C_1 position for CR-initial roots:** *g<um>radwet* (11b)

/gradwet, um/	ONSET	DEP-C	CNTG-ST	ALN-AF-L	ALN-ROOT-L	CNTG-CR
a. <**um**>gradwet	*!				**	
b. ʔ<**um**>gradwet		*!		*	***	
c. ☞ g<**um**>radwet				*		*
d. gr<**um**>adwet				**!		
e. grad<**um**>wet				**!**		*
f. gradw<**um**>et				**!***		
g. gradwet<**um**>				**!****		

- Since C-initial roots (14) and V-initial roots (15) don't involve clusters, their analysis works exactly the same as before.

(14) **Infixing past the first C to avoid an ONSET violation:** *s<um>ulat*

/sulat, um/	ONSET	DEP-C	CNTG-ST	ALN-AF-L	ALN-ROOT-L	CNTG-CR
a. <**um**>sulat	*!				**	
b. ʔ<**um**>sulat		*!		*	***	
c. ☞ s<**um**>ulat				*		
d. sul<**um**>at				**!*		

(15) **No infixation when it doesn't fix ONSET:** *ʔ<um>abot*

/abot, um/	ONSET	DEP-C	CNTG-ST	ALN-AF-L	ALN-ROOT-L	CNTG-CR
a. <**um**>abot	*!				**	
b. ab<**um**>ot	*!			**		
c. ☞ ʔ<**um**>abot		*		*	***	
d. ʔaʔ<**um**>bot		**!		***	*	
e. ʔab<**um**>ot		*		**!*	*	
f. ʔabot<**um**>		*		**!***	*	

→ One additional upshot of this analysis is that it is not dependent on syllabification.
- ○ Therefore, it is consistent with medial heterosyllabic parsing, unlike the NOCODA-based analysis.

- Zuraw (2007) actually uses high-ranked "ALIGN-STEM" (≈ALIGN-ROOT-L) to generate infixation, rather than high-ranked {ONSET ≫ DEP-C}.
  - ○ This amounts to saying that infixation is the *default* (ALIGN-ROOT-L ≫ ALIGN-AF-L).
  - → This creates a problem for "vowel-initial" roots.

- ONSET must dominate ALIGN-ROOT-L, because the reverse ranking would block epenthesis as a means of repairing an ONSET violation (because it introduces a pre-root segment). This means we'd need the ranking in (16).
  - ○ But the fact that ALIGN-ROOT-L ≫ ALIGN-AF-L means that we now predict infixation past the first C in these roots, **because infixation is the default** given the alignment ranking.

(16) **Incorrect prediction of ALIGN-ROOT-L ≫ ALIGN-AF-L for V-initial roots**

/abot, um/	ONSET	DEP-C	ALN-ROOT-L	CNTG-ST	ALN-AF-L	CNTG-CR
a. <**um**>abot	*!		**			
b. ab<**um**>ot	*!				**	
c. ☹ ʔ<**um**>abot		*	**!*		*	
d. ʔaʔ<**um**>bot		**!	*		***	
e. 💣 ʔab<**um**>ot		*	*		***	
f. ʔabot<**um**>		*	*		****!*	

- A way to circumvent the problem is to say that these roots are actually underlyingly /ʔ/-initial.
  - ○ If so, they will behave exactly like other C-initial roots, e.g. /sulat/.

⋆ However, we still have a Richness of the Base (Prince & Smolensky [1993] 2004) problem here:
  - → If there were vowel-initial roots, they would be predicted to behave differently (as in (16)).
  - ○ One could tell a story about lexicon optimization (Prince & Smolensky [1993] 2004, McCarthy 1998) based on the isolation forms, but it would be pretty tenuous.

1.1.4 P ≫ M vs. Subcategorization in Tagalog

- The analysis outlined above is a **P ≫ M** approach to infixation:

(17) **P ≫ M analysis**

a. Assuming the MAP (Zukoff 2023), the morphosyntax wants the AF morpheme to be a prefix (ALIGN-AF-L ≫ ALIGN-ROOT-L).
b. This succeeds in vowel-initial roots, because infixation would not improve on any phonological problems.
c. This fails in consonant-initial roots, because infixation can avoid more important phonological problems (ONSET and DEP-C).
d. The infixation site is regulated (gradiently) by (morpho)phonological alignment, subject to purely phonological CONTIGUITY constraints.

⋆ **What would a Subcategorization approach look like?**

- If we assumed that CC-initial roots uniformly infixed after C_2 (following McCarthy & Prince 1993), then we could say that /um/ wants to attach *to the left of the first vowel/mora*:

(18) ACTOR.FOCUS ⇔ *um* / [(C)(C)_V...]$_{\text{STEM}}$ (cf. Paster 2009:19)

(19) ALIGN(/um/$_{\text{ACTOR.FOCUS}}$, R; μ_1, L) (cf. Yu 2007:91 on Leti)

- In order to account for the difference in behavior for different cluster types (per Zuraw 2007) with Paster-style subcat frames, we could consider specifying a distinct frame for #CR-roots (20a).
  → Since (20a) specifies *two* necessary segments whereas (20b) specifies only *one*, the Subset Principle / Elsewhere Condition should preferentially select (20a) when both are compatible (as long as optional segments "don't count").

(20) a. ACTOR.FOCUS ⇔ *um* / [C_R...]$_{\text{STEM}}$
b. ACTOR.FOCUS ⇔ *um* / [(C)(C)_V...]$_{\text{STEM}}$

  ○ If we assume that the elsewhere condition is *gradient* rather than *categorical* (not something usually assumed), we could assign some frequency distribution to both exponents in the case of #CR-root.
  ∗ But this won't generate any frequency for post-C_1 infixation in the case of an #ST-root.

- Alternatively, we could consider the following:

(21) a. ACTOR.FOCUS ⇔ *um* / [(C)(C)_V...]$_{\text{STEM}}$
b. ACTOR.FOCUS ⇔ *um* / [C_...]$_{\text{STEM}}$

  ○ For V-initial stems, only (21a) would apply, so we'd still have categorical prefixation.
  ○ For C-initial stems, both frames would have the same result (because *after the first C* is the same place as *before the first V*), so we'd always get infixation in the right place.
  ○ For CC-initial stems, (21a) generates post-C_2 infixation while (21b) generates post-C_1 infixation.

- If all CC-initial stems had the same free-variation distribution between the two infixal positions, then this analysis would work.
  ○ If we assume that optional segments don't count for the determination of specificity of subcat frames, then the two are equally specific, and we might reasonably assume a 50/50 distribution.
  ∗ If we follow Kalin & Rolle (2022), then indeed the optional segments shouldn't even be included.
  → But this gives us no mechanism for generating the distinction between ST and CR stems.

⋆ It seems that subcategorization is going to have trouble accounting for the cluster-type differences.

1.2 Alignment-driven infixation and "anti-optimization"

- As always, one of the arguments against **P** ≫ **M** for infixation is that there are some cases which appear to be non-/anti-optimizing (Paster 2006, 2009, Yu 2007, Kalin 2022, Kalin & Rolle 2022, *a.o.*).
  ○ i.e., the structures resulting from infixation look like they're equally/more phonologically marked than what would have resulted from prefixation/suffixation.

- One of the cases frequently mentioned in this context is actor focus infixation in Atayal (Austronesian, Taiwan; Egerod 1965, Rau 1992; cf. Huang 2018) exemplified in (22).
  ○ In this pattern, the morpheme *m* is infixed after the first consonant of the root.
  ○ This happens even when this position sits inside a long consonant cluster (22d–f).

(22) **Atayal animate actor focus** (Yu 2007:35, ex. (45); data from Egerod 1965:263–266)

	Root	Root + AF	Gloss
a.	qul	q*m*ul	'snatch'
b.	kat	k*m*at	'bite'
c.	kuu	k*m*uu	'too tired, not in the mood'
d.	hŋuʔ	h*m*ŋuʔ	'soak'
e.	skziap	k*m*ziap	'catch'
f.	sbil	s*m*bil	'leave behind'

- Yu (2007) argues that this pattern cannot be described in terms of phonological optimization, and thus serves as counter-evidence to the **P** ≫ **M** model.
  - i.e., nothing phonological is being gained by infixation relative to prefixation — both (can) result in long consonant sequences.

→ However, this argument does not consider *alignment itself* as a trigger for output optimization.
  - If Align-Root-L outranks Align-AF-L, alignment on its own will generate infixation (23).

(23) **Atayal AF infixation**

/kuu, m/	Align-Root-L	Align-AF-L	Contiguity
a. **m**-kuu	*!		
b. ☞ k<**m**>uu		*	*
c. kuu-**m**		**!(*)	

∗ Despite the typical representation in (22), the *m* infix is usually/always preceded by a schwa / reduced vowel on the surface (Yu 2007:35, n. 12): i.e., *kmuu* might be more accurately transcribed [kəmuu].

→ If this schwa were underlying (see Huang 2018, contrary to most accounts), then this case might be analyzable as prosodic optimization, just like Tagalog. Indeed, Atayal does not allow (word-initial) onsetless syllables (Rau 1992:21).

- There's additional morphological evidence that may speak in favor of the alignment-driven infixation analysis:
  - Some active/agent stems built with the *m* morpheme display infixal ordering, but many show prefixal ordering instead or in addition (see the forms in Egerod 1965:263–267).
  - For some roots, both an infixal and prefixal form is attested, but with differences in meaning.

→ Per Rau (1992:37–38): infixal forms are *transitive* (24a) while prefixal forms are *intransitive/stative* (24b):

(24) **Infix/prefix alternations in Atayal** (see Egerod 1965:263–267, Blevins 2014:12)
   a. *h<**m**>utaw* [həmutaw] 'drop'
   b. ***m**-hutaw* [məhutaw] 'fall'

∗ Blevins (2014:11–12) asserts that there are two different /m/ morphemes, such that this is not a prefix/infix alternation of the same morpheme.

- This suggests that syntactic differences correlate with ordering differences (à la the MAP; Zukoff 2023).
  - Prefixal ordering is generated when the MAP (plus any attendant relevant default rankings) transmits the ranking Align-AF-L ≫ Align-Root-L.
  - Infixal ordering is generated when it transmits the reverse ranking Align-Root-L ≫ Align-AF-L (as shown in (23)).

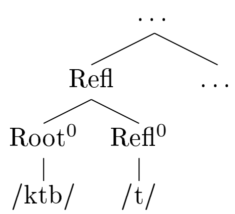
- This would be exactly equivalent to what we find with the Reflexive in Arabic (Zukoff 2023:§4):
  - Infixation occurs when the morpheme *is* the first head to combine with Root (25/26a).
  - Prefixation occurs when the morpheme *is not* the first head to combine with Root (25/26b).

(25) **Arabic Forms with Reflexive /t/** (for example root √*ktb* 'write'; data from McCarthy 1981:384)

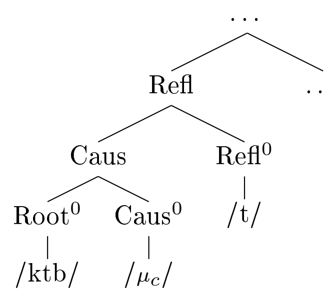
Position		Form	Proposed morphosyntax	Example form	Translation
a.	*Infixal*	VIII	Reflexive	***k*<*t*>*ataba***	'write, be registered'
		V	Reflexive of the Causative	*t̲akattaba*	(*constructed form*)
b.	*Prefixal*	VI	Reflexive of the Applicative	*t̲akaataba*	'write to each other'
		X	Causative of the Reflexive	*st̲aktaba*	'write, make write'

(26) **Syntactic structures with Reflexive**

a. Form VIII ***k*<*t*>*ataba***



b. Form V ***t*-*akat$_c$taba***



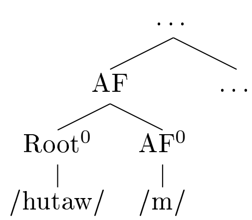
- Projecting this analysis onto the Atayal case (repeated in (27)), we predict structures like (28).

(27) **Infix/prefix alternations in Atayal**

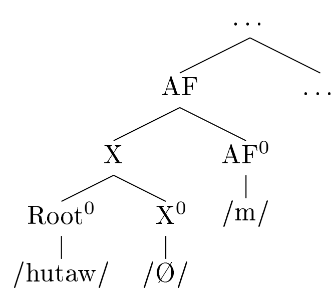
a. *h*<***m***>*utaw* [həmutaw] 'drop'
b. ***m***-*hutaw* [məhutaw] 'fall'

(28) **Syntactic structures with Atayal AF**

a. *h*<***m***>*utaw* (transitive)



b. ***m***-*hutaw* (intransitive)



- A structure like this would seem to make sense if X is something like Stative or some other valence-reducing head and AF is some sort of active Voice head or *v*.

⋆ Therefore, assuming that infixation in Atayal is driven by alignment constraints themselves, rather than prosodic optimization, we capture not only the surface phonological behavior, but also the morphosyntactically-correlated prefix/infix alternations.

→ This approach gives a roadmap for addressing other "non-/anti-optimizing" cases of infixation presented in Yu (2007) and elsewhere, in a way that is actually consistent with optimization.

1.3 Subcategorization and pivots

- Of course, subcategorization could get the Atayal case easily (minus accounting for the morphosyntax of the prefix/infix alternation):

(29) ACTOR.FOCUS ⇔ *m* / [C_...]$_{\text{STEM}}$ (30) ALIGN(/m/$_{\text{ACTOR.FOCUS}}$, L; C_1, R)

- In Yu's (2007) typological survey of infixation, he finds that this subcat frame (after the first consonant) is one of a fairly small number of locations where infixes can end up.
  → He calls these positions (or rather, the units delimiting the positions) **pivots**.
  - The set of possible pivots is given in (31):

(31) **Possible pivots** (Yu 2007:67, adapted from Kalin & Rolle 2022:7; parentheses = uncommon)

Edge pivots		**Prominence pivots**
First consonant	(Last consonant)	Stressed foot
First vowel	Last vowel	Stressed vowel
(First syllable)	Last syllable	Stressed syllable

- According to this table, there are four units that can function as pivots:

(32) **Pivot units:** consonant (non-syllabic segment), vowel (syllabic segment), syllable, foot

- And there are three features that can identify these units:

(33) **Pivot features:** first (leftmost), last (rightmost), stressed

- Given that (non-syllabic) consonants can't be stressed, the cross-classification of the units and features is nearly fully fleshed out, with the only exception being first/last foot.

- Per Yu, languages can employ subcat frames aligning morphemes to either the left or the right of any of these pivots, but only these pivots.
  - Absent are other conceivable phonological entities, like a specific consonant or a vowel with specific features, etc. (Yu 2007:218ff.).
  → This is noteworthy because Paster (2006, 2009) says that these kinds of entities *can* define subcat frames for PCSA (Kalin & Rolle 2022:§4.1).

⋆ While Yu identifies the pivots in (31) through his typological survey, the way he implements subcategorization (inviolable opposite-edge alignment) doesn't always actually refer to that pivot.
  → For example, he formalizes "pre-V_1" position using moras:

(34) **Tagalog** (19): ALIGN(/um/$_{\text{ACTOR.FOCUS}}$, R; μ_1, L) (cf. Yu 2007:91 on Leti)

- Another conceptual problem with his account is the status of first/last.
  → Kalin & Rolle (2022) are able to recast this as "closest" (which may or may not be conceptually stronger) by positing a step of edge-selection *before* infixation.

- Putting aside the subcategorization implementation questions, we should consider how this notion of pivots might relate to P ≫ M.

→ The fact that first/last consonant/vowel defines most cases of infixation, this seems largely compatible with the P ≫ M alignment-based view I introduced above.
  - Displacement from the edge should be minimal (because of gradient alignment), so we should observe mostly first/last positions.
  - In phonology-optimizing cases involving syllable structure, it should position itself with respect to consonants and vowels.
  - In alignment-optimizing cases, it should position itself immediately inside the stem in terms of segments. If a language has relatively consistent phonological structures for roots/stems, this is likely to look like positioning relative to a consonant or vowel.

- The prominence pivots are a little trickier. Here's some data from Samoan in (35):
  - The Samoan plural is marked by infixal reduplication.
  - This morpheme is always CV, copying the stressed syllable, which it immediately precedes.
  - Stress is rigidly on the penultimate mora.

(35) **Samoan plural** (Yu 2007:24, citing Mosel & Hovdhaugen 1992:221–222)

tóa	'brave'	<<u>to</u>>tóa
máː	'ashamed'	<<u>ma</u>>máː
alófa	'love'	aː<<u>lo</u>>lófa
galúe	'work'	gaː<<u>lu</u>>lúe
aːvága	'elope'	aː<<u>va</u>>vága
atamái	'clever'	ata<<u>ma</u>>mái
maʔalíli	'cold, feel cold'	maʔa<<u>li</u>>líli
toʔúlu	'fall, drop'	to<<u>ʔu</u>>ʔúlu

- Yu would account for this with the following subcategorization constraint:

(36) **Samoan:** ALIGN(/RED/$_{\text{PL}}$, R; $\acute{\sigma}$, L) [could also use (stressed/final) foot]

∗ Can we do this with P ≫ M? Yes, if *stress constraints* outrank ALIGN-PL-R.

- We can derive penultimate stress w/ foot-free stress constraints *LAPSER ([*σσ#]) and NONFIN ([*σ́#]):

(37) **Simplex stress**

/alofa/			*LAPSER	NONFIN
a.		alofá		*!
b.	☞	alófa		
c.		álofa	*!	

- If these stress constraints, plus a constraint demanding that stress be identical between the derivative and its base (IDENT[stress]-BD), outrank ALIGN-PL-R, we derive the outcome where the reduplicant tucks in right before the stressed syllable (38e).
  - If it comes any further to the right, it will either displace the stress too far to the left (38a) or cause stress to fall on a different syllable than in the base (38b–d).
  - The pre-stress position (the antepenult) is the rightmost position that does not disrupt the original stress pattern ((38e) ≻ (38f)).
  - ∗ I don't know exactly what is going on with the length alternation (not reflected in the tableau), but I'm pretty sure it has to do with orthogonal facts about stress and weight.

(38) **Stress and infixation**

BASE: [alófa] INPUT: /RED_{PL}, alofa/		*LAPSER	NONFIN	IDENT[stress]-BD	ALIGN-PL-R
a.	alófa<fa>	*!			
b.	alofá<fa>			*!*	
c.	alo<fa>fá		*!	*!*	**
d.	alo<fá>fa			*!	**
e. ☞	a<lo>lófa				****
f.	<a>alófa				*****!

→ This works well because we can say that the infix is oriented towards the same edge where stress is regulated (the right edge).
- ◦ In most of the cases that Yu (2007:Ch. 4.7) identifies, it seems like the two edges match up.
- ◦ Not all of them are amenable to such a simple analysis (but somebody should try...).

1.4 Infixation and allomorphy (Kalin 2022)

- To my mind, the best argument *against* P ≫ M for infixation comes from Kalin's (2022) work on the interaction between infixation and allomorphy. Here are her findings (as summarized in her Appendix B of a previous ms. version):

(39) **On suppletive allomorphy involving an infix**

a. Suppletive allomorphs may differ with respect to pivot/placement (§3.1)
b. Suppletion involving an infix may be lexically, morphologically, phonologically, or prosodically conditioned (§3.2)
c. Conditions on exponent choice are distinct from an exponent's pivot/placement (§3.3)
d. Suppletive allomorphs share an edge orientation (§3.4)
e. Suppletion is conditioned based on the underlying form of the stem, at the stem edge identifiable via edge orientation (§3.5)
f. The surface (infixed) environment of an infix cannot condition suppletion (§3.6)

(40) **On non-suppletive infix allomorphy**

a. Non-suppletive infix allomorphy is conditioned only in surface (infixed) positions (§4.1)
b. No hypothetical position for an infix apart from its surface (infixed) position can (§4.2) induce non-suppletive allomorphy
c. An infix may condition phonological stem changes only in its surface (infixed) position (§4.3)

- The conclusions regarding non-suppletive allomorphy are completely consistent with a P ≫ M model, because they say that phonologically-*driven* allomorphy is local and transparent.
  - ◦ Some of the suppletive allomorphy conclusions are consistent too, especially (39d) given a system where alignment is sensitive to morphosyntactic features (and thus will apply equally to different exponents of the same morpheme).

∗ However, as Kalin (2022) points out, most of the conclusions about suppletive allomorphy do not appear to be consistent with P ≫ M.
- ◦ E.g., if PCSA is governed by P ≫ M via something like PRIORITY (Bonet, Lloret, & Mascaró 2007, Mascaró 2007), then PCSA should be able to be conditioned by infix location, not just the edge (39e,f).

- Many of Kalin's analyses need to be made more precise, and certain P ≫ M-based alternative analyses should be pursued further, but overall her results seem fairly strong.

⋆ Coupled with her refinements of subcategorization into "Conditions on Insertion" and "Conditions on Position" (Kalin & Rolle 2022), this seems like a compelling theory of the phonology-morphology interface (as much as I don't want to admit it).

2 Phonologically-Conditioned Affix Order (PCAO)

- Phonologically-Conditioned Affix Order (PCAO; Paster 2006, 2009) refers to cases where:

(41) a. Phonological principles transparently override morpho-syntactic/-semantic principles (≈ whatever is responsible for the Mirror Principle) in determining the surface order of morphemes.
b. Phonological principles transparently override morphological principles (≈ whatever is responsible for templatic morphology) in determining the surface order of morphemes.

- Paster talks about *mobile affixation* as one (putative) type of PCAO.
  - Huave mobile affixation, e.g., doesn't obviously induce Mirror Principle violations, so that wouldn't be grounds to call it PCAO.
  - It would be PCAO if "BE A SUFFIX" is a morphological principle, since (at least according to Kim 2010 and Zukoff 2021) epenthesis-avoidance is a phonological factor which causes a "suffix" to surface as a prefix instead.

- Some of the things discussed in Zukoff (2023) (at least according to the way I analyze them) would also broadly fall under this definition, though only marginally:
  - Position of Aspect/Voice vowels in Arabic
  - Suffix doubling in Chichewa

- But there are other types of cases which have been proposed in the literature...

2.1 Predictions for PCAO: P $\gg$ M vs. Subcategorization

- Paster lays out the predictions of the P $\gg$ M model and the Subcategorization model for PCAO.
  - These mirror very closely the differences in predictions for PCSA.

(42) **Predictions of P $\gg$ M for PCAO** (Paster 2009:23)
a. Phonology can produce morpheme orderings that disobey other principles (i.e., PCAO exists).
b. Entire morphemes, not just segments, may be phonologically ordered.
c. A sequence of multiple affixes may be re-ordered for reasons of phonological optimization.
d. PCAO results from externally motivated P constraints.

(43) **Predictions of Subcategorization approach for PCAO** (Paster 2009:24)
a. True PCAO does not exist.
b. Segments belonging to affixes may undergo phonological metathesis, but entire affixes cannot.
c. No case exists in which multiple affixes are phonologically ordered with respect to each other.
d. Phonological conditions on the placement of affixes may or may not be phonologically optimizing.

- Paster's conclusion is that PCAO doesn't exist, and thus that Subcategorization is the correct model.
  - Based on most of the cases she addresses, that seems like a fairly reasonable conclusion.
  - But Washo (Benz 2018) looks like it might really be PCAO.

2.2 What PCAO would (and wouldn't) look like

2.2.1 TDNR in Fula and Pulaar and the idea of "phonological scales"

⋆ Arnott (1970) claimed that the Gombe dialect of Fula (West Africa, Atlantic-Congo) has a fixed affix order among a set of its verbal suffixes.

- Gombe Fula has a number of suffixes that are underlyingly single coronal consonants: /-t/, /-d/, /-n/, /-r/.

(44) **Gombe Fula affixes** (Arnott 1970, via Paster 2005:157)

T	/-t/	Reversive (REV)	taar-**t**-a	'untie'
	/-t/	Repetitive (REP)	soor-**t**-o	'sell again'
	/-t/	Reflexive (REF)	ndaar-**t**-o	'look at oneself'
	/-t/	Retaliative (RET)	jal-**t**-o	'laugh at ... in turn'
	/-t/	Intensive (INT)	yan-**t**-a	'fall heavily'
D	/-d/	Associative (ASS)	nast-i**d**-a	'enter together'
	/-d/	Comprehensive (COM)	janng-i**d**-a	'read, learn all ...'
N	/-n/	Causative (CAU)	woy-**n**-a	'cause to cry'
R	/-r/	Modal (MOD)	ɓe mah-i**r**-i ɗi	'they built them with'
	/-r/	Locative (LOC)	'o 'yiw-**r**-ii	'he came from'

- Arnott asserts that, whenever any of these affixes co-occur, they occur in that order: TDNR.
  - There are a few examples that violate that order, but Arnott says they're just lexicalized exceptions.

- Unlike, say, the CARP template in Bantu, the letters in TDNR stand for **phonological entities**, not morphological categories.
  - This ordering can be interpreted as correlating with **sonority**, going from least sonorous on the left to most sonorous on the right.
  - → If Arnott is correct, this is **PCAO**, because the principle governing the order of these affixes is sonority, to the exclusion of the morphosyntax.

⋆ Paster (2005) shows that Gombe Fula and the Fuuta Tooro dialect of the closely related language Pulaar are actually best explained using a mixed scope/template interaction akin to Hyman's (2003) analysis of the CARP template in Bantu.
  - In Pulaar, Paster finds mirror image orderings (and maybe even asymmetric compositionality) just like in Bantu, so there isn't fixed ordering in the first place.
  - This approach also better explains the exceptions that Arnott brushes aside as lexcalized forms.

- However, Paster (2006, 2009) continues to claim that something like TDNR — ordering according to a "phonological scale" like sonority — is a **prediction of P ≫ M**.
  - Since Fula/Pulaar was the only claimed case of this kind of PCAO, its reanalysis then becomes evidence against P ≫ M.

→ This seems like a strawman argument to me. How would P ≫ M actually derive TDNR?

- Alignment constraints? (T = [-son,-cont,-voice], D = [-son,-cont,+voice], N = [+son,-cont,+voice], R = [+son,+cont,+voice])

(45) a. **Right-aligned**: ALIGN-R-R ≫ ALIGN-N-R ≫ ALIGN-D-R ≫ ALIGN-T-R
b. **Left-aligned**: ALIGN-T-L ≫ ALIGN-D-L ≫ ALIGN-N-L ≫ ALIGN-R-L

  - This would require alignment constraints to refer directly to (collections of) segmental features.
  - These aren't phonological constituents, so this is not an independently motivated type of alignment constraint.
  - Therefore, this is not a way to generate the "phonological scale" prediction.

- We could consider something like weight sensitivity constraints (cf. Ryan 2019a,b).
  - However, referencing the weight of consonants on their own (i.e. independent of syllables) is not independently motivated in Ryan's theory.

⋆ The only way I see that we might be able to generate ordering via a scale is using syllable weight, but even this would not be straightforward to implement with any existing mechanisms.
→ I conclude that the phonological scales prediction doesn't really hold up.

2.2.2 Kim's (2015) hypothetical

- Kim (2015), however, spells out a better version of what true P ≫ M-driven PCAO would look like.

- Assume a language with three prefixes /i/, /l/, /b/.
  - Roots must be word-final (undominated ALIGN-ROOT-R? — affix mobility not allowed).
  - This language categorically bans hiatus (undominated *VV).
  - It tolerates rising-sonority onset clusters but no other clusters (undominated SSP).
  - It allows codas in roots, but nowhere else (FAITH_{RT}-IO ≫ NOCODA ≫ FAITH-IO).

→ It would look like this:

(46) **Hypothetical total PCAO** (adapted from Kim 2015:119)

UR	V-initial root /ag/		C-initial root /ga/	
/RT/+/i/+/l/	a.	i-l-ag	b.	l-i-ga
/RT/+/i/+/b/	c.	i-b-ag	d.	b-i-ga
/RT/+/b/+/l/	e.	b-l-ag	f.	b-lə-ga
/RT/+/i/+/l/+/b/	g.	l-i-b-ag	h.	b-l-i-ga

- When the vocalic prefix (/i/) and one consonantal prefix (/l/ or /b/) attach to a root, their relative order is determined purely by the initial segment of the root, driven by *VV and NOCODA.
  - We get V-C- for vowel-initial roots (46a,c), but C-V- for consonant-initial roots (46b,d).
  - Because of this, we can't tell what order the morphosyntax is preferring.

- When the two consonantal prefixes co-occur without the /i/ (46e,f), they arrange themselves so as to create a licit onset cluster. (Epenthesis is employed to break up would-be three-consonant clusters (46f).)
  - Because of this, we can't tell what order the morphosyntax is preferring.

- When all three co-occur (46g,h), they arrange themselves in whatever way can produce a legal sequence given the root-initial segment.
  - If it's consonant-initial (46h), the only way to get all three prefixes before the root without applying epenthesis or having an illegal sequence is /b-l-i/.
  - If it's vowel-initial (46g), the only legal sequence will be /C-V-C-/. Presumably, the fact that /l/ precedes /b/ is driven by the morphosyntax.

⋆ This would be a language that thoroughly exhibits PCAO because almost all aspects of affix order seem to be best explained by phonological principles.

→ No known languages work exactly like this, and indeed it seems highly unnatural.

- However, it turns out this isn't a strong argument for or against anything.
  - P ≫ M can (probably) derive this fairly straightforwardly, either cyclically or in parallel.
  - But Kim (2015:119) shows that Subcategorization can get it too as long as you assume that subcat frames can simultaneously specify a left and a right context (which is admittedly something Paster would say you couldn't do).

2.2.3 Fake PCAO that's really phonological metathesis?

- Most of the claimed instances of PCAO that Paster (2009:30–32) considers can probably be better understood as phonological metathesis:

1. Apparent non-scopal ordering involving Augmentative /-m/ in Doyayo (Adamawa-Ubangi, Cameroon; Wiering & Wiering 1994) results from general metathesis of [m] into post-vocalic position.

(47) **Non-scopal orders involving Doyayo Augmentative /-m/** (Paster 2009:30, ex. (17))

a.	haa-**m**	'(several) are sour'	b.	ɛ-**m**	'sing (many)'
	haa-**m**-z	'(several) turned sour (rapidly)'		ɛɛ-**m**-l	'sing (many) (over a period of time)'
	*haa-z-**m** [/z/ should be the inner affix?]			*ɛɛ-l-**m** [/l/ should be the inner affix?]	

→ This seems rock solid to me, given the evidence that this /m/ gets infixed into roots:

(48) **Augmentative /-m/ infixation into C-final roots** (Paster 2009:30, ex. (18))

a.	tus	'spit out'	b.	kab	'catch'
	tu-**m**-s	'spit out (several)'		ka-**m**-b	'catch (many)'
	*tus-**m**			*kab-**m**	

⋆ But the fact that it results from a general phonological process doesn't mean that it's inconsistent with P ≫ M — in fact it is totally consistent with P ≫ M.

◦ It just means that you can derive it in the phonology after the morphology has attached it as a suffix.

2. Ordering alternations involving Negative /s-/ in Witsuwit'en (Athabaskan, British Columbia; Hargus & Tuttle 1997) result from (morpheme-specific) syllable structure constraints on [s].
   → The data here is a mess, and I wouldn't read too much into it.

3. Suffix-initial consonants in Hamer (South Omotic, Ethiopia; Lydall 1976:408–409; Zoll 1996) surface before the root-final consonant if that consonant is non-coronal.

(49) **Metathesis in Hamer** (Paster 2009:32)

a.	isin	'sorghum'	isin<u>**ta**</u>	'small amount of sorghum'
	rac	'Rac (clan)'	ra<u>t</u>c<u>a</u>	'Rac man'
b.	oto	'calf '	oto<u>**no**</u>	'all calves'
	isin	'sorghum'	isin<u>**no**</u>	'all sorghum'
	rac	'Rac (clan)'	ra<u>n</u>c<u>o</u>	'all Rac'

→ This doesn't need to have anything to do with morpheme order per se, and can just be about conditions on codas/clusters being repaired through metathesis.

- Cases like these therefore don't necessarily tell us anything about PCAO (but they also don't necessarily contradict a P ≫ M model).

2.3 Stress and PCAO in Washo

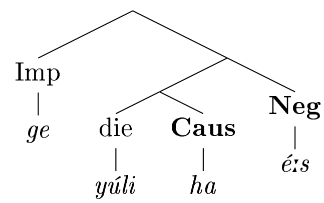
- Benz (2018) demonstrates that true PCAO exists in Washo (Hokan, Lake Tahoe; Jacobsen 1964, 1973).
  → Avoidance of final stress at the stem-level can trigger reordering of stressed and unstressed affixes.

2.3.1 Mirror Principle violation

- Consider (50). The semantics of "Don't kill (it)" suggest the morphosyntactic structure in (51).
  → However, the relative order of NEG and CAUS in the output doesn't match this constituency structure.
    - The order should correspond to a meaning like "Make not die".

(50) [geyúliyéːsha]
/ge-yúli-**éːs-ha**/
IMP-die-**NEG-CAUS**
"Don't kill it!" (Benz 2018:4)

(51)



- Benz's (2018) analysis is that stress is not allowed in final position (undominated NonFinality).
  - If NonFinality outranks the alignment constraints implementing the Mirror Principle (via the MAP, perhaps), then we can easily generate reordering:

(52)

/ge$_{\text{IMP}}$, yúli$_{\text{RT}}$, éːs$_{\text{NEG}}$, ha$_{\text{CAUS}}$/	Max[stress]	NonFin	Align-Neg-R	Align-Caus-R
a. ge-yúli-ha(y)-éːs		*!		**(*)
b. ge-yúli-ha(y)-eːs	*!			**(*)
c. ☞ ge-yúli-(y)éːs-ha			**	

- The preferred alignment (52a) would place a stressed suffix in final position, fatally violating NonFin.
  - Deletion of underlying stresses (52b) is not permitted because of high-ranked Max[stress].
  → This means that the best way of avoiding a stressed final syllable is flipping the order of the affixes (52c), violating only Align-Neg-R.

∗ We could also consider a candidate *[ge-yúli-h-éː(y)-a-s] that metathesizes the vowels.
  - This would fix all the problems, and actually improve alignment relative to (52a).
  - This can presumably be ruled out by Contiguity, which penalizes discontiguous realization of morphemes, because both suffixes would have a segment from the other suffix between their two segments.

2.3.2 Non-transitivity

- Another clue that this is PCAO is that certain sets of affixes exhibit *non-transitivity* in their order:

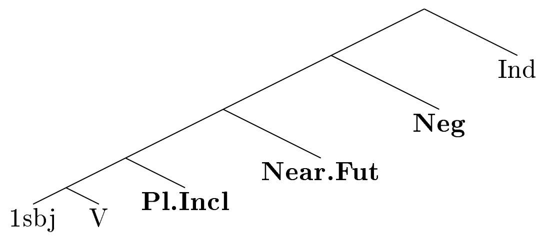
(53) [lémeʔhuyášaʔi] **A > B**
/le-ímeʔ-**hu-ášaʔ**-i/
1SBJ-drink-**PL.INCL-NEAR.FUT**-IND
"We (incl.) are going to drink."

(54) [lémaʔášaʔéːsi] **B > C**
/le-ímeʔ-**ášaʔ-éːs**-i/
1SBJ-drink-**NEAR.FUT-NEG**-IND
"I am not going to drink."

(55) [lémeʔéːshuyi] **C > A**
/le-ímeʔ-**éːs-hu**-i/ (*/le-ímeʔ-**hu-éːs**-i/) ***A > C**
1SBJ-drink-**NEG-PL.INCL**-IND
"We (incl.) are not drinking."
(Benz 2018:5, exx. (8–10))

→ Reverse engineering the syntax based on (53) and (54), we'd expect a morphosyntax that looks something like (56). But this won't directly generate (55); something needs to be messing with the process.

(56) **Predicted morphosyntactic structure**



- The same explanation as the earlier cases will help sort this out:
  - (55) is the one case where the predicted lefthand affix is unstressed and the predicted righthand affix is stressed.
  - If the phonology is able to move the stressed affix away from the right edge, then that will explain the lack of transitivity.

2.3.3 Stratality and Clash

- There are two problems left to address.

- First, consider (55) again:

(57) [lémeʔéːshuyi] **C > A**
/le-ímeʔ-**éːs-hu**-i/ (*/le-ímeʔ-**hu-éːs**-i/) ***A > C**
1SBJ-drink-**NEG-PL.INCL**-IND
"We (incl.) are not drinking."

  - If we are saying that NonFinality is the motivation for Neg /éːs/ to surface before Pl.Incl /hu/, then the presence of Ind /i/ at the end should alleviate the problem, but it doesn't.

⋆ Benz's (2018) solution: use Stratal OT (Kiparsky 2000, 2015).
  - Ind /i/ is a word-level suffix, whereas the other ones are stem-level suffixes.
  - The stem-level suffixes are spelled-out and linearized (simultaneously) before the word-level affixes are.
  → Therefore, Neg /éːs/ would be (domain-)final if it surfaced after Pl.Incl /hu/, allowing NonFin to trigger its inward movement.

- Second, consider (54) again:

(58) [lémaʔášaʔéːsi] **B > C**
/le-ímeʔ-**ášaʔ-éːs**-i/
1SBJ-drink-**NEAR.FUT-NEG**-IND
"I am not going to drink."

  - Given what we just said about Ind /i/ not being present when Neg /éːs/ is added, we would expect Neg /éːs/ to retract here too, but it doesn't: */le-ímeʔ-**éːs-ášaʔ**-i/.

⋆ Benz's (2018) solution: *CLASH, which penalizes adjacent stressed syllables.

(59) **Stem-level evaluation of (58)** (Benz 2018:8, ex. (21))

/íme$ʔ_{RT}$, é:s_{NEG}, áša$ʔ_{NR.FUT}$/	*CLASH	MAX[stress]	NONFIN	ALN-NEG-R	ALN-NR.FUT-R
a. ☞ íme?-áša?-é:s			*		**
b. íme?-áša?-e:s		*!			**
c. íme?-é:s-áša?	*!			****	
d. é:s-íme?-áša?	*!			****, ****	

2.3.4 Three affixes

- When all three of the affixes we've been talking about are present in the same form, they surface in the following order:

(60) [léma?áša?é:shuyi] **B > C > A**
/le-íme?-**áša?-é:s-hu**-i/
1SBJ-drink-**NEAR.FUT-NEG-PL.INCL**-IND
"We (incl.) aren't going to drink." (Benz 2018:9, ex. (23))

- This is exactly what we expect from Benz's P ≫ M analysis:

(61) **Stem-level evaluation of (60)** (Benz 2018:10, ex. (25))

/íme$ʔ_{RT}$, é:s_{NEG}, áša$ʔ_{NR.FUT}$, $hu_{PL.INCL}$/	*CLASH	MAX [stress]	NON FIN	ALIGN-NEG-R	ALIGN-NR.FUT-R	ALIGN-PL.INCL-R
a. íme?-hu-áša?-é:s			*!		2	6
b. íme?-hu-áša?-e:s		*!			2	6
c. íme?-é:s-hu-áša?				6!		4
d. íme?-hu-é:s-áša?	*!			4		6
e. ☞ íme?-áša?-é:s-hu				2	4	

- There are two orders that satisfy all three stress constraints: (61c) and (61e).
  → The grammar selects the one where Neg /é:s/ is further to the right (61e), because ALIGN-NEG-R is the highest-ranked alignment constraint.

2.3.5 Local summary

- This case turns out to be very similar to Kim's (2015) hypothetical PCAO, but involving stress instead of syllable structure.
  → Affix order is primarily determined by stress considerations.
    ◦ Only under ideal circumstances can we glean the morphosyntactic ordering preferences.
    ◦ Nevertheless, they do play a role in those instances.

⋆ If this is the correct way to understand Washo, then this would seem to be strong evidence for true PCAO, and thus for P ≫ M.

2.4 Against Subcategorization for Washo

- Paster (2006:229) suggests that the Washo facts can be accounted for by saying that, in Washo, "stressed suffixes subcategorize for a foot to their left".

- This is meant to capture forms like (55) (foot structure added):

(62) [(léme)(ʔéːs)huyi] (*[(lémeʔ)hu(yéː)si]) **C > A**
/le-ímeʔ-**éːs**-**hu**-i/ (*/le-ímeʔ-**hu**-**éːs**-i/) *__A > C__
1SBJ-drink-**NEG-PL.INCL**-IND
"We (incl.) are not drinking."

- But right off the bat it doesn't account for forms like (53) (foot structure added):

(63) [(lémeʔ)hu(yáša)ʔi] (*[(léme)(ʔášaʔ)huyi]) **A > B**
/le-ímeʔ-**hu**-**ášaʔ**-i/ (*/le-ímeʔ-**ášaʔ**-**hu**-i/)
1SBJ-drink-**PL.INCL-NEAR.FUT**-IND
"We (incl.) are going to drink."

- Benz (2018:9) additionally argues that it doesn't work for the complex 3-affix example (60), even though it may seem so on the surface (but I can't reconstruct what her argument is based on the handout).

(64) [(léma)(ʔáša)(ʔéːs)huyi] **B > C > A**
/le-ímeʔ-**ášaʔ**-**éːs**-**hu**-i/
1SBJ-drink-**NEAR.FUT-NEG-PL.INCL**-IND
"We (incl.) aren't going to drink."

- If we build up cyclically according to the structure in (56) using Paster's proposed subcat requirements (something like (65)), it seems like we do get the right result (66):

(65) a. NEAR.FUT ⇔ *-ášaʔ* / ...$)_{Ft}$_
b. NEG ⇔ *-éːs* / ...$)_{Ft}$_
c. etc.

(66) a. [(ímeʔ)] + /hu/
b. [(ímeʔ)hu] + /ášaʔ/
c. [(íme)(ʔ-**ášaʔ**)-hu] + /éːs/
d. [(íme)(ʔáša)(ʔ-**éːs**)-hu]

- However, I think there are some deficiencies about the subcat frames:
  1. The frame should specify the right edge of the *rightmost* foot, not just any foot.
     - This may be doable if the rightmost foot is the head foot, but neither Benz nor Paster mentions anything about that.
  2. This is yet another example of a duplication problem with subcategorization frames.
     - Each *stressed* suffix must have the same subcat frame, and that frame has to do with stress.
     - A generalization is willfully being missed.

→ Even if we stomach all of this, we still have the very basic problem that it's wrong for cases like (63).

2.5 Conclusions

⋆ Washo is the best case I know of in favor of true PCAO.

- Huave mobile affixation, if you buy Kim (2010) and/or Zukoff (2021), also seems like a very good case.
  - Though it doesn't necessarily involve Mirror Principle violation.
  - And Kim's (2015) Huave analysis needs to be more thoroughly responded to.

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