Class 3
Cyclic spell-out and allomorphic conditioning

10/12/23

1 Japanese opaque PCSA in Harmonic Serialism

- Last time, we talked about how the argument against P ≫ M from opaque allomorph selection is really an argument against the parallel OT via opacity, nothing about the general idea of P ≫ M.
- We identified the Japanese case as "counter-shifting opacity". Following Rasin (2022), counter-shifting opacity is derivable in Harmonic Serialism (McCarthy 2000, 2010).
- So let's see if we can get Japanese opaque PCSA in HS.

1.1 Basics of HS

⋆ Harmonic Serialism = "Serial OT", in contrast to classical OT = "Parallel OT"

- In OT, GEN provides all conceivable candidates to be evaluated and selected by EVAL.
  - ◦ There is a single evaluation, and thus a *parallel* mapping between input and output.

- In HS, GEN provides only candidates that differ from the input by **one change/operation** — this is called the "gradualness" requirement.

- Since we obviously observe outputs that differ from the input in more than one way, this process is iterated, i.e. "serial".
  - → The candidate selected by EVAL serves as the input to another evaluation, where GEN furnishes all candidates that differ by one operation from the new input.
  - ◦ This is repeated until EVAL selects the candidate which matches the input from that step — this is called "convergence".

- Like Parallel OT (but unlike Stratal OT), there is a single constraint ranking that is held constant across each evaluation.

- By having this single constraint ranking coupled with the "gradualness" requirement, the grammar will make changes according to the order of markedness constraints in the ranking.
  - ◦ Changes to the input are only motivated when some $\mathbb{M} \gg \mathbb{F}$.
  - ◦ The highest ranked $\mathbb{M}$ gets satisfied first, then the second highest ranked $\mathbb{M}$, and so on, until no more changes can be made that don't violate higher ranked $\mathbb{F}$'s.
  - → Thus, HS is a way of doing process ordering through constraint ranking rather than rule ordering.

1.2 An example: Classical Arabic epenthesis in HS

- Classical Arabic (for the most part) doesn't allow consonant clusters word-initially.
  - ◦ It fixes #CC by epenthesizing [ʔi] before the cluster.
- Classical Arabic also doesn't allow onsetless syllables.
  - ◦ #V repaired by epenthesizing [ʔ] before the V.

→ [ʔi] epenthesis can be modeled serially as [i] epenthesis followed by [ʔ] epenthesis (McCarthy 2010:3–4):

- Take an input with an initial cluster: /fʕal/
- In HS, GEN provides candidates which make "one change" (and no change — i.e. the faithful candidate) relative to this input:
  - Deletion of one segment: [ʕal], [fal], etc.
  - Insertion of one segment: [ifʕal], [fiʕal], [ʔfʕal], etc.
  - Change of one(ish) feature: [*u*ʕal], [f*a*al], etc.
  - Metathesis(?): [faʕl], [falʕ](?), etc.

- These are the candidates entered into the initial evaluation.
  - ⋆ The candidate chosen in the POT evaluation (and ultimately in the HS derivation) — ʔifʕal (1✗) — is not available in the initial evaluation, because it makes *two changes* relative to the input.
  - If it were available, it would have been selected here right off the bat.

→ In this instance, the derivation gets there later anyway, so it's a moot point.
  - In other cases — including the Japanese case — this gradualness effect can block certain POT derivations that require simultaneous changes.

- Given the ranking in (1), we select the candidate that repairs the initial cluster (satisfying highest ranked *ComplexOns) through vowel epenthesis.
  - This introduces a new markedness violation (Onset), but this is tolerated due to ranking.

(1) Step 1 (vowel prothesis)

/fʕal/			*ComplexOns	Max	Contiguity	Onset	Dep
a.		fʕal	*!				
b.	☞	ifʕal				*	*
c.		ʕal		*!			
✗		ʔifʕal					**

⋆ Crucially, the best way (according to this ranking) of fixing the *ComplexOnset ($\mathbb{M}_1$) problem involves creating a new violation of Onset ($\mathbb{M}_2$).

- Once Step 1 selects [ifʕal] as the most *most harmonic available candidate*, that candidate becomes the input to a new round of evaluation.
  - The candidate set is different, because it is now derived relative to the new input //ifʕal//, not the original input /fʕal/.
    - Furthermore, faithful violations are assessed differently vis-à-vis equivalent candidates from Step 1, since they are reckoned relative to a different input.
  - → Now the ʔ epenthesis candidate is available, because it is only one change away from the new input.

- Since Onset ≫ Dep, the Onset violation introduced on the last step can be repaired.
  - This results in (2c), which represents [ʔi] epenthesis relative to the original input.

(2) Step 2 (ʔ prothesis)

//ifʕal//			*ComplexOns	Max	Contiguity	Onset	Dep
a.		ifʕal				*	
b.		fʕal	*!	*!			
c.	☞	ʔifʕal					*

- This candidate is now the input to another round of evaluation.
  - Given the ranking, there are no more problems that can be fixed.
  - Any additional markedness violations (e.g. *CC) are too low ranked (i.e. below faithfulness) to be able to induce more changes.
  - The faithful candidate is selected, so the derivation converges and ends, and this candidate ends up as the output form.

(3) Step 3 (convergence)

//ʔifʕal//	*ComplexOns	Max	Contiguity	Onset	Dep	*CC
a. ☞ ʔifʕal						*
b. ifʕal		*!		*		*
c. ʔififʕal			*!		*	
d. ʔiʕal		*!	*!			

1.3 The Japanese data again

(4) Japanese opaque allomorphy with [w]-final stems (Nevins 2011:17, citing Gibson 2008)

		C-final root	V-final root	[w]-final roots	
		jom 'read'	ne 'sleep'	iw 'say'	jow 'get drunk'
NON-PAST	{u/ru}	jom-u	ne-ru	**i-u**	**jo-u**
INCHOATIVE	{oo/joo}	jom-oo	ne-joo	**i-oo**	**jo-oo**
NEGATIVE	{anai/nai}	jom-anai	ne-nai	iw-anai	jow-anai

(5) /w/ → Ø / _$V_{[-\text{low}]}$ (= *w$V_{[-\text{low}]}$ ≫ Max[w]-IO)

1.4 Analyzing Japanese in HS

- Let's assume that picking an allomorph is an operation. If that is the case, then you can't do that *and* delete a /w/ at the same time.
  - The gradualness requirement on candidates will then prevent you from considering any candidates which have done both (6e,f).

1.4.1 Step 1

- Since the /w/ problem only arises after you select the allomorph (if you select the V-initial allomorph), then the only thing you can sensibly do first is select your allomorph.
  - If you don't even try — whether you do nothing (6a) or delete the /w/ (6b) — you violate the Use constraints.

(6) Step 1: Select [-u] and create your /w/ problem

/jow+{-u, -ru}/	NoCoda	Use:/-ru/	Use:/-u/	*w$V_{[-\text{low}]}$	Max	Onset
a. jow.-{???}	(*!)	*(!)	*(!)			
b. jo.-{???}		*	*!		*	
c. jow.-ru	*!		*			
d. ☞ jo.w-u		*		*		
e. ✗ jo.-u		*			*	*
f. ✗ jo.-ru			*		*	

- Since this is PCSA, we're still going to need a 𝕄 ≫ Use ranking to drive allomorph selection. We'll use NoCoda ≫ Use:/-ru/. (The other option, Onset ≫ Use:/-u/, won't work because of Step 2.)
  - This ranking eliminates the /-ru/ candidate that is otherwise faithful (6c), because of NoCoda.

- This leaves the /w/-deletion candidate (6b) and the otherwise-faithful /-u/ candidate (6d).
  - As long as *the lower-ranked Use constraint* outranks $*wV_{[-\text{low}]}$, it will be better to pick the appropriate allomorph and create a new violation of $*wV_{[-\text{low}]}$ than it will be to delete the /w/ in preparation for the next step (a weird kind of look-ahead).
  - This gets us the allomorph appropriate to C-final roots: /-u/ (6d).

→ The gradualness inherent to HS is crucial here.
  - If this step of the evaluation had access to the two-change candidates (6e,f), they would *both* be better than the winner.
  - It would have selected the transparent candidate from the POT analysis (6f).

⋆ This seems to be the only case where using multiple Use constraints predicts something different than having a single Priority constraint.
  - The reason is that we are now giving the system the option to not pick an allomorph in the first place, which isn't the case in the other versions we've been looking at.
  - But given how they are now ranked consecutively, we might be able to redefine Priority to do the job correctly.

1.4.2 Steps 2 & 3

- The output of Step 1 is [jo.w-u]. This has created the /w/ problem where it didn't previously exist.
  - Given the ranking necessary for the process to occur independently in the general case (which I'm pretty sure it does), the process will apply at Step 2.

- The output of Step 1 now gets entered into the input for the next step.
  - Since allomorphy has already been resolved, we can now deal with the /w/ problem, via deletion, as expected.
  - → But it's too late to go back and change your mind about the allomorph selection.
  - ∗ Note that the winning candidate at Step 2 is a candidate that was not available at Step 1 because of gradualness.

(7) Step 2: Fix your /w/ problem

/jo.wu/	NoCoda	Use:/-ru/	Use:/-u/	$*wV_{[-\text{low}]}$	Max	Onset
a. jo.wu		*moot*	*moot*	*!		
b. ☞ jo.u					*	*
c. ✗ jo.-ru			*		*	

- You could delete another vowel to solve your new Onset violation, but as long as Max outranks Onset, you won't. Instead, you converge.

(8) Step 3: Convergence

/jo.u/	NoCoda	Use:/-ru/	Use:/-u/	$*wV_{[-\text{low}]}$	Max	Onset
a. ☞ jo.u		*moot*	*moot*			*
b. ju					*!	
c. ✗ jo.-ru			*		*	

1.4.3 Confirming for other root types

(9) Step 1 for other C-final roots

/jom+{-u, -ru}/	NoCoda	Use:/-ru/	Use:/-u/	*wV$_{[-\text{low}]}$	Max	Onset
a. jom.-{???}	(*!)	*(!)	*(!)			
b. jo.-{???}		*	*!		*	
c. jom.-ru	*!		*			
d. ☞ jo.m-u		*				
e. ✗ jo.-u		*			*	*
f. ✗ jo.-ru			*		*	

(10) Step 1 for V-final roots

/ne+{-u, -ru}/	NoCoda	Use:/-ru/	Use:/-u/	*wV$_{[-\text{low}]}$	Max	Onset
a. ne.-{???}		*!	*			
b. n.-{???}		*!	*		*	
c. ☞ ne.-ru			*			
d. ne.-u		*!				*
e. ✗ n-u		*			*	

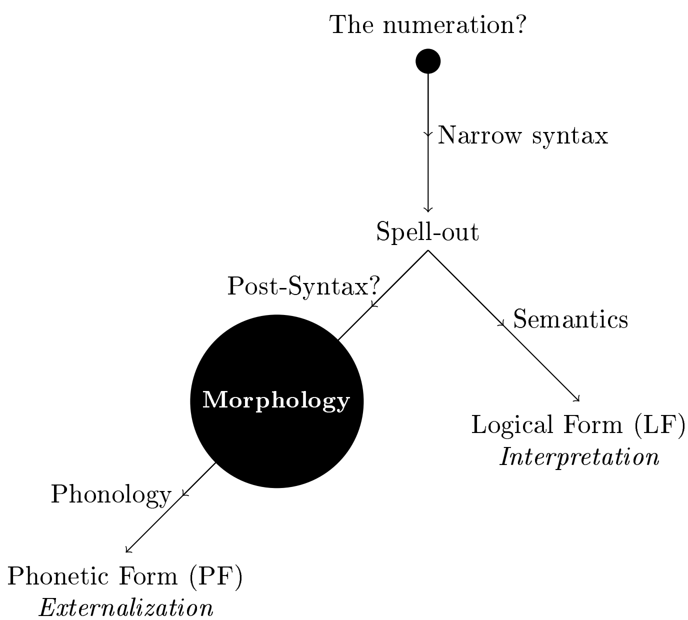
1.4.4 Conclusions

- This shows that a P ≫ M model **can** handle opaque allomorph selection, if it is embedded in a framework that can handle counter-shifting opacity.
- Paster's contentions are therefore an argument against POT regarding opacity, *not* an argument against P ≫ M as a model of PCSA in general.

2 (Cyclic) Spell-out

- Here's the Y-model again:

(11) The Y-Model



- The morphology receives a hierarchical syntactic structure, comprised entirely of abstract features.
  - Its job is to translate that into phonological structure that the phonological component can work with.
  - It does this by applying Vocabulary Insertion (VI) rules to that structure (which maybe it adjusted a little beforehand).

- The choice of whether to apply a given VI rule in a given derivation is handled in large part by the Subset Principle / Elsewhere Condition.
  - For whatever Feature(s) you are trying to spell out, apply the VI rule that is *most specific* (≈ meets the largest number of features, has the most complicated context, etc.).

⋆ Question: How do you spell out multiple (morpho)syntactic terminal nodes within the same word?
→ Typical answer: Cyclically, from the bottom up (≈ from the root out)

3 Consequences of cyclic spell-out

3.1 German verbal inflection

- A well-known allomorphy problem is verbal inflection in German, taken here from Gouskova & Bobaljik (2020:6).

- Regular ("weak") verbs (12) show no exponent of tense in the present, a [t] between root and agreement suffixes in the past, and no alternations in the root between the two tenses.
  - ∗ [b]∼[p] alternations reflect phonological constraints on voicing; not (real) allomorphy.

(12) German regular (weak) verbs lack ablaut: *leben* "to live"

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	leb-ə	leb-ən	1	lep-t-ə	lep-t-ən
2	lep-st	lep-t	2	lep-t-əst	lep-t-ət
3	lep-t	leb-ən	3	lep-t-ə	lep-t-ən

- German irregular ("strong") verbs don't have [t] in the past tense, and display vowel changes in the root:
  - Within the present paradigm: 2SG/3SG [ɪ] vs. elsewhere [e]
  - Across the tense paradigms: PAST [a] vs. PRESENT [ɪ/e]
  - The past tense agreement inflection also differs slightly from the weak verbs:
    - Strong 1/3.SG.PAST /Ø/ vs. Weak 1/3.SG.PAST /ə/
    - ∗ Maybe we can get rid of this by assuming the weak past suffix is /tə/, as Gouskova & Bobaljik (2020:7) imply in their example (7)? I don't think this is the common wisdom, but it does work for the data here.

(13) German vowel alternations in strong verbs: *geben* "to give"

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	geb-ə	geb-ən	1	gap	gab-ən
2	gɪp-st	gep-t	2	gap-st	gap-t
3	gɪp-t	geb-ən	3	gap	gab-ən

- Additionally, there are some verbs that show weak inflection but do have stem alternations, e.g. *denk* (14).
  - [deŋk] in the present vs. [dax] in the past (cp. Eng *think* vs. *thought*)

(14) German suppletive alternations: *denken* “to think”

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	dɛŋk-ə	dɛŋk-ən	1	dax-t-ə	dax-t-ən
2	dɛŋk-st	dɛŋk-t	2	dax-t-əst	dax-t-ət
3	dɛŋk-t	dɛŋk-ən	3	dax-t-ə	dax-t-ən

- By looking across these three different types, we can identify three different positions within the verb:

(15) Basic structure of the German verb: **Root-Tense-Agr**

- If we assume that all German verbs underlyingly have (morpho)syntactic terminal nodes corresponding to each of these three positions (not a necessary assumption), then we can recast the morphological parsing as in (16) and posit the morphosyntactic structure in (17).
  - ∗ I also get rid of phonologically predictable schwas and voicing alternations.

(16) Underlying forms of paradigms, including morphological zeroes

a. **Weak**

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	leb-Ø-ə	leb-Ø-n	1	leb-t-ə	leb-t-n
2	leb-Ø-st	leb-Ø-t	2	leb-t-st	leb-t-t
3	leb-Ø-t	leb-Ø-n	3	leb-t-ə	leb-t-n

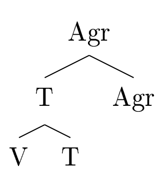
b. **Strong**

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	geb-Ø-ə	geb-Ø-n	1	gab-Ø-Ø	gab-Ø-n
2	gɪb-Ø-st	geb-Ø-t	2	gab-Ø-st	gab-Ø-t
3	gɪb-Ø-t	geb-Ø-n	3	gab-Ø-Ø	gab-Ø-n

c. ***denk***

PRESENT	SINGULAR	PLURAL	PAST	SINGULAR	PLURAL
1	dɛŋk-Ø-ə	dɛŋk-Ø-n	1	dax-t-ə	dax-t-n
2	dɛŋk-Ø-st	dɛŋk-Ø-t	2	dax-t-st	dax-t-t
3	dɛŋk-Ø-t	dɛŋk-Ø-n	3	dax-t-ə	dax-t-n

(17) Morphosyntactic structure of the German verb word (simplified)



$[\,[\,[\text{ V }]\text{ T }]_{\text{T}}\text{ Agr }]_{\text{Agr}}$

- This brings to the fore several questions about allomorphy:

(18) **Questions about allomorphy**
   a. What kinds of items can undergo allomorphy?
   b. What kinds of (non-phonological) information can trigger/condition allomorphy?
   c. Are there restrictions on the relative locations of the target and trigger of allomorphy (including in terms of what kind of information can be where)?

3.2 Answers about allomorphy

⋆ What kinds of items can undergo allomorphy?
   ◦ Roots: /dɛŋk/ vs. /dax/, /geb/ vs. /gɪb/ vs. /gab/ (some people would use "readjustment rules")
   ◦ Tense affixes: PAST /t/ vs. /Ø/
   ◦ Agreement affixes: at least 3.SG.**PRES** /t/ vs. 3.SG.**PAST** /Ø/
   (maybe also 3.SG.PAST.**STRONG** /Ø/ vs. 3.SG.PAST.**WEAK** /ə/)

⋆ What kinds of information can trigger allomorphy?
   ◦ Class membership: strong vs. weak triggers tense allomorphy, and maybe agreement allomorphy
   ◦ Tense information: past vs. present triggers agreement allomorphy
   ◦ Tense & agreement & class information(?): root alternations in strong verbs

⋆ Are there restrictions on the relative locations of the target and trigger of allomorphy?
   ◦ It mostly depends on how we understand the answers to the last question...

3.3 Spelling stuff out

- The standard assumption/argument in DM (Bobaljik 2000, Adger, Béjar, & Harbour 2003, Embick 2010) is that you start by spelling out the root (the most deeply embedded terminal), and work your way outwards.

- If we try to spell out the root first:
   ◦ What do our VI rules need to look like?
   ◦ What other information must be accessible (already)?

- Putting aside the *gib-* forms to make things easier:

(19) a. √GIVE ⇔ gab / (__)PAST
     b. √GIVE ⇔ geb

or

(20) a. √GIVE ⇔ geb / (__)PRESENT
     b. √GIVE ⇔ gab

(21) a. √THINK ⇔ dax / (__)PAST
     b. √THINK ⇔ dɛŋk

or

(22) a. √THINK ⇔ dɛŋk / (__)PRESENT
     b. √THINK ⇔ dax

   ∗ Probably conditioned by PAST, because we get the "present" form in the infinitives and other verb forms.

↪ We need multiple VI rules for each root, one with a context specifying tense information.
   → Tense information needs to be available at the point of the derivation where these VI rules get discharged.

- What do we need to say in order to have this info available?
   → VI is acting upon a (morpho)syntactic structure that is larger than just the root.
      ↪ The syntax sends off *chunks* to the morphology, rather than sending one terminal node at a time.
         ▪ Open question for now: how big is that chunk?

- After the first VI rule has applied, we now have our first bit of phonological structure in the derivation.
  - This phonological structure is now co-existing with the morphosyntactic structure of the terminals which have not yet been spelled out, which we know we need to be visible already because they conditioned VI.

- Taking, e.g., the derivations of 2nd singular past [daxtəst] and [gapst], we can represent this something like the following:

(23) a. [[[*dax*] PAST $]_{\text{T}}$ 2SG $]_{\text{Agr}}$ b. [[[*gab*] PAST $]_{\text{T}}$ 2SG $]_{\text{Agr}}$

- Because we are doing this from the inside out, we proceed to the next terminal above the root, which is T.
  - Do we have the right representations to make this work?

- We know that there is an alternation in the realization of PAST between /t/ and /Ø/.
  - This alternation is conditioned by the *class membership* of the verbal root: 'weak' /t/ vs. 'strong' /Ø/.

- Currently, our representations have only the phonological shape of the root that was spelled out by the first VI rule.
  - Consider the following pair of singular∼plural noun paradigms from English:

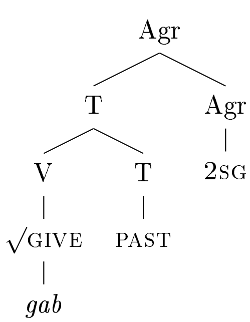
(24) a. SG *deer* [dir] ∼ PL *deer* [dir]
b. SG *dear* [dir] ∼ PL *dears* [dir**z**]

- If the VI rules for plural in English only had access to the phonological shape of the roots/stems they're attaching to, we shouldn't be able to distinguish the two. But clearly we need to.

- We've got (at least) two options for fixing this:

1. Assume that the abstract root remains visible after VI applies
   - We could understand this as VI *adding* phonological content to the morphosyntactic structure (Adger, Béjar, & Harbour 2003, Deal & Wolf 2017, Gribanova & Harizanov 2017), but not *replacing* the morphosyntactic structure (25) (which is the more traditional assumption).
   - This would allow us to write VI rules for PAST that directly mention the roots (26).

(25) Additive VI



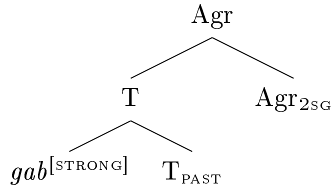
(26) a. PAST ⇔ Ø / {√GIVE, ...(other "strong" roots)} [context is the list of 'strong' roots]
b. PAST ⇔ t

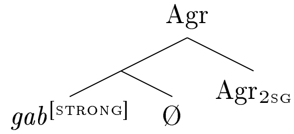
2. Assume that the VI rule marks the phonological output with a diacritic that is legible to VI
   - Once this is part of the structure (29a), we no longer need to keep track of the identity of the individual roots in order to insert the right morph (29b).

(27) a. $\sqrt{\text{GIVE}}$ ⇔ gab$^{[\text{STRONG}]}$ / PAST
     b. $\sqrt{\text{GIVE}}$ ⇔ geb$^{[\text{STRONG}]}$
     c. $\sqrt{\text{LIVE}}$ ⇔ leb

(28) a. PAST ⇔ Ø / STRONG
     b. PAST ⇔ t

(29) Replacive VI

a. 

b. 

   - It is worth wondering what the phonology proper does with this diacritic...

- The replacive approach, however, runs into the same problem at the next step, but without the same sort of solution available.
  - Consider the differences in the agreement morphs for 3rd person singular between the tenses:

(30) a. 3.SG.PRES [gɪpt] (← /gɪb-Ø-t/) vs. 3.SG.PAST [gap] (← /gab-Ø-Ø/)
     b. 3.SG.PRES [lept] (← /leb-Ø-t/) vs. 3.SG.PAST [leptə] (← /leb-t-ə/ or /leb-tə-Ø/)

- The contrast motivates at least the following VI rules:

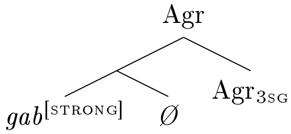
(31) a. 3SG ⇔ Ø / PAST (to be revised)
     b. 3SG ⇔ t

- If we assume the parse /leb-t-ə/ → [leptə] for weak verbs, then we would need additional conditioning to differentiate weak 3SG /ə/ from strong 3SG /Ø/.[1]

(32) a. 3SG ⇔ Ø / PAST, [STRONG] (or {$\sqrt{\text{GIVE}}$, ...} in the additive approach)
     b. 3SG ⇔ ə / PAST
     c. 3SG ⇔ t

- We can handle the root-based conditioning either way (32a), but the PAST-based conditioning doesn't quite work with the replacive approach:
  - Once the VI rule for PAST has been discharged, the feature PAST would no longer be visible to the derivation (33).

(33) Problem with Agr insertion with replacive VI



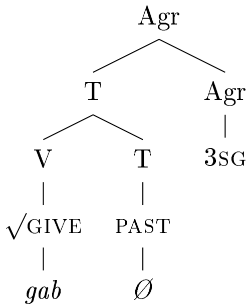
  - Hence, the only viable rule should be (32c), incorrectly predicting */gab-Ø-t/ → *[gapt].

[1] We could also try to deal with this by using an impoverishment rule (Bonet 1991, Noyer 1992, 1997) that deletes a feature in the 3rd singular (or the 1st singular) in the past. We want something like this independently to account for the syncretism between 1st and 3rd singular in the past.

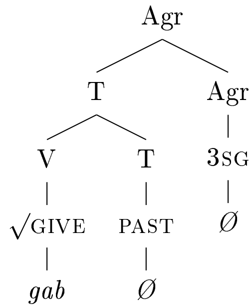
- We encounter no such problem with additive VI:
  → Everything we need for the conditioning persists through multiple rounds of spell-out.

(34) Agr insertion with additive VI

a.



b.



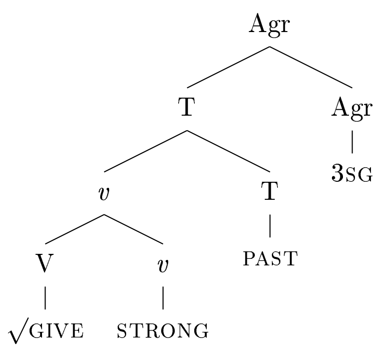
- If we buy the dual conditioning of 3SG (32a), this gives us evidence that VI rules can be conditioned "non-locally", i.e. by something embedded in the sister of the head being spelled out, not just the sister itself.
  * There's some discussion in the literature about morphological zeroes being transparent, so maybe this is not the best example...

- There's one other thing we could consider, but it's not going to get us all the way there:

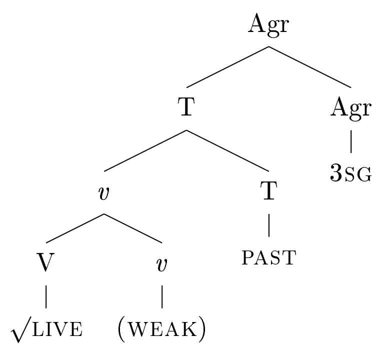
  3. Assume that there are different *v*'s (verbal categorizing heads) for strong and weak verbs

(35) Different *v*'s

a. **Strong**



b. **Weak**



  - The choice of *v* would be a matter of (syntactic?) selection: you always have the right one with the right root.
  - And then it turns out we had the wrong morphological analysis:

(36) a. [[[[*gab*]$_{\text{Rt}}$ *Ø*]$_{v_{\text{S}}}$ *Ø*]$_{\text{T}_{\text{PAST}}}$ *Ø*]$_{\text{Agr}_{\text{3SG}}}$

b. [[[[*leb*]$_{\text{Rt}}$ $\boxed{t(ə)}$]$_{v_{\text{W}}}$ $\boxed{Ø}$]$_{\text{T}_{\text{PAST}}}$ *t*]$_{\text{Agr}_{\text{3SG}}}$

(37)
a. √GIVE ⇔ gab / v_{STRONG}, PAST
b. v_{STRONG} ⇔ t / PAST
c. PAST ⇔ Ø
d. **3SG ⇔ Ø**

(38)
a. √LIVE ⇔ leb
b. v_{WEAK} ⇔ tə / PAST
c. PAST ⇔ Ø
d. **3SG ⇔ t**

- If VI is replacive and not additive, we run into the same problem again with the agreement suffixes.
- So even if we wanted to implement the analysis using *v* (which seems sensible), the conclusions in favor of additive VI still hold.

3.4 Local summary

⋆ There are certainly other ways to put all this together:
  ◦ We could allow VI to target more than just a single terminal node at one time, via *spanning* or *nanosyntax* (e.g. Caha 2009, Bobaljik 2012, Svenonius 2012, Merchant 2015).
  ◦ We could have morphological operations that adjust feature specifications.
  ◦ We could use readjustment rules.

- Importing these additional devices can affect all the little conclusions we've drawn along the way.
  ◦ This is one reason why doing morphological theory is so hard...

4 A prediction of cyclic spell-out: no outward phonological conditioning

- Under either version (replacive or additive), cyclic spell-out predicts that phonological content is not present in the derivation until introduced by a VI rule.
  ↪ If VI rules can reference phonological content (as in Paster 2006's subcategorization model), phonological conditioning should only ever be ***inward***, i.e. referring to material that has been spelled out earlier in the derivation.
  → Phonologically-*conditioned* allomorphy should never be outward looking.

∗ But no such restriction should hold over phonologically-*driven* allomorphy, because phonology can apply over the entire word (even if it does apply incrementally first).

> - The same predictions basically hold in other cyclic models of the phonology-morphology interface:
>   ◦ Lexical Phonology & Morphology (Kiparsky 1982)
>   ◦ Stratal OT (Kiparsky 2000, Bermúdez-Otero 2018)
>   ◦ Cophonology theory (Orgun 1996, Inkelas & Zoll 2007)
>   ◦ Optimal Interleaving (Wolf 2008)
>
> → These models will by and large have trouble with outward conditioning of any kind...

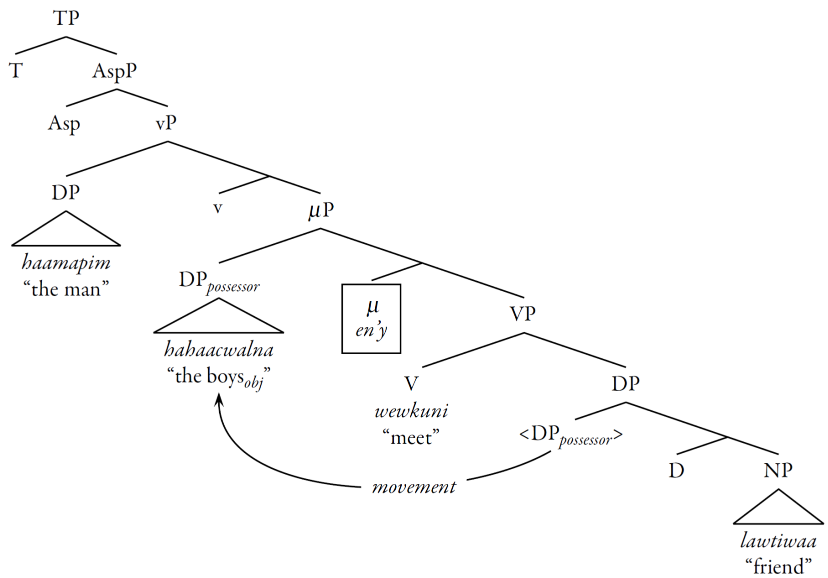
- People argue about this a lot, but most people believe this to be basically a correct prediction.
  → Deal & Wolf (2017) complicate the picture with evidence from Nez Perce.
  ◦ (See Caballero 2021 for similar arguments from Choguita Rarámuri.)

4.1 The view from Nez Perce

- There is a morpheme in Nez Perce (Northwestern US, Sahaptian) that is used in possessor raising constructions (39/40), which Deal & Wolf (2017) [DW] refer to as μ.
  ◦ "This head assigns case to the possessum DP; the possessor DP receives case from v." (DW:33)

(39) háama-pim hi-nées-wewkuny-[en'y]-Ø-e ha-háacwal-na láwtiwaa
man-ERG 3SUBJ-O.PL-meet-μ-P-REM.PAST PL-boy-OBJ friend.NOM
"The man met the boys' friend." (DW:34, ex. (14))

(40) Syntactic structure of Nez Perce possessor raising (DW:34, ex. (15))



- DW assume that the order of the affixes in the verb directly correlates with their relative syntactic structural position, standardly following Baker's (1985) "Mirror Principle" generalization.
  - Hence anything internal to VP is inside of μ, and anything above vP is outside of μ.
  - → All the suffixes that surface to the right of μ are syntactically above vP, and thus outward context.

- μ has two suppletive allomorphs:

(41) a. Long allomorph: *en'i* /ænʔi/
b. Short allomorph: *ey'* /æjʔ/

- The final segment in the *en'i* allomorph regularly changes to [y] (= IPA [j]) before vowels (to avoid hiatus).
  - This is a general phonological rule of the language.
  - It is therefore phonologically-*driven* allomorphy and does not need to be explained in the morphology.
- There are also alternations driven by regular vowel harmony, which can likewise be ignored.
- There's also some sort of alternation where certain morphemes trigger an [n(V)] element between them and the following morph.
  - DW insist the triggering feature is syntactic, because in verbs it correlates with unaccusativity.
  - It does not interact with allomorph selection for μ, so we can put it aside.

4.2 What conditions the μ allomorphy?

- DW argue that the distribution of the short allomorph (42) vs. the long allomorph (43) can only be explained by referring to the **following phonological context**.
  - → Under the assumptions about structure and order, *following context* means **outward looking**.

- If the sequence of suffixal phonological material that follows μ starts in a consonant-vowel sequence — /_CV(...) — we get the short form:

(42) Contexts where the short allomorph appears (DW:38, ex. (29))

Short form: *(n)ey'*

Form	Gloss
'aw-'yáx̂-nay'-sa-Ø	3OBJ-find-μ-imperfective.singular-present
'aw-'yáx̂-nay'-six-Ø	3OBJ-find-μ-imperfective.plural-present
'aw-'yáx̂-nay'-t'aax̂	3OBJ-find-μ-modal
'aw-'yáx̂-nay'-tato-Ø	3OBJ-find-μ-habitual.singular-present
'aw-'yáx̂-nay'-ta-Ø	3OBJ-find-μ-go.to-singular.imperative

- If not — i.e. /_(V,C)(C,#) — we get the long form:

(43) Contexts where the long allomorph appears (DW:38, ex. (28))

Long form: *(n)en'i / (n)en'y*

Form	Gloss
'aw-'yáx̂-nan'i-Ø	3OBJ-find-μ-imperative.singular
'aw-'yáx̂-nan'i-tx	3OBJ-find-μ-imperative.plural
'aw-'yáx̂-nan'i-s-Ø	3OBJ-find-μ-P.aspect-present
'iyáx̂-nan'i-t	find-μ-nominalizer
'aw-'yáx̂-nan'y-u'	3OBJ-find-μ-prospective.aspect
'aw-'yáx̂-nan'y-Ø-a	3OBJ-find-μ-P.aspect-remote.past

- While the rationale is not obvious, the conditioning is clear:

(44) a. $\mu \Leftrightarrow$ *ey'* / _ $_{\sigma}$[(= *the following material starts with a syllable boundary*)
b. $\mu \Leftrightarrow$ *en'i*

  - If the following context begins in a vowel, the μ-final segment would resyllabify as its onset, meaning that there is not a syllable boundary immediately to its right.
  - If the following context begins in a consonant that is not followed by a vowel, that suffix consonant will syllabify as a coda on the final syllable of μ, meaning that there is not a syllable boundary immediately to its right.
  - If the following context is null, there can obviously be no left-edge syllable boundaries to its right. This shows that it is not simply that the right edge of μ coincide with the right-edge of a syllable.

4.3 Phase-based spell-out

- There's at least one case where this seems to break down:
  - When μ is followed by the P.ASPECT morpheme /Ø/ plus additional material that begins in CV, we get the long form, not the short form.

(45) μ + P.aspect /Ø/ + CV → long form (DW:41, ex. (37))

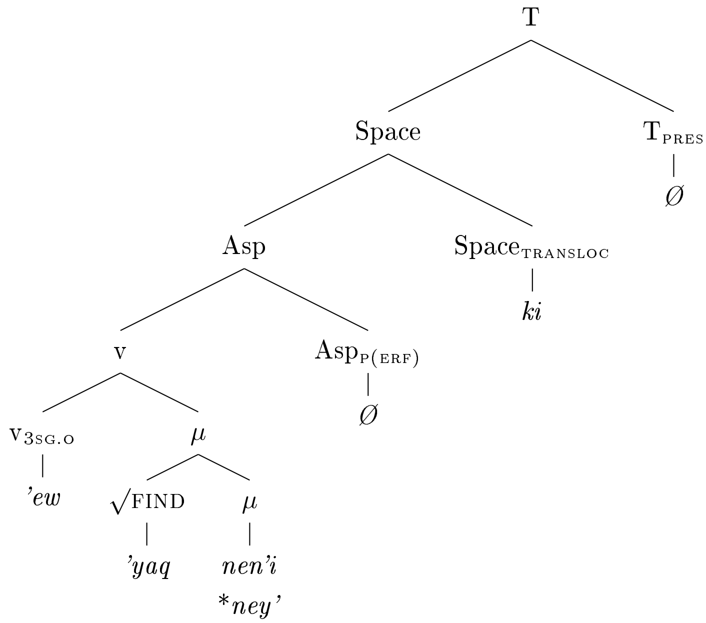
Long form

Form	Gloss
'aw-'yáx̂-nan'i-Ø-m-a	3OBJ-find-μ-P.aspect-cislocative-remote.past
'aw-'yáx̂-nan'i-Ø-ki-Ø	3OBJ-find-μ-P.aspect-translocative-present

- Judging purely by the output, the phonological string following μ initiates in CV, and so the context for the short form appears to be met.

→ **Why do we get the long form?** DW's answer: that material happens to not be available yet.
  - Consider the structure one such example:

(46) Structure of *'aw'yax̂nan'iki* with exponents



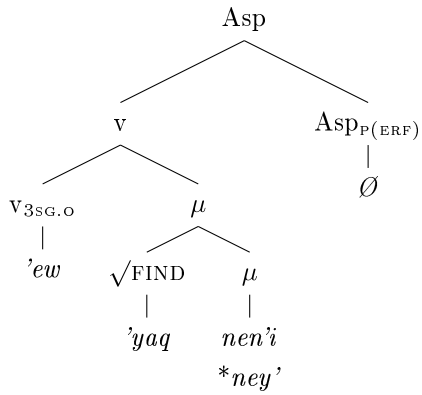
- If only the P.aspect /Ø/ is available at the point in the derivation where μ's exponent is selected, then we rightly predict the long form to appear. But if everything's there already, we wrongly predict the short form.
  ↪ So, we can explain the situation if we can find a way to say that the additional material is inserted **after** μ's VI rules are resolved, i.e. *too late* to condition its allomorphy.

⋆ **DW's proposal:**

1. In a derivation, there are (/can be) multiple *spell-out domains.*
   ↪ These spell-out domains may or may not correlate with syntactic *phases.*
2. Insertion is *cyclic by spell-out domain*, not by individual terminal node.
   ↪ Insertion in a lower spell-out domain takes place before material — both syntactic and phonological — in a higher spell-out domain is accessible to the (morphological) derivation.
3. All material in the same spell-out domain is in principle *mutually accessible.*
   ↪ This includes *phonological content of structurally higher terminals* in the spell-out domain.

- DW thus posit a phase (/spell-out domain) boundary between Aspect and Space.
  → Therefore, the structure that is available at the time-point of Vocabulary Insertion for μ is:

(47) Structure after spell-out of μ's phase



- The material that eventually creates the CV to the right of μ doesn't exist yet. Only P.aspect's /Ø/ exists.
  → Whatever the right way of doing VI for μ, this creates the context for the long allomorph, which is what we observe.
- Allomorphy becomes inert after insertion, so the addition of CV material to its right in the next spell-out domain will not change the exponent.

- DW come up with a novel way of determining the order of insertion *within* a spell-out domain.
  ◦ Essentially, if a morpheme has a context for the insertion of its morphs, it must be inserted *after* a morpheme that can supply that context.
  → This doesn't seem very well-developed to me, but I don't think it's a necessary piece of the main argument about spell-out domains; i.e., we could come up with a better of way doing insertion within spell-out domains.

∗ DW also detail another allomorphy pattern, involving roots, that has all the same crucial properties, and makes the same argument, perhaps with less interference from these questions about the order of insertion.

5 Possible sensitivities in allomorph conditioning

- Bonet & Harbour (2012) explore the interaction between several dimensions of allomorph conditioning:
  ◦ Inwards vs. outwards
  ◦ Phonological vs. morphosyntactic
  ◦ Long distance vs. adjacent

(48) Varieties of allomorphic sensitivities (Bonet & Harbour 2012:227, Table 6.12)

Direction	**Feature type**	**Locality**	**Example**
inwards	phonological	adjacent	Georgian (43)
inwards	phonological	long distance	none? (see p. 230)
inwards	morphosyntactic	adjacent	Latin (see p. 233)
inwards	morphosyntactic	long distance	Kiowa? (49)
outwards	phonological	adjacent	none? (see note 22)
outwards	phonological	long distance	none? (see note 22)
outwards	morphosyntactic	adjacent	Georgian (44)
outwards	morphosyntactic	long distance	Itelmen? (46)

- Based on the more recent work by DW and Caballero, we should at least be able to conditionally fill in the cell for *outwards phonological adjacent* allomorphy.
- As Bonet & Harbour point out, there are often so many moving parts that it can be hard to figure out exactly what categories to put any given pattern in, hence the question marks.

→ This is as far as I'll go with this in class, but *exploring one or two of these dimensions and their interaction would be a great paper topic.*

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