Allomorph selection precedes phonology: evidence from Yindjibarndi*

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1 Introduction

- **Phonologically conditioned suppletive allomorphy (PCSA)** describes cases of suppletive allomorphy where the distribution of allomorphs is determined by phonological considerations. (Carstairs 1988; term from Paster 2006).
  - PCSA can be optimizing, as is true for the Korean nominative suffix (1).

(1) Allomorphy in the Korean nominative suffix (Embick 2010:7)

	Allomorph	*Environment*	*Example*	*Gloss*
a.	-i	/C_	pap-i	'cooked rice'
b.	-ka	/V_	ai-ka	'child'

  - PCSA can be apparently non-optimizing, as in the Haitian Creole definite suffix ((2), though see Bonet et al. 2007 on this case).

(2) Allomorphy in the Haitian Creole definite suffix (Embick 2010:7)

	Allomorph	*Environment*	*Example*	*Gloss*
a.	-la	/C_	liv-la	'book'
b.	-a	/V_	tu-a	'hole'

- **Question:** should the analysis of PCSA be integrated with the analysis of regular phonology? Numerous different answers in the literature:
  1. *Yes:* the same constraints govern regular phonology and PCSA, so we should analyze them together (McCarthy & Prince 1993a,b; Raffelsiefen 2018, *a.o.*).
  2. *No:* allomorph selection is a morphological process that precedes regular phonology (Paster 2006, Embick 2010, *a.o.*).
  3. *It depends:* the analysis of optimizing cases of PCSA should be integrated with the analysis of regular phonology (Bonet et al. 2007, Smith 2015, *a.o.*).
- For a given data set, phonological and morphological analyses are usually both possible; arguments for one over the other hinge on which is more desirable.
- **This talk:** a case of PCSA in Yindjibarndi (Pama-Nyungan, Wordick 1982) that argues for [2], on the grounds that an integrated analysis is likely unworkable.

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Roadmap and main points

- *Empirical point:* for common nouns, the form of Yindjibarndi's locative suffix depends on phonological information.
  - Two suppletive allomorphs, /A/ and /B/, whose distribution is phonologically determined (by stem mora count, identity of final segment).
  - Suppletive allomorphs have predictable allomorphs (so /A/ → [A′, A″] and B → [B′, B″], whose distribution is governed by regular phonology.
- *Theoretical point:* though both reference phonological factors, suppletion and regular phonology reside in different components of the grammar.
  - The proposed analysis, in sketch form:
    - ⩾ Morphology determines the distribution of /A/ and /B/.
    - ⩾ Phonology governs distribution of [A′, A″] and (separately) [B′, B″].
- *The argument:* an analysis that integrates suppletion and regular phonology predicts that suppletion should repair more phonotactic problems than it does. Rankings for suppletive and non-suppletive allomorphy are inconsistent.

2 Data and proposed analysis

- The form of Yindjibarndi's locative case marker is determined by semantic and phonological information. (These generalizations from Wordick.)
  - *Semantic information:* noun class, of which Yindjibarndi has five. Each class takes a distinct set of locative allomorphs.[1]
  - *Phonological information:* the distribution of the common nouns' allomorphs ([-ŋka], [-wa], [-a], [-la], [-ta], [-ʈa], [-ca]) is phonologically predictable.
- In this talk I will focus only on the phonologically conditioned aspect of locative allomorphy. The distribution of the common nouns' allomorphs is in Table 1.

[1] Proper nouns take /-la/, common nouns take /-la/ or /-ŋka/, "retroflex" nouns take /-ʈa/, directional nouns that decline like "north" take /-t/, and directional nouns that decline like "south" take /-ji/.

Table 1: Locative allomorphs for common nouns (data from Wordick)

Seg. type	μ	NC?	Seg.	Morph	Example (all -LOC)
V	2μ	No		[-ŋka]	[juɻa-**ŋka**] ‘day’ (p. 149)
		Yes	[i a]	[-a]	[maɲci-**a**] ‘death adder’ (p. 33)
					[waɳʈa-**a**] ‘stick’ (p. 33)
			[u]	[-wa]	[wuntu-**wa**] ‘river’ (p. 33)
	3μ			[-la]	[loːpu-**la**] ‘Friday’ (p. 237)
C			[n]	[-ta]	[majtan-**ta**] ‘my gum tree’ (p. 22)
			[ɳ]	[-ʈa]	[kaɻwaɳ-**ʈa**] ‘summer’ (p. 210)
			[ɲ]	[-ca]	[wiʈaɲ-**ca**] ‘path’ (p. 247)
			[t ʈ c ɾ]	[-a]	[kuɳʈat-**a**] ‘daughter’ (p. 23)
					[t̪uɻuʈ-**a**] ‘prescribed’ (p. 23)
					[kaŋkac-**a**] ‘loose’ (p. 23)
					[maʈaɻ-**a**] ‘red ochre’ (p. 23)

- Four phonological factors determine the distribution of allomorphs.[2]
  1. **[±syllabic] value of stem’s final segment (“Seg. type”)**
     - Different sets of allomorphs appear on V-final and C-final stems.
     - For example: [-ŋka] appears with V-final stems, but never C-final stems.
  2. **Length of stem, in terms of moras (“μ”)**
     - For V-final stems, the allomorph that appears depends on length.
     - [-la] appears with 3μ stems; other allomorphs appear with shorter ones.
  3. **Whether or not the stem contains a nasal-stop cluster (“NC?”)**
     - For 2μ stems, allomorph depends on presence of NC in stem.
     - Allomorph is [-ŋka] if no NC is present, [-wa] or [-a] if one is.
  4. **Identity of final segment (“Seg.”)**
     - Identity of final segment conditions remaining differences in allomorphs.
     - For example: after N-final stems, there appears to be place assimilation.
- This looks like a lot of variation, but most can be attributed to regular phonology.
- If we assume (with Wordick p. 56) that two suppletive allomorphs /-ŋka/ and /-la/ underlie the variation in Table 1, the allomorphs are easy to derive.
  - /-ŋka/ has predictable allomorphs [-ŋka], [-wa], [-a] (unshaded rows in Tab. 1).
  - /-la/ has predictable allomorphs [-la], [-ta], [-ʈa], [-ca], [-a] (shaded rows).

[2] The instrumental suffix behaves identically; the only difference is that its allomorphs end in /u/.

- **For /-ŋka/**, allomorph that surfaces depends on *the stem’s segmental content.*
  - When /-ŋka/ doesn’t attach to an NC-containing stem, it appears normally (3).

(3) Suffixation of /-ŋka/ to V-final stems

a.	/malu+ŋka/	→ [malu-ŋka]	‘shade-LOC’ (p. 236)
b.	/maɻa+ŋka/	→ [maɻa-ŋka]	‘hand-LOC’ (p. 230)
c.	/juɻa+ŋka/	→ [juɻa-ŋka]	‘day-LOC’ (p. 149)

  - When /-ŋka/ attaches to an NC-containing stem, it appears as [(w)a] (4).

(4) Suffixation of /-ŋka/ to NC-containing stems

a.	/wuntu+ŋka/	→ [wuntu-wa]	‘river-LOC’ (p. 33)
b.	/waɳʈa+ŋka/	→ [waɳʈa-a]	‘stick-LOC’ (p. 33)
c.	/maɲci+ŋka/	→ [maɲci-a]	‘death adder-LOC’ (p. 33)

- These alternations arise from the interaction of two different processes, both of which are entirely general in the language.
  - Yindjibarndi has nasal cluster dissimilation (NCD, term from McConvell 1988): in a sequence of two NCs, the second N is deleted (Wordick p. 33).[3]
  - NCD affects affixes (compare (5a-b, c-d)) and is a static restriction on roots.

(5) Nasal cluster dissimilation affects topicalization clitic /mpa/

a.	/munti+mpa/	→ [munti-pa]	‘really-TOP’ (p. 34)
b.	/t̪aŋka+mpa/	→ [t̪aŋka-pa]	‘enough-TOP’ (p. 34)
c.	/n̪ula+mpa/	→ [n̪ula-mpa]	‘at this-TOP’ (p. 240)
d.	/paɻaː+mpa/	→ [paɻaː-mpa]	‘long time-TOP’ (p. 273)

  - Intervocalic /k/s are lenited to [w] between [u] and [a], and are deleted in all other intervocalic contexts (Wordick pp. 28, 32).

(6) Lenition and deletion of intervocalic /k/s[4]

a.	/paʈu+kaɭaː/	→ [paʈu-waɭaː]	‘feather-having’ (p. 28)
b.	/malu+ku/	→ [malu-u]	‘shade-OBJ’ (p. 208)
c.	/maja+kaʈa/	→ [maja-aʈa]	‘house-DIR.ALL’ (p. 30)
d.	/waɻapa+ku/	→ [waɻapa-u]	‘grass-OBJ’ (p. 70)
e.	/ŋamaji+ku/	→ [ŋamaji-u]	‘tobacco-OBJ’ (p. 188)
f.	/maɳi+kaɭaː/	→ [maɳi-aɭaː]	‘mark-having’ (p. 304)

[3] With a couple of small caveats. First, NCD only occurs if the second NC is a homorganic labial or velar cluster ([mp] or [ŋk]). Second, it is likely that NCD only occurs when the NCs are separated by vowels or glides: a [+consonantal] segment likely blocks NCD. See the appendix and Stanton (2019) for more details on and analysis of this case.

[4] Yindjibarndi has no /ki/-initial suffixes, so there is no data on underlying /uki/, /aki/, and /iki/.

- The alternations in the locative can be straightforwardly modeled as a feeding interaction between NCD and lenition/deletion ((7), as noted by Wordick p. 33).

(7) /-ŋka/ allomorphy results from NCD and lenition

a. NCD results in the loss of the suffixal [ŋ].
   (i) /wuntu-ŋka/ → wuntu-ka
   (ii) /waɳʈa-ŋka/ → waɳʈa-ka
   (iii) /maɲci-ŋka/ → maɲci-ka

b. Newly intervocalic [k] is lenited in u_a and deleted elsewhere
   (i) wuntu-ka → [wuntu-wa]
   (ii) waɳʈa-ka → [waɳʈa-a]
   (iii) maɲci-ka → [maɲci-a]

- For an analysis, I assume (8–12). (This analysis is relevant to later discussion.)

(8) ***[+syll][DORS, -son][+syll] (*VkV)**:
A * for each intervocalic dorsal obstruent.

(9) ***[-back, +syll][DORS, -cons][+syll] (*{i,a}wV)**:
A * for each [w] preceded by [i] or [a] and followed by another vowel.

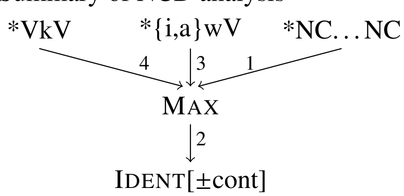
(10) ***NC…NC**:
A * for each pair of NCs.

(11) **MAX**:
A * for each input segment that lacks an output correspondent.

(12) **IDENT[±cont]**:
A * for each [αcont] input seg. whose output corr. is [-αcont].

– The ranking necessary to generate NCD and lenition is in (13).

(13) Summary of NCD analysis



– Illustration of ranking arguments, with tableaux:

1. *NC…NC ≫ MAX: /wuntu+ŋka/ → [wuntu-wa] ≻ *[wuntu-ŋka]

(14)

/wuntu+ŋka/	*NC…NC	MAX
a. [wuntu-ŋka]	*!	
☞ b. [wuntu-wa]		*

2. MAX ≫ IDENT[±cont]: /wuntu+ŋka/ → [wuntu-wa] ≻ *[wuntu-a]

(15)

/wuntu+ŋka/	MAX	IDENT[±cont]
☞ a. [wuntu-wa]		*
b. [wuntu-a]	*!	

3. *{i,a}wV ≫ MAX: /maɲci+ŋka/ → [maɲci-a] ≻ *[maɲci-wa]

(16)

/maɲci+ŋka/	*{i,a}wV	MAX
a. [maɲci-wa]	*!	
☞ b. [maɲci-a]		*

4. *VkV ≫ MAX: /maɲci+ŋka/ → [maɲci-a] ≻ *[maɲci-ka]

(17)

/maɲci+ŋka/	*VkV	MAX
a. [maɲci-ka]	*!	
☞ b. [maɲci-a]		*

- **For /-la/**, the allomorph that surfaces depends on *the stem's final segment*.

– When /-la/ is suffixed to a vowel-final stem, it appears as expected.

(18) Suffixation of /-la/ to vowel-final stems
   a. /loːpu+la/ → [loːpu-la] 'friday-LOC' (p. 237)
   b. /paɽkaɾa+la/ → [paɽkaɾa-la] 'plain-LOC' (p. 210)

– When /-la/ is added to a C-final stem, either modification or deletion is possible.

⋗ When /-la/ is added to a nasal-final stem, /l/ hardens and place-assimilates.

(19) N-final stems: /l/ hardening and place assimilation
   a. /kaɾwaɳ+la/ → [kaɾwaɳ-ʈa] 'summer-LOC' (p. 210)
   b. /majtan+la/ → [majtan-ta] 'my gum tree-LOC' (p. 22)
   c. /wiʈaɲ+la/ → [wiʈaɲ-ca] 'path-LOC' (p. 247)

⋗ When /-la/ is added to a stem ending in a stop or a tap, /l/ deletes.

(20) Other C-final stems: /l/ deletion
   a. /kuɳʈat+la/ → [kuɳʈat-a] 'daughter-LOC' (p. 23)
   b. /t̪uruʈ+la/ → [t̪uruʈ-a] 'prescribed-LOC' (p. 23)
   c. /kaɲkac+la/ → [kaɲkac-a] 'loose-LOC' (p. 23)
   d. /maʈaɾ+la/ → [maʈaɾ-a] 'red ochre-LOC' (p. 23)

- These alternations aren't predictable from regular phonology, but the generalizations on clusters that they respect are. For a full analysis, see the appendix; some generalizations (drawn from Wordick's pp. 14-16 and lexicon) are below.[5]

[5] Note that the final consonants in Yindjibarndi are [n ɳ ɲ t ʈ c ɾ], so the examples below are exhaustive.

– *Why harden after a nasal?* Laterals are never the second member of clusters (21), so some modification is necessary to avoid an illicit cluster.

(21) Possible Yindjibarndi cluster types

		C_2			
		Stop	Nasal	Lateral	Glide
C_1	Stop	✓			
	Nasal	✓	✓		
	Lateral	✓			
	Glide	✓	(✓)		(✓)

– *Why place-assimilate after a nasal?* While heterorganic NC clusters are permitted, coronal NC clusters (in gray) typically agree in minor place (22).

(22) NC clusters in Yindjibarndi (counts from Wordick's lexicon)

		C_2					
		p	t̪	t	ʈ	c	k
C_1	m	75					
	n̪		63				
	n	26		97		19	59
	ɳ	11			132	5	26
	ɲ	2				66	12
	ŋ						141

– *Why delete after a stop?* Other options aren't great: stops must be followed by stops (21); heterorganic coronal CCs and geminates are dispreferred (23).

(23) CC clusters in Yindjibarndi (counts from Wordick's lexicon)

		C_2					
		p	t̪	t	ʈ	c	k
C_1	p						
	t̪						
	t	14				6	1
	ʈ	1				1	1
	c	11					2
	k						

– *Why delete after /ɾ/?* Coronal consonants never follow /ɾ/.

– The full details of how this analysis works are not relevant for what follows.

- **The final piece of the analysis** is to analyze the distribution of /-ŋka/ and /-la/.
  – Basis for treating this as suppletion: no regular alternations between [l], [ŋk].
  – How to regulate which suppletive allomorph occurs in which context?
  – My proposal: the distribution of suppletive allomorphs is morphologically determined, perhaps by Vocabulary Insertion rules ((24), Halle & Marantz 1993).

(24) Vocabulary insertion rules for locative suffix on common nouns

a. [LOC] ↔ /-ŋka/ / C_0VC_0V__ , C_0Vː __

b. [LOC] ↔ /-la/

⋗ Exact formalization doesn't matter here: the distribution could be captured with subcategorization frames (à la Paster 2006), or in some other way.

⋗ What matters: phonology does not get to choose between /-la/ and /-ŋka/.

- **In sum**, I assume the following analysis of the Yindjibarndi locative:
  – There are two suppletive allomorphs, /-la/ and /-ŋka/, whose distribution is phonologically conditioned but governed by the morphology.
  – Each gives rise to a set of allomorphs (/-la/ → [-la], [-ta], [-ʈa], [-ca]. [-a]; /-ŋka/ → [-ŋka], [-wa], [-a]) whose distribution is governed by regular phonology.
  – Few formal details (constraint definitions, morphological analysis, etc.) matter; what's important is the separation of suppletive and non-suppletive allomorphy.

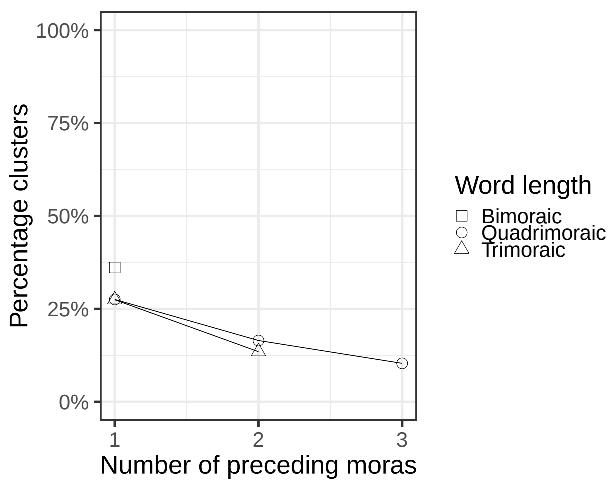
3 An alternative: all allomorphy is phonology

- A potential criticism of the morphological analysis of suppletion proposed in (24): it misses generalizations that link suppletive and non-suppletive allomorphy.
  – All allomorphy, suppletive or otherwise, is phonologically conditioned.
  – Furthermore, the same phonological generalizations are relevant to suppletive and non-suppletive allomorphy.
    ⋗ For shorter (2μ) stems, [±syllabic] value of the final segment determines whether the allomorph is /-ŋka/ or /-la/.
    ⋗ For longer stems, [±syllabic] value of the final segment determines whether /-la/ surfaces as [-la] or something else ([-ta], [-ʈa], etc.).
  – So why not analyze both types of allomorphy together, in the phonology?
- **This section:** an integrated analysis of suppletion and phonology, and why it fails.
- One way to analyze the aspect of suppletion that depends on **mora count**:
  – There is a general preference to use the allomorph /ŋka/ (25); this is enforced by PRIORITY ((26); Mascaró 2007:726).

(25) Preferred ordering of allomorphs
LOC = {$/\text{ŋka}/_1 > /\text{la}/_2$}

(26) PRIORITY: Respect lexical priority (ordering) of allomorphs.

Figure 1: Frequency of clusters, by word length and position in word



– Why is /-ŋka/ not used for longer stems? Potentially: a language-wide dispreference for clusters that appear later, in longer words (Figure 1[6]).

  ⋗ Figure 1: frequencies of clusters by position, in 2-4μ words (90% of lexicon).
  ⋗ Word length matters: clusters more frequent in 2μ words (a**mp**a > a**mp**ala).
  ⋗ Position matters: in 3μ and 4μ words, clusters are more frequent after 1μ than after 2μs (a**mp**ala > ala**mp**a); in 4μ words, clusters more frequent after 2μs than after 3μs (ala**mp**ata > alata**mp**a).
  ⋗ Suggests that attaching /-la/ to 3μ and longer stems may be a way to avoid placing a cluster in a position where it would be dispreferred.

– I formalize this dispreference as (27), in line with the trends in Figure 1.

(27) *μ_2CCμ: assign a * for each cluster with at least two preceding moras.

– To take effect, *μ_2CCμ must dominate PRIORITY.

• The aspect of suppletion that depends on the identity of the **stem-final segment** can also be linked to more general facts about Yindjibarndi phonotactics.

– Triconsonantal clusters are unattested; this motivates the constraint in (28).

(28) *CCC: a * for each sequence of three consonants.

– If /-ŋka/ attached to C-final /majtan/, the result would be illicit *[majtan-ŋka]. Using /-la/ instead violates PRIORITY, but avoids a *CCC violation.

[6]Plot made in R's ggplot2 (Wickham 2016), data from Wordick's lexicon.

• The fact that suppletion is the preferred repair to *CCC and *μ_2CCμ shows us that PRIORITY is low-ranked; it's dominated, for example, by MAX (11).

• Putting it all together: this case of PCSA instantiates the ranking in (29).

(29) *CCC, *μ_2CCμ, MAX ≫ PRIORITY

• For longer stems, using /-la/ avoids violation of *μ_2CCμ (30a) or MAX (30b).

(30) Allomorph used for longer stems is /-la/

/loːpu+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC, *μ_2CCμ MAX	PRIORITY
a. [loːpu-ŋka$_1$]	*μ_2CCμ !	
b. [loːpu-wa$_1$]	*MAX!	
☞ c. [loːpu-la$_2$]		*

• For short C-final stems, using /-la/ avoids violation of *CCC (31a) or MAX (31b).[7]

(31) Allomorph used for shorter, C-final stems is /-la/

/majtan+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC, *μ_2CCμ MAX	PRIORITY
a. [majtan-ŋka$_1$]	*CCC!	
b. [majtan-ka$_1$]	*MAX!	
☞ c. [majtan-ta$_2$]		*

• For short V-final stems, /ŋka/ surfaces due to PRIORITY.

(32) Allomorph used for shorter, V-final stems is /-ŋka/

/malu+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC, *μ_2CCμ MAX	PRIORITY
☞ a. [malu-ŋka$_1$]		
b. [malu-la$_2$]		*!

• **In sum:** suppletion can be analyzed as the interaction of phonological constraints with an allomorph preference constraint.

[7]In light of the discussion that follows, it's worth asking whether or not a ranking like M ≫ PRIORITY ≫ MAX could also account for (30–31), where M is a markedness constraint that rules out (30b) and (31b). For (30b), this could be a constraint stipulating that /-ŋka/ and its allomorphs may not be attached to trimoraic or longer forms. For (31b), an equivalent move is likely not feasible. One could appeal to a restriction on heterorganic NCs, but NC clusters that disagree in major place are attested within roots ([kanka] 'height, top' (p. 288)) and across other stem-suffix boundaries ([ɲin-ku] 'you-OBJ' (p. 219); [puɽkuɳ-ku] 'close smoke-OBJ' (p. 215)). In addition, such an analysis would not be able to rule out a further candidate, [majtan-a$_1$], which poses no obvious phonotactic problem.

- **Problem:** the ranking MAX ≫ PRIORITY makes incorrect predictions when we try to integrate it with the analysis of NCD.
  - NCD characterized by the ranking *NC…NC ≫ MAX.
  - Adding MAX ≫ PRIORITY predicts suppletion rather than NCD (33).

(33) MAX ≫ PRIORITY makes wrong prediction for /waɳʈa+ŋka/

/waɳʈa+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*NC…NC	MAX	PRIORITY
a. [waɳʈa-ŋka$_1$]	*!		
☹ b. [waɳʈa-a]		*!*	
💣 c. [waɳʈa-la$_2$]			*

  - Fixing this problem would require us to rank PRIORITY over MAX.

Problem for the integrated analysis

- Suppletive allomorphy shows us that it is better to use the “wrong” allomorph than it is to delete a consonant (in the service of *CCC, *μ_2CCμ).

(34) *CCC, *μ_2CCμ, **MAX ≫ PRIORITY**

- Non-suppletive allomorphy shows us that it is better to delete a consonant than it is to use the “wrong” allomorph (in the service of *NC…NC).

(35) *NC…NC, **PRIORITY ≫ MAX**

- This is a ranking paradox. There is no solution that I am aware of.
- Why does the integrated analysis run into this problem?
  - If we allow the grammar to treat suppletion as a potential repair that can be prioritized over other repairs, like deletion, we expect this hierarchy to hold in all cases where both repairs are in principle available.
  - This doesn’t happen; suppletion solves some problems, deletion others.
- The proposed analysis avoids this problem by depriving phonology of the option to use suppletion as a repair to phonotactic problems.

4 Summary

- **Claim**: PCSA in the Yindjibarndi locative suffix should be analyzed in the morphology, *even though the allomorph distribution appears to be optimizing*.
- **Evidence**: an integrated analysis that relates suppletion to broader phonotactic patterns is not just undesirable, but likely unworkable.
- **Broader contribution**: provides support for analyses of suppletion as a morphological operation that precedes phonology.

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Appendix

Analysis of /l/-hardening and place assimilation

- There are several suffixes in Yindjibarndi that end with /l/. When these suffixes are attached to a C-final word, the /l/ undergoes changes.
  - If the C-final word ends with a nasal, /l/ hardens and place-assimilates.

(1) /l/ hardening and place assimilation

a.	/karwaɳ+la/	→ [karwaɳ-ʈa]	'summer-LOC'
b.	/majtan+la/	→ [majtan-ta]	'my gum tree-LOC'
c.	/wiʈaɲ+la/	→ [wiʈaɲ-ca]	'path-LOC'

  - If the C-final word ends with a stop or /ɾ/, the /l/ deletes.

(2) /l/ deletion

a.	/kuɳʈat+la/	→ [kuɳʈat-a]	'daughter-LOC'
b.	/t̪uɾuʈ+la/	→ [t̪uɾuʈ-a]	'prescribed-LOC'
c.	/kaɲkac+la/	→ [kaɲkac-a]	'loose-LOC'
d.	/maʈar+la/	→ [maʈaɾ-a]	'red ochre-LOC'

  - NB: the only licit word-final consonants in Yindjibarndi are [t ʈ c n ɳ ɲ ɾ]. (This means that the data provided above exhaust the possible clusters.)

- The fact that /l/ is modified in these clusters is linked to a general prohibition on laterals as C_2 in a cluster. We can express this as (3), abbreviated as *CL.

(3) *[-syll][+cons, +son] (*CL): a * for each consonant-lateral cluster.

- The choice between hardening (and place assimilation) and deletion is governed by further constraints on cluster composition.
  - Hardening and place assimilation occur after nasals, in line with constraints on NC composition ((4); counts from Wordick's lexicon).

(4) Attestedness and frequency of different NC types

		C_2					
		p	t̪	t	ʈ	c	k
C_1	m	75					
	n̪		63				
	n	26		97		19	59
	ɳ	11			132	5	26
	ɲ	2				66	12
	ŋ						141

- A few observations from (4):
  - ⋗ All homorganic NCs (in black) are attested.
  - ⋗ Coronal-noncoronal clusters are generally licit, with the exception of n̪C.[1]
  - ⋗ Coronal-coronal clusters that disagree in minor place are restricted.
- Constraints in (5–8) account for the restrictions on clusters. (All restrictions are independently attested in Australian languages; Hamilton 1995).

(5) *[+distrib][-distrib]: a * for each [+distrib] coronal (dental or palatal) followed by a [-distrib] coronal (alveolar or retroflex).

(6) *[αdistrib, βant][αdistrib, -βant]: a * for each pair of consonants that agree for [±distrib] but disagree for [±ant].

(7) *[-distrib]//[+distrib, +ant]: a * for each dental consonant that follows a [-distrib] consonant.

(8) *[-cor, αplace][βplace]: a * for each labial or velar that precedes a consonant at a difference place of articulation.

- To save space in the analysis, I'll use a cover constraint, *BADCLUS, which assigns violations for each of (5–8).

- *CL and *BADCLUS force the /l/ to map to a non-liquid (due to low-ranked IDENT[±son]) that place-assimilates to the preceding nasal.
  - I assume that IDENT[±ant] and IDENT[±distrib] are low-ranked but active.
  - By contrast, I assume that IDENT[±cor] and MAX are high-ranked (the evidence for this: /l/ never maps to [p] or [k]; deletion does not occur).

- A couple of sample tableaux, to demonstrate how this analysis works:

(9) /n+l/ → [n-t]

/n+l/	*CR	*BADCLUS	IDENT[±cor]	IDENT[±son]	MAX	IDENT[±ant]	IDENT[±distrib]
a. [n-l]	*!						
☞ b. [n-t]				*			
c. [n-c]				*		*!	*
d. [n-k]			*!	*			
e. [n]					*!		

[1]It is possible that the distribution of dentals is less constrained than the lexicon suggests: Wordick's fn. 3, on p. 15, notes that when dental consonants follow another C the result seems somewhat 'funny'. It's not clear however exactly which of these clusters are attested, so my analysis follows the lexicon.

(10) /ɳ+l/ → [ɳ-ʈ]

/ɳ+l/	*CR	*BADCLUS	IDENT[±cor]	IDENT[±son]	MAX	IDENT[±ant]	IDENT[±distrib]
a. [ɳ-l]	*!	*					
b. [ɳ-t]		*!		*			
☞ c. [ɳ-ʈ]				*		*	
d. [ɳ-k]			*!	*			
e. [ɳ]					*!		

- Deletion of /l/ after a stop can be traced to a restriction on stop-stop clusters at the same place of articulation (11).

(11) Attestedness and frequency of different CC types

		C_2: p	t̪	t	ʈ	c	k
C_1	m						
	t̪						
	t	14				6	1
	ʈ	1				1	1
	c	11					2
	k						

- Why not map /l/ to something other than a stop? Because stop-sonorant clusters are unattested ((12); parentheses indicate marginal cluster types).[2]

(12) Possible types of clusters in Yindjibarndi

		C_2: Stop	Nasal	Lateral	Glide
C_1	Stop	✓			
	Nasal	✓	✓		
	Lateral	✓			
	Glide	✓	(✓)		(✓)

- These patterns can be captured with the constraints in (13–14). (MAX is split into MAX[-lateral] and MAX[+lateral], to explain why the [l] preferentially deletes.)

[2] With the two exceptions of [puɭutmu] 'before reaching the goal' and [wutli] 'Woodley King' (a name borrowed from English).

(13) *[-son, αplace][-son, αplace] (*TT): a * for each stop followed by another stop at the same major place.

(14) *[-son][+son]: a * for each stop followed by a sonorant.

- IDENT[±cor] acts with (13–14) to prevent /l/ from mapping to any other segment. A sample tableau follows.

(15) /t+l/ → [t-l]

/t+l/	*TT	*[-son][+son]	IDENT[±cor]	MAX[-lateral]	MAX[+lateral]
a. [t-l]		*!			
b. [t-t]	*!				
c. [t-c]	*!				
d. [t-p]			*!		
☞ e. [t]					*
f. [l]				*!	

- This can't be the full story, though – as is clear from (11), some heterorganic coronal-coronal clusters are possible, but the ranking in (15) rules them out.
  - [tc] and [ʈc] are rare but attested (16); most involve the verbalizer /-caɾi/.

    (16) Examples of coronal heterorganic stop-stop clusters

    a. [mitcu] 'talon'
    b. [paɾat-caɾi] 'get stuck'
    c. [yiːmit-caɾi] 'get itchy'
    d. [wiɾaʈ-caɾi] 'feel like'

  - One way to account for their existence would be to rank MAX[-lateral] and IDENT[place]/[-lateral] (17) over *TT: if /t+c/ is underlying, it must surface.

    (17) IDENT[place]/[-lateral]: a * for each input [-lateral, αplace] segment whose place specification is [βplace].

  - A full account of this requires these faithfulness constraints to be dominated in turn by (5–8), to ensure that not all heterorganic clusters surface.
  - I don't provide tableaux or a worked-out analysis of this here, but (as far as I can tell) the necessary revisions do not jeopardize the analysis of /l/-alternations.

- Finally, we need to account for why /l/ deletes after /ɾ/.

  – As is evident from (12), [l] (a lateral) cannot follow [ɾ] (a glide). This follows from the general prohibition on laterals as C_2 (*CL).

  – There is also a dispreference for homorganic clusters where a glide is C_1.

(18) Attestedness and frequency of glide-stop clusters

C_1 \ C_2	p	t̪	t	ʈ	c	k
w						
ʋ						
ɾ	2				2	32
ɻ	32					35
j						1

(19) Attestedness and frequency of glide-nasal clusters

C_1 \ C_2	m	n̪	n	ɳ	ɲ	ŋ
w						
ʋ						
ɾ	6				1	
ɻ						
j						

(20) Attestedness and frequency of glide-glide clusters

C_1 \ C_2	w	ʋ	ɾ	ɻ	j
w					
ʋ					
ɾ	38				2
ɻ					
j					

  – These patterns suggest the constraint in (21), abbreviated as *RT.

(21) *[-cons, -syll, αplace][-syll, αplace] (*RT): a glide may not be followed by another consonant at the same major place of articulation.

  – *RT, with *CL and IDENT[±cor], predicts that /l/ should delete following /ɾ/ (22): other possible repairs violate high-ranked constraints.

(22) /ɾ+l/ → [ɾ]

/ɾ+l/	*CL	*RT	IDENT[±cor]	MAX[-lat]	MAX[+lat]
a. [ɾ-l]	*!				
b. [ɾ-t]		*!			
c. [ɾ-c]		*!			
d. [ɾ-p]				*!	
☞ e. [ɾ]					*
f. [l]			*!		

- Again, this can't be the full story: [ɾc], [ɾɲ], and [ɾj] are rare but attested (23). The ranking in (22) would however rule them out.

(23) Examples of tap-palatal clusters

a.	[cimpuɾ-cimpuɾ]	'speckled (like a crow's egg)'
b.	[paɻaɾci]	'seagull'
c.	[paɻpaɾ-ɲuŋu]	'bird, airplane'
d.	[kaŋkuɾja]	'forktail catfish'

  – An analysis of these facts could appeal to MAX[-lateral] and IDENT[place]/[-lateral], to explain why these clusters are permitted to surface.

  – The set of constraints that dominate MAX[-lateral] and IDENT[place]/[-lateral] would likely need to be more extensive than those in (5–8), as the set of permitted glide-initial clusters is more restricted.

  – Again, I don't provide a worked-out analysis, but (as far as I could tell) the necessary revisions would not jeopardize the analysis of /l/-alternations.

- In sum: the ranking in Figure 1 accounts for the alternations when /l/ attaches to a C-final stem. Further constraints and rankings are necessary for a full analysis.

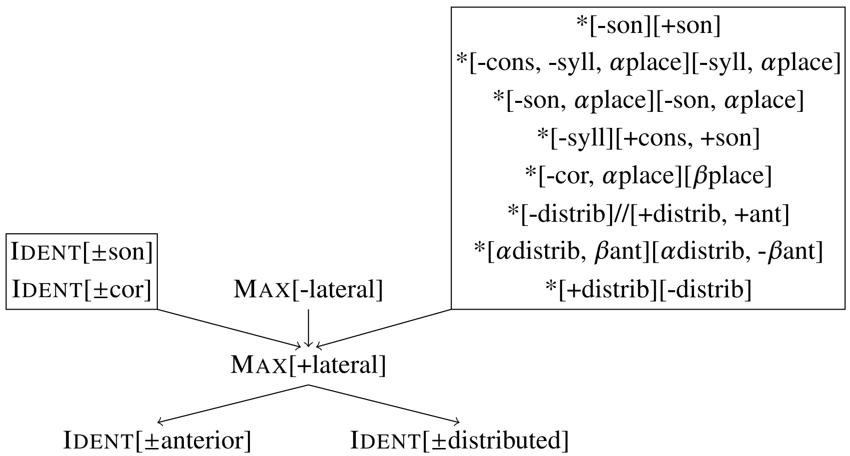
A serial analysis and its troubles

- An analysis where phonological and morphological operations are serially interleaved (à la Wolf 2008) can derive the locative facts, but has problems with others.

  – The analysis below is framed in Harmonic Serialism (McCarthy 2010).

  – This differs from Wolf's proposal, but preserves the insight that morphological and phonological operations can be serially interleaved.

Figure 1: Summary of /l/-alternations analysis



- This analysis makes the same assumption that /-ŋka/ is the preferred exponent of the locative for common nouns, and uses the constraints in (24–27).[3]

(24) *CCC: a * for each sequence of three adjacent consonants.

(25) *NC…NC: a * for each pair of NCs.

(26) PRIORITY: Respect lexical priority (ordering) of allomorphs.

(27) MAX: a * for each input C that lacks an output correspondent.

- For a serial analysis, we want to model the following order of operations:
  – Allomorph choice: [-ŋka] in the general case, [-la] in case a *CCC violation would result from attaching [-ŋka].
  – Allomorphy for /-ngka/: [-ngka] generally, [-(w)a] in case a *NC…NC violation would result from realizing /-ŋka/ faithfully.
- The ranking that gives us this order of operations is below.

(28) *CCC ≫ PRIORITY ≫ *NC…NC ≫ MAX

[3]This analysis does not take into account the mora-counting aspect of allomorphy; its successes and failures are clear from the aspect of allomorphy that appeals to the stem-final consonant.

- **Derivation of [majtan-tu] 'my gum tree-LOC'**
  – I assume morph insertion must happen, and that it must happen first.
  – (This is equivalent to a claim that MAXMORPH is inviolable; I don't include this constraint or candidates that violate it in the tableaux that follow.)

(29) Step 1: morph insertion

majtan+LOC LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC	PRIORITY	*NC…NC	MAX
☞ a. majtan-la$_2$		*		
b. majtan-ŋka$_1$	*!			

(30) Step 2: hardening of [l] to [t] (not shown)

- **Derivation of [wuntu-wa] 'river-LOC'**

(31) Step 1: morph insertion

wuntu+LOC LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC	PRIORITY	*NC…NC	MAX
a. wuntu-la$_2$		*!		
☞ b. wuntu-ŋka$_1$			*	

(32) Step 2: resolution of *NCVNC violation

wuntu-ŋka	*CCC	PRIORITY	*NC…NC	MAX
a. wuntu-ŋka			*!	
☞ b. wuntu-ka				*

(33) Step 3: lenition of [k] to [w] (not shown)

- But: /-mpa/, a topicalization clitic, poses problems for this analysis.
- **Bizarre lookahead with topicalization clitic /-mpa/**
  – Just as [-ŋka] alternates with [-(w)a], [-mpa] alternates with [-pa] as a function of the preceding environment.[4]

(34) Nasal deletion in [-mpa] (Wordick 1982:34,273)

a.	/munti+mpa/	→ munti-pa	'really-TOP'
b.	/t̪aŋkaɾ+mpa/	→ t̪aŋkaɾ-pa	'enough-TOP'
c.	cf. /paraː+mpa/	→ paraː-mpa	'long time-TOP'

  – The data in (34) is easy to account for; I've taken out PRIORITY from the tableaux below, as it's no longer relevant.

[4]The example in (b) demonstrates that NCD can occur through a single consonant. It's not clear from Wordick's description if this is just [ɾ] or all single consonants.

(35) Step 1: morph insertion

/t̪aŋkar+TOP TOP = /mpa/	*CCC	*NC...NC	MAX
☞ a. t̪aŋkar-mpa	*	*	

(36) Step 2: resolution of *CCC and *NCVNC

t̪aŋkar-mpa	*CCC	*NC...NC	MAX
a. t̪aŋkar-mpa	*!	*	
☞ b. t̪aŋkar-pa			*

– The problem: [-mpa] suffixation to C-final stems is not possible unless that stem is NCVC-final, i.e. unless NCD would apply and eliminate a C.

– Wordick (p. 34) is extremely clear about this. Apropos of (34b), he writes:

> "The reader should understand that this is not simply a reduction of an impossible triconsonantal cluster to a disyllabic [sic] one: the topic clitic will just not fit on words ending in a consonant with no immediately preceding nasal plus stop cluster [...] Gilbert Bobby tells me that the only thing you can do in this case is to use the emphatic clitic in its place.[5]"

– I take Wordick's quote to mean that it's possible to delete a C in service of *NCVNC, but not *CCC.

  ⋗ Parallel to facts for locative discussed in the main handout.

  ⋗ The difference: clitic has no other allomorphs. If a *CCC violation would result, the word is impossible, and speakers resort to other strategies.

– Confirming with a hypothetical example that the current analysis fails:

(37) Step 1: morph insertion

maʈar+TOP TOP = /mpa/	*CCC	*NC...NC	MAX
☞ a. maʈar-mpa	*		

(38) Step 2: resolution of *CCC and *NCVNC

maʈar-mpa	*CCC	*NC...NC	MAX
a. maʈar-mpa	*!		
☹ b. maʈar-pa			*

– We can fix this by ranking MPARSE between *CCC and MAX.

[5]The emphatic clitic is /-pa/. How can we tell that it is really a different morpheme? Because the /p/ of emphatic /-pa/ lenites, but the /p/ of the topicalization /-mpa/ does not (compare /munti+mpa/ → [munti-pa] 'truly-TOP' to /munti+pa/ → [munti-wa] 'truly-EMP'). In rule-based terms, /p/-lenition counterfeeds NCD. I wasn't able to find examples of the emphatic after [ɾ] to confirm that it lenites in that context too, but this is what's expected given Wordick's description of lenition.

(39) Step 1: morph insertion

maʈar+TOP TOP = /mpa/	*CCC	MPARSE	MAX
a. maʈar-mpa	*!		
☞ b. ⊙		*	

– But this predicts that /thangkarr+TOP/ should lead to a null parse, too.

(40) Step 1: morph insertion

t̪aŋkar+TOP TOP = /mpa/	*CCC	MPARSE	MAX
a. t̪aŋkar-mpa	*!		
☞ b. ⊙		*	

– I call this a 'bizarre lookahead' problem because it has the flavor of lookahead, but the actual problem is elsewhere.

  ⋗ Culprit here is *CCC ≫ MAX; it predicts that Cs should be deletable in response to *CCC violations. Suggested by richness of the base.

  ⋗ No way to account for the behavior of [-mpa] with this ranking in place.

- **It's possible to save the serialist analysis, but it gets really complicated.**

  – Analysis necessarily involves 2 strata and a control component (à la Orgun & Sprouse 1999).

(41) Stratum 1: ***CCC ≫ PRIORITY ≫ *NC...NC ≫ MAX**
Derives correct allomorphy patterns for case-marked forms

(42) Stratum 2 (Cliticized forms): ***NC...NC ≫ MAX ≫ *CCC**
Derives nasal cluster dissimilation for cliticized forms. A contrast arises between forms like [t̪aŋkar-pa], with NCD, and [maʈar-mpa], with a CCC cluster. But both are licit.

(43) Control component: ***CCC**
Prohibits forms with an illegal CCC, like [maʈar-mpa], from surfacing.

- **In sum**: a successful analysis involves serialism, strata, and a control component. Maybe better to pursue an alternative, like the modular analysis for the locatives.

  – Restrictions on topicalization morpheme can be captured with restrictions on the contexts where /-mpa/ can be inserted.

(44) Vocabulary insertion rule (Halle & Marantz 1993) for /-mpa/
[TOP] ↔ /-mpa/ / V__, NCVC__

  – NCD then remains part of regular phonology, and does not play a role in determining whether or not /-mpa/ gets inserted.