Linearity and the status of tier-based representations: a case study of Uab Meto metathesis

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1 Overview

- Languages differ on what linear orders are contrastive
- In English, all segments are ordered with respect to one another (and thus consonant-vowel orders are contrastive):[1]

(1) **English**

a.	sɑp	'sop'	spɑ	'spa'
b.	ski	'ski'	sik	'seek'
c.	sɑɪt	'sight'	stɑɪ	'sty'
d.	fɹi	'free'	fiɹ	'fear'
e.	ɹion	'reown'	ɹino	'Reno'
f.	pɛɪji	'payee'	pijɛɪ	'PA'

- In Uab Meto (Austronesian; Timor, Indonesia) consonants are only ordered with respect to one another (as are vowels), and so surface order between consonants and vowels optimizes phonotactics and is <u>not</u> contrastive:

(2) **Uab Meto**

a.	mɛop	'work'	ɑ-mɛpo-t	'worker'
b.	ʔoɛl	'younger brother'	ʔolɛ-f	's.o.'s younger brother'
c.	sonɑf	'palace'	sonfɑ-m	'palace-and'
d.	mɑun	'chicken'	mɑnu	'chicken (phrase final)'

- Some linear order changes are predictable from the variants in the phonotactic environment, such as affixation or prosodic position – these are always variants on CV/VC orders
- However, precedence relationships between consonants are unpredictable and need to be stored; the same goes for vowel-vowel precedence relationships

(3) Consonant-Consonant Precedence is Unpredictable

a.	nisi	'tooth'	sini	'filter'
b.	tɑʔɛ	'border'	ʔɑtɛ	'liver'

(4) Vowel-Vowel Precedence is Unpredictable

a.	pɛoʔ	'tell'	poɛʔ	'appear'
b.	niuf	'thousand'	nuif	'bone'
c.	mfɑu	'many'	mfuɑ	'you de-kernel (it)'

- **Proposal**: Consonant-vowel precedence relationships in Uab Meto are entirely phonologically determined

[1] Thanks to Guy Tabachnick for these great examples.

1.1 What will this say for our underlying representations?

- As a general preview, there are two main ways of going about this
  - **Strategy 1:** LIN is dominated – we arbitrarily choose an CV or VC underlying form
    e.g. the word mɛpo/mɛop would have a UR that's either mɛpo or mɛop, doesn't matter which
  - **Strategy 2:** LIN is undominated – consonants and vowels are separated onto separate tiers
    e.g. the word mɛpo/mɛop has a tiered UR:

CONSONANT TIER	m	p
VOWEL TIER	e	o

  - Forms that preserve this precedence order (obey LIN): mɛpo, mɛop, ɛmpo, ɛmop, ɛomp, and mpɛo
  - Forms that don't preserve this precedence order (violate LIN): *pɛmo (p < m), *moɛp (o < e), ...
- For almost all cases, the choice between Strategy 1 and Strategy 2 **doesn't matter much** – Richness of the Base makes Strategy 1 approach Strategy 2 quite closely
- But, Strategy 2 has undominated LIN: this is important, as it may explain why we don't have infixation in the language (Section 3)
- **For now, I'll take the Strategy 1 approach** – but we will return to this question in Section 4
  - Note that these tableaux work identically for Strategy 2, we would just need to add general syllable well-formedness constraints (e.g. ONSET, FINAL-C, *DIPH, etc.)

2 (Word-Internal) Phonotactic Data

- We're going to go through some simple cases of metathesis, seeing that it repairs consonant clusters and helps create a maximally binary (trochaic) word

2.1 Metathesis repairs consonant clusters

- Uab Meto prohibits CC# clusters in word-final position and CCC clusters in any position
- Metathesis is the preferred repair for these types of clusters

(5) a. meop 'work (phrase-medial)'
b. ʔa-mepo-t 'worker'
c. ʔa-meop-t-in 'workers'

/ʔa-meop-t/	*CC#	*CCC	DEP	LIN
a. ʔa-meop-t	*!			
☞ b. ʔa-mepo-t				*
c. ʔa-meop-at			*!	

- But, if metathesis cannot repair both violations, epenthesis occurs instead

(6) a. bsoʔ 'dance (phrase-medial)'
b. ʔa-bsoʔ-at 'dancer'
c. ʔa-bsoʔ-t-in 'dancers'

/ʔa-bsoʔ-t/	*CC#	*CCC	DEP	LIN
a. ʔa-bsoʔ-t	*!			
b. ʔa-bsʔo-t		*!		*
☞ c. ʔa-bsoʔ-at			*	

2.2 Words metathesize to keep stress penultimate

- Words metathesize and diphthongize in order to keep the stressed syllable within the last foot of the word
- I model this with LAPSE-RIGHT

(7) LAPSE-RIGHT: A maximum of one unstressed syllable separates the rightmost stress from the right edge of a stress domain. (No more than one syllable separates the rightmost syllable with a level 1 grid mark from the right edge.) (Gordon 2002: 503)

- From our previous example, [ʔɑmepot] 'worker' becomes [ʔɑmeoptin] 'workers' with the plural suffix *-in*
- This is predicted by LAPSE-RIGHT

/ʔɑ-ˈmeop-t-in/	*CC#	LAPSE-RIGHT	DEP	LIN
☞ a. ʔɑ-ˈmeop-t-in				
b. ʔɑ-ˈmepo-t-in		*!		*
c. ʔɑ-ˈmeop-ɑt-in		*!	*	

- In words with single-vowel affixes, LAPSE-RIGHT causes word-medial metathesis to keep stress penultimate

(8) a. ˈʔɛ.noʔ 'door'
b. ˈʔɛon.ʔ-ɛ 'the door' *[ˈʔɛ.no.ʔ-ɛ]
c. ˈko.kɛs 'bread'
d. ˈkoɛk.s-ɛ 'the bread' *[ˈko.kɛ.s-ɛ]

- Uab Meto also disallows hiatus across morpheme boundaries (Section 2.3), represented as *V-V constraint

(9) *V-V: Assign one violation for a sequence of two vowels that cross a morpheme boundary.

/ˈkokɛs-ɛ/	*V-V	LAPSE-RIGHT	DEP	LIN
a. ˈkokɛs-ɛ		*!		
☞ b. ˈkoɛks-ɛ				*
c. ˈkoksɛ-ɛ	*!			*

- We see a similar alternation in affixation cases that force epenthesis
- The monosyllabic CVVC form is chosen over the disyllabic CVCV form

(10) a. ʔo.lɛ-f 'someone's younger brother'
b. ʔoɛl.-f-ɑm 'someone's younger brother and' *[ʔo.lɛ-.f-ɑm]
c. muti-s 'Mutis (lit. white-NMLZ)'
d. muit-s-ɑt 'while Mutis' *[muti-s-ɑt]

- Metathesis can't repair the *CCC cluster, so epenthesis is forced to occur
- The candidate with the monosyllabic CVVC form wins, because it maintains penultimate stress

/muit-s-t/	*CC#	LAPSE-RIGHT	DEP	LIN
a. ˈmuit-s-t	*!			
b. ˈmuti-s-t	*!			*
☞ c. ˈmuit-s-ɑt			*	
d. ˈmuti-s-ɑt		*!		

- When suffixes aren't vowel bearing, LAPSE-RIGHT allows the CVCV form

/muit-s/	*CC#	LAPSE-RIGHT	DEP	LIN
a. ˈmuit-s	*!			
☞ b. ˈmuti-s				*
c. ˈmuit-ɑs			*!	

2.3 Consonant Insertion as Hiatus Resolution

- Uab Meto doesn't allow vowel hiatus in two contexts:
  - Any length of hiatus crossing morpheme boundaries
  - VVV (three morae) sequences
- To prevent these types of hiatus, Uab Meto has consonant epenthesis

(11) Nominal Specificity Suffix -ɛ/-e

					Epenthetic C
a.	[nuɑ]/[nuu]	'two'	[nuβ-e]	'the two' (Middelkoop 1963)	β
b.	[mɛo]	'cat'	[mɛoβ-ɛ]	'the cat'	β
c.	[bi͡ɟɟɑɛ]	'buffalo'	[bi͡ɟɟɑɛl-ɛ]	'the buffalo'	l
d.	[fee]	'woman'	[fɛɛl-ɛ]	'the woman'	l
e.	[mee]	'table'	[mei͡ɟɟ-e]	'the table'	ʄ͡ʝ
f.	[fɑɪ]	'night'	[fɑi͡ɟɟ-ɛ]	'the night'	ʄ͡ʝ
g.	[ʔii]	'this'	[ʔii͡ɟɟ-e]	'this (particular) one'	ʄ͡ʝ
h.	[noɑ]	'coconut'	[noɑh-e]	'the coconut'	h

- Round vowels (u, o, ɔ) trigger β, lax mid front vowels (ɛ) trigger l, tense front vowels (e, i) trigger ʄ͡ʝ, and ɑ triggers h
- Note that the ʄ͡ʝepenthesis is the odd one out because it totally consumes the preceding i/e vowel and no diphthong remains
- The bottom line: consonants inherit features from their neighboring/replaced vowels. We can account for this using autosegmental splitting (Staroverov 2014)
- For now I'll just model this using IDENT[-CONS] constraint

/ˈmɛo-ɛ/	*V-V	DEP	IDENT[-CONS]	LIN
a. ˈmeo-ɛ	*!			
☞ b. ˈmɛo-βɛ			*	
c. ˈmɛo-ge		*!		

2.4 Heavy syllables have restricted distribution

- Uab Meto heavy syllables are CVV(C) (like Maori, Gordon 2002b: 52)
- These heavy syllables have a restricted distribution: they can only occur under certain suffixation patterns or near morpheme edges

(12) **Mollo Dialect**

a.	ˈfɑ.tu	'stone'	
b.	ˈfɑt.b-e	'the stone'	*[ˈfɑʊ.t-e]
c.	ˈtɑ.si	'sea'	
d.	ˈtɑs.ʄ͡ʝ-e	'the sea'	*[ˈtɑɪ.s-e]
e.	ˈbɛ.lo	'monkey'	
f.	ˈbɛl.b-ɛ	'the monkey'	*[ˈbɛo.l-ɛ]

- One way of capturing this is to say that heavy syllables must align themselves rightwards to morpheme edges
- This predicts that we should see different behavior in words that have identical consonants and vowels but different morphological constituency

- Consider tɑsi/tɑɪs 'sea' vs. tɑɪ-s 'sarong (lit. wear-NMLZ)'

(13) a. ˈtɑ.si 'sea'
b. ˈtɑɪs metan 'black sea'
c. ˈtɑs.ʄ͡ʝ-ɛ 'the sea' *[ˈtɑɪ.s-ɛ] ✗CVVC-V

(14) a. ˈtɑɪ-s 'sarong' (lit. wear-NMLZ)
b. ˈtɑɪ.-s-ɛ 'the sarong' *[ˈtɑs.ʄ͡ʝ-ɛ] ✓CVV-C-V

- If we implement this with a generalized alignment constraint, we get something like this:

(15) ALIGN(σ_{HEAVY}, R, M, R): Assign one violation for each heavy syllable (CVV) whose right edge does not align with a morpheme boundary.

- In ˈtɑsʄ͡ʝ-ɛ 'the sea', we avoid the ALIGN violation by strengthening the vowel into a consonant

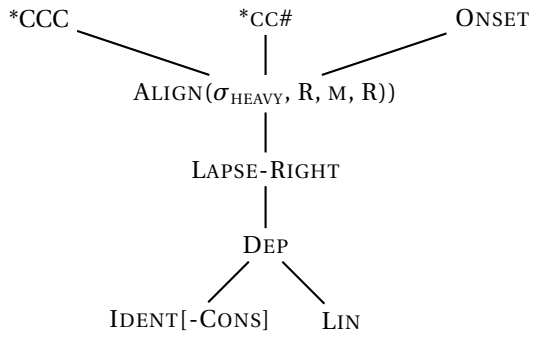
/ˈtɑsi-ɛ/	ALIGN(σ_{HEAVY}, R, M, R)	DEP	IDENT[-CONS]	LIN
a. ˈtɑɪ.s-ɛ	*!			
☞ b. ˈtɑs.ʄ͡ʝ-ɛ			*	
c. ˈtɑɪs.-ʄ͡ʝɛ		*!		
d. ˈtɑʄ͡ʝ.s-ɛ			*	*!

- There's nothing wrong with tɑɪ-s-e 'the sarong', so the faithful candidate wins

/ˈtɑɪ-s-ɛ/	ALIGN(σ_{HEAVY}, R, M, R))	DEP	IDENT[-CONS]	LIN
☞ a. ˈtɑɪ-s-ɛ				
b. ˈtɑʄ͡ʝ-s-ɛ			*!	

2.5 Summary

- To sum up, so far we've seen the following constraint ranking:



- In **monomorphemic** forms, this predicts the following:

	V́	V́V	VV́V
C	CV́	CV́V	VCV́V
	ˈhɑ 'four'	ˈhɑʊ 'wood'	–
CC	CV́C	CV́VC	CVCV́V
	ˈkɑn 'name'	ˈmɛop 'work'	boˈlɑɪ 'husk'
CCC	CCV́C	CV́CVC	CVCV́VC
	ˈknik 'horn'	ˈʔɛnoʔ 'door'	ʔɑˈtoin 'man'
CCCC	CCV́CAC	CCV́CVC	CVCV́CVC
	ˈplɛnɑt 'command'	ˈknino ʔ 'clean, pure'	bɑˈkɑseʔ 'horse'

- Light grey cells undergo **metathesis** upon (i) suffixation of certain morphemes and (ii) prosodic edges
- Dark grey cells undergo **consonant epenthesis** upon (i) suffixation of a vowel-initial morpheme and (ii) prosodic boundaries

3 Interim Discussion: Infixation and Metathesis

- Metathesis cannot infix into an adjacent morpheme – epenthesis occurs instead

(16) a. ʔolɛ-f 'someone's younger sibling'
b. ʔoɛl-f-ɑm 'and someone's younger sibling' *[ʔol<f>ɛ-m]

- Under fully-ordered UR approach (Strategy 1), where LIN is dominated, there are two options:
  - ***INFIX**: Have a constraint specifically against infixation[2] (spoiler alert: this is the one that fares best)
  - **Constraint Conjunction**: Conjoin LIN with itself (Green 1991, Smolensky 1995, Lubowicz 2002, a.o.) e.g. No segments can have multiple LIN violations (LIN$^2_{seg}$)[3] (Horwood 2004: 61)
- Each of these options have their issues, but work for the *[ol<f>e-m] case
- *INFIX is a simple case, penalizing any infixation regardless of UR

/ʔolɛ-f-m/	*CC#	*INFIX	DEP	LIN
a. ʔoɛl-f-m	*!			*
b. ʔolɛ-f-m	*!			
c. ʔol<f>ɛ- -m		*!		*
☞ d. ʔoɛl-f-am			*	*

/ʔoɛl-f-m/	*CC#	*INFIX	DEP	LIN
a. ʔoɛl-f-m	*!			
b. ʔolɛ-f-m	*!			*
c. ʔol<f>ɛ- -m		*!		*
☞ d. ʔoɛl-f-am			*	*

- Cons of *INFIX: it's been argued not to exist (Horwood 2004) due to typological and formal concerns
- In the constraint conjunction case, LIN is dominated but LIN$^2_{seg}$ is undominated
- LIN$^2_{seg}$ incurs a violation because ɛ precedes l and f in the input, but follows *both* in the output

/ʔoɛl-f-m/	*CC#	LIN$^2_{seg}$	DEP	LIN
a. ʔoɛl-f-m	*!			
b. ʔolɛ-f-m	*!			*
c. ʔol<f>ɛ-m		*!		*
☞ d. ʔoɛl-f-am			*	

- Cons of constraint conjunction: it doesn't rule out all the cases we need it to
- If we have different underlying forms (say ole-f-m), it won't rule out *[ol<f>e-m] (see Section 2.4 for why CVCV may be a better UR)

/ʔolɛ-f-m/	*CC#	LIN$^2_{seg}$	DEP	LIN
a. ʔole-f-m	*!			
b. ʔoɛl-f-m	*!			*
💣 c. ʔol<f>ɛ-m				*
☹ d. ʔoɛl-f-am			*!	*

- So, we are at a difficult point:
  - If we choose *INFIX, we might predict the wrong typology (Horwood 2004)
  - If we choose LIN$^2_{seg}$, we can only account for ...VC# underlying forms (ʔoel, but not ʔole)
- Of these, I'd rather choose *INFIX – this raises the question of how LIN is represented
- We can also avoid this choice with a tier-based representation

[2] Formal definition for *INFIX: If $x, y \in S_1$ and $x \in M_1, y \in M_2$ where $M_1 < M_2$ in S_1, then $x < y$ iff $\neg[Y' = \{y' \in S_2 \mid y' \Re y\} < X' = \{x' \in S_2 \mid x' \Re x\}]$

[3] Formal defintion for LIN$^2_{seg}$: For every x, a segment, accrue one violation if both of the following are false:
i. If $x, y \in S_1$ then $x < y$ iff $\neg[Y' = \{y' \in S_2 \mid y' \Re y\} < X' = \{x' \in S_2 \mid x' \Re x\}]$; and
ii. If $x, z \in S_1$ then $x < z$ iff $\neg[Z' = \{z' \in S_2 \mid z' \Re z\} < X' = \{x' \in S_2 \mid x' \Re x\}]$ and $z \neq y$.

4 A Tier-Based Approach

- Every lexical entry has an ordered set of consonants and an ordered set of vowels – there's no intrinsic ordering between consonants and vowels (c.f. McCarthy 1986, 2000, Besnier 1987)
- For a sample lexical entry mepo/meop, we have the following structure:

CONSONANT TIER	m	p
VOWEL TIER	e	o

- Since there is no underlying order between consonants and vowels, LIN will not incur violations for CV metathesis, only for changes in CC or VV order
- Sample derivation of mepo

/ m p / e o /	LIN	ONSET	*CC#	*DIPH
a. meop				*!
☞ b. mepo				
c. empo		*!		
d. eomp			*!	*
e. emop		*!		
f. pemo	*!			
g. moep	*!			

- I adopt the definition of LIN from Horwood (2004), which also penalizes infixation

(17) LINEARITY
S_1 reflects the precedence structure of S_2 and vice versa
If $x, y \in S_1$ then $x < y$ iff $\neg[Y' = \{y' \in S_2 \mid y' \Re y\} < X' = \{x' \in S_2 \mid x' \Re x\}]$

4.1 General prematter: Syllables have onsets, morphemes have final consonants

- Uab Meto syllables uniformly have onsets
- (Perhaps strangely), Uab Meto morphemes have consonant-final morphemes when possible[4]

(18) a. ONSET: Assign one violation for each syllable without an onset.
b. FINAL-C: Assign one violation for each morpheme that ends in [-consonantal] segment. (McCarthy & Prince 1994: 22)

- Sample derivation of kan-am 'your name' (note kna is an acceptable onset: e.g. knapan 'butterfly')

/ k n -m/ a	ONSET	*CC#	FINAL-C	DEP
a. kan-m		*!		
b. akn-am	*!			*
☞ c. kan-am				*
d. kna-m			*!	

- This also works to make simple CVC syllables, like kan 'name'

[4] This effectively pulls one consonant to the right edge of the morpheme right off the bat – happy to hear suggestions for alternatives!

/ k n / a	ONSET	*CC#	FINAL-C	DEP
a. akn	*!	*!		
☞ b. kan				
c. kna			*!	

- Also, FINAL-C means that you only get complex onsets in a word once there's already a morpheme-final consonant, as in knik 'horn'

/ k n k / i	ONSET	*CC#	FINAL-C	DEP
a. kink		*!		
☞ b. knik				
c. kanik				*!

4.2 Back to metathesis

- We also low-ranked introduce *DIPH, which penalizes any VV sequence (i.e. don't have diphthongs unless you need them)

(19) a. *DIPH: Assign one violation for each VV sequence.

- A sample derivation of ʔɑmepot (abstracting away from the tier-based representation of the prefix ʔɑ-)

/ʔɑ- m p / e o -t/	LIN	*V-V	*CC#	ALIGN(σ_{HEAVY}, R, M, R)	FINAL-C	DEP	*DIPH
a. ʔɑ-.meop-t			*!				*
b. ʔɑ-.meo.p-ɑt				*!		*	*
☞ c. ʔɑ-.ˈme.po-t					*		
d. ʔɑ-m.ˈpeo-t					*		*!
e. ʔɑ-em.po-t		*!		*	*		
f. ʔɑ-.mep.<t>o-	*!				*		
g. ʔɑ-.pe.mo-t	*!				*		

- Adding back in LAPSE-RIGHT, we derive ʔameoptin 'workers' (note we need one more low-ranked constraint here to rule out d. – could be "one syllable, one morpheme" type thing)

/ʔɑ- m p -t-in/ e o	LIN	*V-V	*CC#	LAPSE-RIGHT	ALIGN(σ_{HEAVY}, R, M, R)	FINAL-C	DEP	*DIPH
☞ a. ʔɑ-.meop-.t-in								*
b. ʔɑ-.meo.p-ɑ.t-in					*!		*	*
c. ʔɑ-.ˈme.po-t-in					*!	*		
d. ʔɑ-m.ˈpeo-t-in						*		*
e. ʔɑ-em.po-t-in		*!				*		
f. ʔɑ-.mep.<t>o-in	*!					*		
g. ʔɑ-.pe.mo-t-in	*!					*		

- We can also derive koɛksɛ 'the bread'

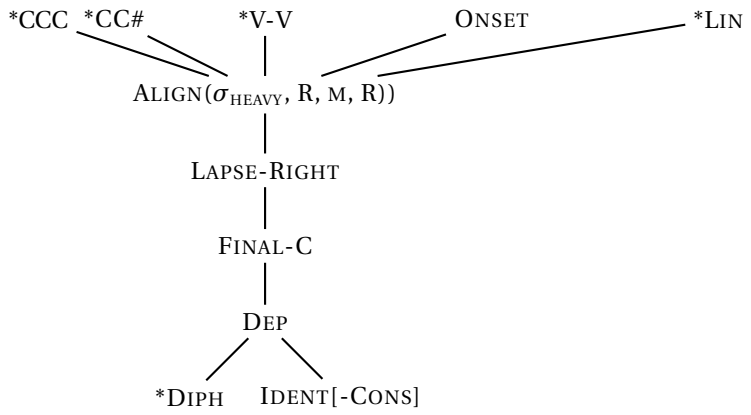
/ k k s / o ɛ -ɛ/	LIN	ONSET	*V-V	*CC#	*CCC	LAPSE-RIGHT	ALIGN(σ_{HEAVY}, R, M, R)	DEP	*DIPH
a. ˈkokɛs-ɛ						*!			
☞ b. ˈkoɛks-ɛ							*		*
c. ˈkoksɛ-ɛ		*!							
d. okɛks-ɛ		*!				*			

- This also correctly derives kokes ‘bread’

/ k k s / o ɛ	LIN	ONSET	*V-V	*CC#	*CCC	LAPSE-RIGHT	FINAL-C	DEP	*DIPH
☞ a. ˈkokɛs									
b. ˈkoksɛ							*!		
c. ˈkoɛks				*!					*
d. ˈkkoɛs									*!
e. okɛks		*!		*!					

4.3 Interim Summary: Back to the template

- Uab Meto has strong syllable well-formedness constraints that predetermine consonant-vowel orders



- Although we can model this with a fully-specified UR, we can also model this through a tier based representation where the precedence relationships are underspecified
- Both analyses create the following template with the same constraints (just different rankings of LIN)

	V́	V́V	VV́V
C	CV́	CV́V	VCV́V
	ˈhɑ ‘four’	ˈhɑʊ ‘wood’	–
CC	CV́C	CV́VC	CVCV́V
	ˈkɑn ‘name’	ˈmɛop ‘work’	boˈlɑɪ ‘husk’
CCC	CCV́C	CV́CVC	CVCV́VC
	ˈknik ‘horn’	ˈʔɛnoʔ ‘door’	ʔɑˈtoin ‘man’
CCCC	CCV́CAC	CCV́CVC	CVCV́CVC
	ˈplɛnɑt ‘command’	ˈkninoʔ ‘clean, pure’	bɑˈkɑseʔ ‘horse’

4.4 Exceptions

- Almost all exceptions include an initial consonant cluster: CCVV, CCVVC, CCVCV
- These account around 10% of the 1500-word lexicon
- One possibility is that the language treats the complex-onset cases as complex segments – if that’s the case, these aren’t counterexamples

(20) Template Exceptions - Native words

a.	bnao	'boat'	CCVV
b.	snaen	'sand'	CCVVC
c.	bluɑʔ	'clothes'	CCVVC
d.	ʔbɑʔu	'bat'	CCVCV
e.	kleʔo	'a little'	CCVCV

(21) Template Exceptions - Loanwords

a.	klɛi	'church'	*Indonesian:* geˈreja	CCVV
b.	mansiaʔ	'human'	*Indonesian:* manuˈsia	CVCCVVC

- Some of these words also have alternate pronunciations – one possibility is that these alternations exist to better match the template

(22) a. ʔbɑʔu ∼ ʔɑbɑʔu
b. bnao ∼ banao

5 Discussion and Predictions

- Two advantages of this proposal:
  - Certain consonant-vowel sequences unambiguously signal morpheme boundaries (Trubetskoy 1969: 273-297)
  - "Larger-scale" phonotactics (i.e. sentence prosody) also cause alternations in surface consonant-vowel orders

5.1 Certain sequences signal morpheme boundaries

- Certain linear orders between consonants and vowels signal to speakers that there must be a morpheme boundary
- One example of this is the word [kɑʊnɑʔ] 'snake' (CVVCVC)
- If it were monomorphemic, our model would incorrectly predict *[kɑnuɑʔ] (CVCVVC) as the surface form
- This surface form is compatible with a bimorphemic analysis [kɑʊ-nɑʔ] (CVV-CVC) or [kɑʊn-ɑ̲ʔ] (CVVC-C) w/ epenthetic ɑ

/ k ɑ - u n ɑ ʔ /	ONSET	LIN/*INFIX	FINAL-C	*DIPH
☞ a. kɑʊnɑʔ			*	*
b. ɑʊknɑʔ	*!			
c. kɑnuɑʔ	*!	*		
d. kɑnuʔɑ		*!	*	

- While inserting this morpheme boundary may seem stipulative, it's not that frequent that this happens
- This might be a plausible segmentation because kɑʊ(n) is seen in other snake-names, and nɑʔ means 'blood'

(23) a. kɑʊnsɑu 'green-lipped pit viper (wedding snake)'
b. kɑʊnɑʔ 'snake'

5.2 Prosodically-triggered alternations

- Might expect that other things could trigger metathesis on the sentential level, and they do!
- At certain phrasal edges, we have a pitch accent dock on the penultimate syllable, possibly also with lengthening effects
- As a result, the penultimate syllable cannot be a diphthong at these phrasal edges, and so it metathesizes
- We see this in low nominal phrases (nPs) and verbal phrases (vPs)

(24) Nominal Domain - Noun Compounds

a. fɑfi]$_{nP}$ ʔii
pig DEM
'this pig'

b. fɑif ʔanaʔ]$_{nP}$ ʔii
pig baby DEM
'this baby pig'

(25) Nominal Domain - Noun Adjective

a. mɑnu]$_{nP}$ nua
chicken two
'two chickens'

b. mɑun mutiʔ]$_{nP}$ nua
chicken white two
'two white chickens'

(26) Verbal Domain - Direct Objects

a. ɑʊ ʔ-ɑim bɑkɑse ʔii
1SG 1SG.AGR-look.for horse DEM
'I look for the horse.'

b. bɑkɑse ʔii ɑʊ ʔ-ɑmi
horse DEM 1SG 1SG.AGR-look.for
'The horse is looked for by me.'[5]

- One way to capture this is to say that you need to assign a pitch accent to nP
- After docking on the penultimate syllable, this pitch accent either requires that its host is not a diphthong, or lengthens so that (*VVV) constraint kicks in and forces metathesis
- Next steps: finish measuring the vowels to see if a lengthening story works

[5] Possibly also a topicalization construction.

5.3 A problematic prediction

- A problem for both analyses: prefixes never trigger metathesis
- Below, we see nm, nt, and nk are all acceptable onsets in the language

(27) a. [n-mof] 'it falls'
b. [n-tɛk] 'it calls/brings'
c. [n-kius] 'it sees'

- But, when we prefix the agreement markers to a complex onset (incurring a *CCC violation), metathesis does not occur

(28) a. [nɑ-mnɑu] 'it remembers' *[n-mɑnu]
b. [nɑ-tʔipuʔ] 'it snaps' *[n-tiʔpuʔ]
c. [nɑ-kninoʔ] 'it is pure' *[n-kinnoʔ]

- There are two possibilities
  - These are not CC clusters but complex segments (and so cannot be separated by metathesis)
  - There's a deeper generalization that we're missing (i.e. metathesis can only occur post-stress)
- Next steps: see if a complex segment analysis makes any sense and check the typology to see if/how metathesis relates to stress

6 Conclusion and next steps

- In Uab Meto, linear order is not contrastive; rather only orders of consonants between other consonants or vowels between other vowels are
- Although previous accounts have treated the affixal-metathesis as phonotactically-driven (Edwards 2016, 2018, Steinhauer 1993, 1996), few have an answer for why metathesis also marks prosodic edges
  - The tier-based approach has a response: metathesis comes for free in the language, because consonants and vowels fall onto separate tiers
  - Thus, consonant-vowel metathesis (and not epenthesis) is expected to be the preferred general strategy for optimizing phonotactic and prosodic well-formedness
- Implications for morphological information available to phonology
- Next steps are to finish up the prosodic cases and see if they can be unified into the main account; then to see if the exceptions should be analyzed as complex segments

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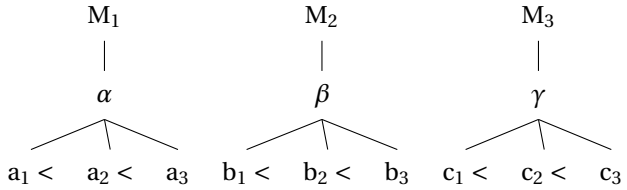
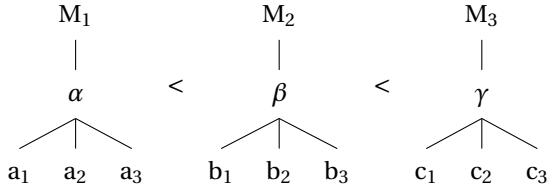
7 Appendix

7.1 Schematic of Various Approaches to LIN-type constraints

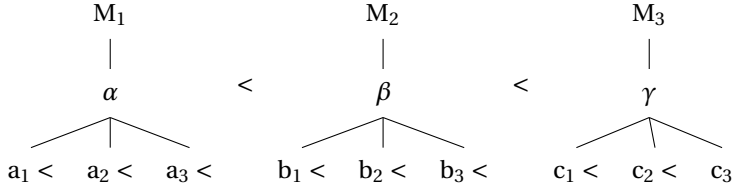
(29) a. LIN



b. *INFIX



c. Horwood's LIN



7.1.1 Dialectal Variation – Restricted distribution of heavy syllables

- In other dialects, we still have this restriction on heavy syllables, but with different strategies
- These different strategies correspond to different rankings of heavy-syllable alignment constraint with DEP and IDENT[-CONS]
- Amarasi epenthesizes a standard consonant to avoid CVV.C-V

(30) **Amarasi (Kotos)** (see also Edwards 2016)

a.	tɑ.si	'sea'
b.	tɑis.-ge[6]	'the sea'
c.	tɑi-s	'sarong'

[6]Sometimes also [tɑis.-$\widehat{\text{ɟɟe}}$]

d. tɑi.-s-e ‘the sarong’

/ˈtɑsi-ɛ/	IDENT[-CONS]	ALIGN(σ_{HEAVY}, R, M, R)	DEP	LIN
a. ˈtɑɪ.s-ɛ		*!		
☞ b. ˈtɑɪs.-gɛ			*	
c. ˈtɑs.j͡j-ɛ	*!			

/ˈtɑɪ-s-ɛ/	IDENT[-CONS]	ALIGN(σ_{HEAVY}, R, M, R)	DEP	LIN
☞ a. ˈtɑɪ.-s-ɛ				
b. ˈtɑɪ-s.-gɛ			*!	
c. ˈtɑj͡j.-s-ɛ	*!			

- Edwards (2016) analyzes this as CRISPEDGE constraint – ambisyllabic elements cannot be shared between syllables
- This is insufficient, because the CRISPEDGE constraint Edwards uses does not make reference to morpheme boundaries, which is necessary in his dataset
- In Amanuban, we instead have glide epenthesis between the root and vowel-bearing suffix[7]
- Next steps: Need to work from recordings on Amanuban – is it really [tɑ.si.jes] or [tɑs.jes]?

(31) **Amanuban**

a. tɑ.si	‘sea’	
b. tɑ.si.-jes	‘a sea’	*[tɑɪ.s-es]
c. tɑɪ-s	‘sarong’	
d. tɑɪ.-s-es	‘a sarong’	*[tɑɪ-s-jes]

- Note that metathesis to the CVVC form is not possible in these cases either – this suggests that LAPSE-RIGHT is ranked rather low

/ˈtɑsi-ɛ/	IDENT[-CONS]	ALIGN(σ_{HEAVY}, R, M, R)	DEP	LIN
a. ˈtɑɪ.s-ɛ		*!		*
☞ b. ˈtɑ.si.-jɛ			*	
c. ˈtɑɪs.-jɛ			*	*!
d. ˈtɑs.j-ɛ	*!			

8 Prosodic Data

- Why metathesis? Three options:
  - High tone can't dock on diphthongs
  - High tone lengthens the vowel it docks on, and you can't have three-mora sequences
  - A prosodic edge must be preceded by a perfect trochee

8.1 Verbal Metathesis

- In the verbal domain, verbs prosodically incorporate the direct object or (optionally) adjuncts that appear directly to their right
- This means that in the vP, there is a high tone that docks on the penultimate syllable of the phrase

(32) Verbal Domain - Direct Objects

[7] This dialect doesn't have a productive specificity suffix; instead I use the indefinite suffix. When present, this suffix works exactly the same as the specificity suffix for purposes of the phonology.

a. ɑʊ ʔ-ɑɪm bɑkɑse ʔii
1SG 1SG.AGR-look.for horse DEM
'I look for the horse.'

b. bɑkɑse ʔii ɑʊ ʔ-ɑmi
horse DEM 1SG 1SG.AGR-look.for
'The horse is looked for by me.'[8]

- When you have postverbal adjuncts, they can optionally incorporate into the prosodic vP without major interpretation changes (e.g. different attachment height of the PP)
- In the locative examples below, both sentences are ambiguous about whether the telling-event occurred in the road or if the working-event occurs in the road

(33) Verbal Domain - Locative PP Adjuncts

a. jermy na-tonan jefri he-n meop ne lálan
Jermy 3-told Jefri IRR-3.AGR work LOC road
'Jermy told Jefri to work in the road'

b. jermy na-tonan jefri he-n mépo ne lalan
Jermy 3-told Jefri IRR-3.AGR work LOC road
'Jermy told Jefri to work in the road.'

(34) Verbal Domain - Adverbs

a. jermy na-tonan jefri he-n mépo lablab
Jermy 3-told Jefri IRR-3.AGR work quickly
'Jermy told Jefri to work quickly'

b. jermy na-tonan jefri he-n meop láblab
Jermy 3-told Jefri IRR-3.AGR work quickly
'Jermy told Jefri to work quickly'

8.2 Nominal Metathesis

- Uab Meto unmarked nominal order:[9]

N - (N) - A_{IND} - (CLAS) - NUM - A_{STAGE} - DEM

(35) nakfun méʔe ⌋*PrEdge* nonoʔ teun ʔin nae
hair red CLAS three PL DEM.DIST
'those three long hairs'

- There can be multiple individual-level adjectives, and in that case only the last one receives the high tone

(36) a. fɑʊt kóʔu
stone big
'big stone'

b. fɑʊt koʊʔ mútiʔ
stone big white
'white big stone'

[8] Possibly also a topicalization construction.

[9] Leaving the possibility open that A_{stage} are reduced relative clauses – they differ from A_{ind} in that they show agreement with their subject like verbs do.

c. fɑʊt muit kóʔu
stone white big
'big white stone'

- Side note: some words receive a glottal when they're in this phrase-final position (e.g. mutiʔ vs. muit)
- I analyze this as the n head, since it also can be a nominalizer

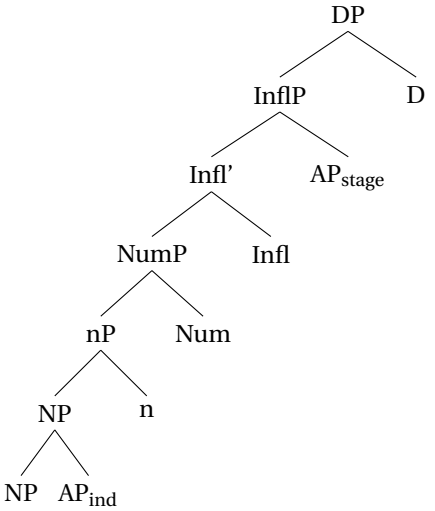
(37) a. meop ~ mépo '(to) work'
b. mepo-ʔ '(the) work'

- This also helps explain why we have disappearing glottal stops in compounding scenarios – the phonology sometimes deletes single-consonant morphemes in this type of phrase-medial environment

(38) a. ʔatóniʔ
man
'man'
b. ʔatoin káse
man city
'city man'

- The edge of the metathesis domain is before the classifier and numeral – the metathesis domain is somewhere around nP
- Issue here for left vs. right-headedness? (If we derive N A order through roll-up movement where NP moves out of nP, there's a difficulty in making the prosodic edges follow from timing of spell-out)

(39)



- N Num generally does not trigger metathesis on the noun – the only exception is in N-Num compounds, such as what you get with certain time expressions – these also take the glottal nominalizer

(40) a. néno teʊn 'three days'
b. nɛon ténuʔ 'Wednesday/day three' COMPOUND
c. léko teʊn 'three hours'
d. lɛok ténuʔ 'three o'clock' COMPOUND

8.3 Why aren't these all (syntactic) incorporation?

- Can't analyze this as noun incorporation (via head movement or a similar mechanism), because the behavior of N-A sequences and N-N compounds come apart under focus
- With focus intonation, the head noun in N-A sequences metathesizes, giving the CV form

(41) a. ɑʊ ʔ-it ʔɑʊs mútiʔ
1SG 1SG.AGR-see dog white
'I see a white dog' (no focus)

b. ɑʊ ʔ-it ʔásu mútiʔ
1SG 1SG.AGR-see dog white
'I see a white DOG' (focus)

- However, compounds aren't eligible for this type of focus-metathesis
- This suggests that N-N compounds <u>are</u> syntactically incorporated

(42) a. ɑʊ ʔ-it ʔɑtoin kaɛs mútiʔ
1SG 1SG.AGR-see man city white
'I see a white man'

b. ∗ɑʊ ʔ-it ʔɑtóni(ʔ) kaɛs mútiʔ
1SG 1SG.AGR-see man city white
intended: 'I see a white MAN'

c. ɑʊ ʔ-it fɑɪf ʔánaʔ
1SG 1SG.AGR-see pig baby
'I see a baby pig'

d. ∗ɑʊ ʔ-it fáfi ʔánaʔ
1SG 1SG.AGR-see pig baby
intended: 'I see a baby PIG / PIGLET'

- Focus works by inserting a prosodic boundary to the right of the focused element – the prosodic boundary is realized as a penultimate high tone
- This also happens with *ha* 'only': even in forms that typically do not metathesize (such as numerals), the high tone can trigger metathesis

(43) a. nok néno teʊn
with day three
'in three days'

b. nok néno ténu ha
with day three only
'in only three days'