

Classes 8 & 9: Issues in process application: multiple targets, directionality, iterativity

To do

- Anderson ch. 10 study questions due Tuesday; online quiz on CCLE
- Woleaian assignment due Friday
- By the end of next week (i.e., by Oct. 30), meet with me about a term-paper topic

Overview: Multiple application

The basic problem to be dealt with today is what to do with a form that, for some rule $A \rightarrow B / X_Y$, contains multiple instances of XAY , either because XAY straightforwardly occurs twice in the form, or because there are multiple ways of interpreting XAY (in a rule schema). And, what if the output of the rule create or destroys instances of XAY ?

We'll see that there's a whole can of worms here that's only barely been re-opened in the OT era.

Great sources for term-paper topics, which I also relied on to get many of this handout's examples: Howard 1972,¹ Johnson 1970², and Anderson 1984 (which you've been reading). I'd stay away from the stress cases, though, since their rule-application issues tend to go away under metrical stress theory.

1. Multiple matches: a simple case

SPE p. 344: "To apply a rule, the entire string is first scanned for segments that satisfy the environmental constraints of the rule. After all such segments have been identified in the string, the changes required by the rule are applied simultaneously."

Example: Palauan again³: recall vowel reduction:

<i>X</i>	<i>his/her/its X</i>	
rákt	rəkt-él	'sickness'
sésəb	səsəb-él	'fire'
bótk	bətk-él	'operation'
ríŋəl	rəŋəl-él	'pain'

- How would your rules apply to an underlying representation like /ðilobaʔ + eli/ 'his injury'?

(real outcome is [ðələbəʔél])

- Any problems for an OT analysis?

¹ Howard, Irwin (1972). *A directional theory of rule application in phonology*. MIT dissertation.

² Johnson, C. Douglas (1970). *Formal aspects of phonological description*. Mouton.

³ Data taken from Josephs, Lewis (1990). *New Palauan-English Dictionary*. Honolulu: University of Hawaii Press.

2. Klamath (self-bleeding)

(Penutian language of Oregon, very endangered. Data and description taken from Kisseberth 1972;⁴ originally from Barker 1963,⁵ which I didn't have a chance to consult)

glottalized stops: $\overset{\text{p}}{\underset{\cdot}{p}} \ \overset{\text{t}}{\underset{\cdot}{t}} \ \overset{\text{c}}{\underset{\cdot}{c}} \ \overset{\text{k}}{\underset{\cdot}{k}} \ \overset{\text{q}}{\underset{\cdot}{q}}$
 glottalized sonorants: $\overset{\text{m}}{\underset{\cdot}{m}} \ \overset{\text{n}}{\underset{\cdot}{n}} \ \overset{\text{y}}{\underset{\cdot}{y}} \ \overset{\text{w}}{\underset{\cdot}{w}} \ \overset{\text{l}}{\underset{\cdot}{l}}$
 regular sonorants: m n w y l
 voiceless sonorants: M N W Y L

Deglottalization rules, informally:

glottalized stop → deglottalized / __C-other-than{m,n,w,y,l}
 other glottalized → deglottalized / __C

$\overset{\text{q}}{\underset{\cdot}{q}} \rightarrow \text{q} / _ \overset{\text{n}}{\underset{\cdot}{n}}$	nčo $\overset{\text{q}}{\underset{\cdot}{q}}$ -a	'is deaf'	nčoq-napg-a	'is almost deaf'
$\overset{\text{p}}{\underset{\cdot}{p}} \rightarrow \text{p} / _ \overset{\text{t}}{\underset{\cdot}{t}}$	peṭ-a	'a hole enlarges'	pe-pṭ-a	'dist. holes tear out'
$\overset{\text{t}}{\underset{\cdot}{t}} \rightarrow \text{t} / _ \overset{\text{k}}{\underset{\cdot}{k}}$	m-peṭ-a	'enlarges hole'	m-peṭ-ky-o:l-a	'chips open a hole'
$\overset{\text{q}}{\underset{\cdot}{q}} \rightarrow \text{q} / _ \overset{\text{c}}{\underset{\cdot}{c}}$	qoc̣-a	'bends'	qo-q̣c̣-a	'dist. bend'
$\overset{\text{p}}{\underset{\cdot}{p}} \rightarrow \text{p} / _ \text{W}$	ntop̣-a	'rots, spoils'	ntop̣-Wi:y-a	'almost rotted'
$\overset{\text{p}}{\underset{\cdot}{p}} \rightarrow \text{p} / _ \text{y}$			ntop̣-ye:g-a	'starts to spoil'
$\overset{\text{t}}{\underset{\cdot}{t}} \rightarrow \text{t} / _ \text{w}$			wLeṭ-wal	'lies spread eagled on top of'
	cf.		wLeṭ-pga	'is lying flat on back'
$\overset{\text{n}}{\underset{\cdot}{n}} \rightarrow \text{n} / _ \overset{\text{k}}{\underset{\cdot}{k}}$	nọ-ka	'little head'	no-ṇ-ka	'dist. little heads'
$\overset{\text{w}}{\underset{\cdot}{w}} \rightarrow \text{w} / _ \overset{\text{c}}{\underset{\cdot}{c}}$	wic̣-a	'is breathless'	wi-ẉc̣-a	'dist. are breathless'
$\overset{\text{y}}{\underset{\cdot}{y}} \rightarrow \text{y} / _ \text{G}^6$?-iwyaq	'put in pl. obj.'	?i-?o:yga	'dist. put pl. obj. into'
$\overset{\text{l}}{\underset{\cdot}{l}} \rightarrow \text{l} / _ \text{l}$	k-bol-a	'hits in stomach'	w-bol-lg-a	'falls on stomach'
$\overset{\text{w}}{\underset{\cdot}{w}} \rightarrow \text{w} / _ \text{l}$	gaẉal	'finds'	gawl-i:ya	'finds for someone'

○ Can we collapse this into a single rule schema?

○ How do we expect the schema to apply to these sequences: q̣lq, p̣lq?

⁴ Kisseberth, Charles. 1972. An argument against the simultaneous application of phonological rules. *Linguistics Inquiry* 3: 393-396.

⁵ Barker, M.A.R. 1963. *Klamath dictionary*. University of California Publications in Linguistics, Vol. 31.

⁶ Kisseberth has g with a dot below, but dot won't show under the g in my font.

Here are the data:	/q̣laq/:	n̄coq- laq -Wi:y-a	‘ears are stopped up’
		n̄co q - lg -a	‘ears are almost stopped up’
		hos-taq- laq	‘make him stop!’
		hos-ta q - lg -a	‘makes someone stop an action’
		to q - lg -a	‘stops an action’
	/p̣laq/:	sno-ntap- laq -s	‘rotted woka ⁷ s’
		sno-nta p - lg -a	‘causes to rot down’

- How about an OT analysis? Can we easily rule out *q̣lq → qlq?

3. Southern Kikuyu (self-counterbleeding)

(Gikuyu/Kikuyu is a Niger-Congo language of Kenya with 7.2 million speakers; datum from Johnson 1970, originally from Bennett 1967,⁸ which I didn’t have a chance to consult)

k → γ / __ V₀[voiceless stop]

- What should happen to /nekakaakeroma/ ‘he will bite him’ in SPE? OT?

Here’s the datum: [neyγaakeroma] (*[nekayaakeroma]) [Is it reduplicated, though?]

4. Tshiluba (self-feeding)

(Lua-Kasai/Tshiluba is a Niger-Congo language of D.R. of Congo with 6.3 million speakers; original consultant work from Johnson 1970)

l → n / [+nasal] V₀ __

u-kwač-ile	‘he took’	u-d ^y im-ine	‘he cultivated
ku-kwač-il-a	‘to take (ben.)’	ku-d ^y im-in-a	‘to cultivate (ben.)’
u-kwač-id ^y -ile	‘he took (ben.)’	u-d ^y im-in ^y -ine	‘he cultivated (ben.)’
(l → d ^y / __i)			

- In an OT analysis, can we easily rule out *u-d^yim-in^y-ile? *u-d^yim-il^y-ile?

5. Self-counterfeeding?

Howard 1972 presents some possible cases but reanalyzes them.

Kaplan 2008, as you read, reanalyzes many purported cases of self-counterfeeding.

Kavistskaya & Staroverov 2008⁹ present a case from Tundra Nenets (Nenets is a Uralic language of Siberia and Arctic Russia with 31,300 speakers):

⁷ some kind of aquatic plant gathered for food

⁸ Bennett, P. 1967. Dahl’s Law and Thagicū. *African Language Studies* 8: 127-159.

/ʌ/ deletes in even-numbered syllables (from left edge) and final syllable, subject to consonant-cluster constraints (seems like no complex onsets, and complex codas must have falling sonority)

/xʌɾʌ/	→ xʌɾ	‘knife- <i>nom.sg.abs.</i> ’	
/xʌɾʌ-rʌ/	→ xʌ.ɾʌ-r	‘knife- <i>2sg.poss</i> ’	I assume [rr] is a bad coda.
/xʌɾʌ-ta/	→ xʌɾ.-da	‘knife- <i>3sg.poss</i> ’	
/xarʌtʌ/	→ xa.ɾʌd	‘house- <i>nom.sg.abs.</i> ’	[see below]
/xarʌtʌ-rʌ/	→ xar.dʌ-r	‘house- <i>2sg.poss</i> ’	
/xarʌtʌ-ta/	→ xar.dʌ.-da	‘house- <i>3sg.poss</i> ’	
/nultʌnʌ-sʲʌ/	→ nult.nʌ-sʲ	‘house- <i>3sg.poss</i> ’	

But note that surface forms do have [ʌ]s in even-numbered and final syllables:

/xarʌtʌ-ta/ → xar.dʌ.-da ; xar.dʌ.-da ↗ xard.da (though *rdd* is apparently legal)

- Can we capture this with rules? OT?
- Consider /xarʌtʌ/ → xa.ɾʌd, *xard. Can our SPE analysis capture this? It’s not just plain self-counterfeeding.
- K&S make the generalization that two /ʌ/s never delete in a row. Does that help?

[K&S’s analysis involves advanced OT machinery.]

There’s also morphological truncation, as in Lardil (which you read about in P&S), and Tohono O’odham (Fitzgerald 1997¹⁰).

6. Interim conclusions

As we’d expect, OT has trouble handling self-counterbleeding and self-counterfeeding, and predicts self-feeding and self-bleeding straightforwardly.

- But what about rule theories? It’s not as simply as choosing two different order for rules. What additional flexibility could we give the rule theory to allow all four types of self-interaction?

⁹ Kavitskaya, Darya & Peter Staroverov. 2008. Opacity in Tundra Nenets. *WCCFL 27 Proceedings*, ed. Natasha Abner & Jason Bishop: 274-282.

¹⁰ Fitzgerald, Colleen. 1997. *O’odham rhythms*. University of Arizona dissertation.

Now some directionality issues...

7. Tricky case from Latvian; from SPE, pp. 365-366,¹¹ which uses different features

glide formation: $\begin{bmatrix} -\text{cons} \\ +\text{high} \end{bmatrix} \rightarrow [-\text{syll}] / ___ [+ \text{syll}]$
 truncation: $V \rightarrow \emptyset / ___ \#$

- First, remember the special convention about the + boundary: / $___ Y$ is really / $___ (+)Y$. That means that every rule is really a schema (can you see how?)!
- Apply the rules to these cases and discuss:

/#iāi+a#/	‘rides’
/#kuru+iai#/	‘basket (gen. sg.)’
/#aui+a#/	‘puts on (footgear)’

- Here are the actual outcomes, apparently: [jaj], [kurwja], [auj]. Are these problematic for any of the rule approaches we’ve seen?
- How about an OT analysis? What problems do we run in to?

8. Possible solution: directional application

Left-to-right: Scan the string for the leftmost eligible segment and apply the rule to it. Then scan the resulting form for the leftmost eligible segment, etc.

Right-to-left: Same thing but start with the rightmost eligible segment.

- Does one of these work for Latvian?
-

9. Tianjin tone sandhi

A northern dialect of Mandarin.

Milliken et al. 1997,¹² Chen 2000.¹³ See also Kuang 2008.¹⁴

<i>the tones</i>	tone A	21 or 11	L	[descriptions disagree]
	tone B	45 or 55	H	
	tone C	13, 213, or 24	LH	
	tone D	53	HL	

¹¹ Originally from Halle & Zeps 1966. A survey of Latvian morphophonemics. *Quarterly Progress Report of the Research Laboratory of Electronics, MIT* 85: 267-270.

¹² Milliken, Stuart, Zhang Guang-Ping, Zhang Xue-Yi, Li Zhi-Qiu & Lü Ying. 1997. Resolving the paradox of Tianjin tone sandhi. In *Studies in Chinese phonology*, ed. by Jialing Wang & Norval Smith. Mouton de Gruyter.

¹³ Chen, Matthew Y. 2000. *Tone sandhi: patterns across Chinese dialects*. Cambridge UP.

¹⁴ Kuang, Jianjing. 2008. Tone sandhi in Tianjin dialect. Ms., UCLA.

basic rules

AA → CA	bing ^L gao ^L	→	bing ^{LH} gao ^L	‘ice cream’
CC → BC	shui ^{LH} guo ^{LH}	→	shui ^H guo ^{LH}	‘fruit’
DD → AD	si ^{HL} lu ^{HL}	→	si ^L lu ^{HL}	‘bus route #4’
DA → BA	da ^{HL} jie ^L	→	da ^H jie ^L	‘street’

Why these rules? Who knows! Tone sandhi tends to be pretty arbitrary synchronically. See Mortensen 2006¹⁵ for a framework in which to analyze tone sandhi.

- You see the problem: what about /AAA/? /DDD/? /DDA/? /CCC/? /CAA/? /ADD/? /DAA/?

For /DDD/ it depends on the syntactic structure (say Milliken et al.; Chen says always BAD):

[[su^{HL} liao^{HL}] bu^{HL}] → AAD (L.L.HL) ‘plastic cloth’ (how to prevent *CAD?)
 [shang^{HL} [yi^{HL} yuan^{HL}]] → DAD (HL.L.HL) ‘House of Lords’ (*BAD?)

/AAA/: [[Xi^L guan^L] Jie^L] → ACA (L.LH.L) ‘Xiguan Street’, not *CCA or *BCA
 [kai^L [fei^L:ji^L]] → ACA (L.LH.L) ‘fly an airplane’

/DDA/: [[si^{HL}:ji^{HL}] qing^L] → ABA (L.H.L) ‘evergreen’
 [zuo^{HL} [dian^{HL} che^L]] → ABA (L.H.L), not *DBA ‘take a tram’

[ran out of time to type full data]

/CCC/ → BBC (LH.LH.LH → H.H.LH)
 /CAA/ → BCA (LH.L.L → H.LH.L)
 /ADD/ → CAD (L.HL.HL → LH.L.HL)
 /DAA/ → DCA (HL.L.L → HL.LH.L)

We’ll can leave as a paradox—there’s an extensive literature you can google, though.

For a simpler but still tough case, see Hyman & VanBik 2004 on Hakha Lai.¹⁶

Now some optionality issues when there are multiple targets...

Cases taken from Kaplan 2009,¹⁷ Riggle & Wilson 2005,¹⁸ Vaux 2008.¹⁹

See those papers for various approaches to optionality.

10. Warao: global optionality

Language isolate of Venezuela, Guyana, and Suriname; 28,100 speakers. From Osborn 1966.²⁰

Little raw data, but Osborn is very definite about the generalization:

¹⁵ Mortensen, David. 2006. *Logical and substantive scales in phonology*. UC Berkeley dissertation.

¹⁶ Hyman, Larry & Kenneth VanBik. 2004. Directional rule application and output problems in Hakha Lai Tone. *Language and Linguistics* 5.4:821-861.

¹⁷ Kaplan, Aaron. 2009. Variation through markedness suppression. UCSC ms.

¹⁸ Riggle, Jason & Colin Wilson. 2005. Local optionality. *NELS* 35, ed. Leah Bateman & Cherlon Ussery.

¹⁹ Vaux, Bert. 2008. Why the phonological component must be serial and rule-based. In Bert Vaux & Andrew Nevins, eds., *Rules, constraints, and phonological phenomena*. Oxford UP.

²⁰ Osborn, Henry A. Jr. Warao I: phonology and morphophonemics. *International Journal of American Linguistics*. 32: 108-123.

“/p/ has allophones [p b]. The voiced allophone [b] is heard more frequently than the voiceless [p] in most words. In every word, except for a few words noted below, alternation between [b] and [p] is presumably possible, since many alternations of this order have been heard. Thus in /paro+parera/ *weak*, both the initial and medial phoneme /p/ is heard as [b] generally, and as [p] infrequently. In words like the one cited, with two or more occurrences of /p/, the allophones are consistently [b] or [p] for each utterance of the word. If the first occurrence of /p/ in the word is [b], the following occurrence(s) will be [b]. If the first occurrence is [p], the following occurrence(s) will be [p]. The following are examples of words with two occurrences of /p/: poto+poto *soft*, apaupute *he will put them*, kapa+kapa *kind of banana*.” (p. 109)

I.e., [paro-parera] ~ [baro-barera], but not *[paro-barera] or *[baro-parera].
Also, for a non-reduplicative case, [hapisapa] ~ [habisaba] ‘other side’

- We haven’t talked at all about how to get optionality in either SPE or OT, so let’s brainstorm...

As discussed by Riggle & Wilson, Kaplan, it would be nice to have more than two non-reduplicated words, or another language where this happens!

11. Local optionality—also hard to find good cases (besides French; see below)

Vaux says that he can produce, for English *marketability*:

[maɪkət^həbɪlət^hi] ~ [maɪkərəbɪləri] ~ [maɪkət^həbɪləri] ~ [maɪkərəbɪlət^hi]

- Can any of our ideas for SPE+optionality get this? Our OT+optionality ideas?

12. Vata: iterative optionality

Ethnologue classifies as dialect of Lakota Dida, a Niger-Congo language of Côte d’Ivoire with 98,8000 speakers. Data taken from Kaplan 2009; originally from Kaye 1982,²¹ which I didn’t get a chance to consult.

[+ATR]: [i, u, e, o, ʌ] [−ATR]: [ɪ, ʊ, ɛ, ɔ, a]

[+ATR] optionally to the final syllable of a preceding word:

/ò nɪ sáká pì/ → ò nɪ sáká pì ~ ò nɪ sáká pì ‘he didn’t cook rice’

If all the words are monosyllabic...

/ò ká zā pī/ → ò ká zā pī ~ ò ká zā pī ~ ò ká zā pī ~ ò ká zā pī ‘he will cook food’

- Can we get this one?

²¹ Kaye, Jonathan (1982). Harmony processes in Vata. In *The structure of phonological representations*, ed. Harry van der Hulst & Norval Smith, vol. II. Foris. Pp. 385-452.

13. Hypercorrection in Dominican Spanish: unique-target optionality

(Vaux 2003 calls this “Basic Optionality”)

Dialect of the Indo-European language from Spain with 328 million speakers worldwide. Data from Bradley 2006.²² See there for original data sources, esp. Núñez-Cedeño 1994,²³ which I didn’t get a chance to consult.

/s/ typically deletes in a syllable coda:

<i>Dominican Spanish</i>	<i>Conservative Spanish</i>	
se.co	se.co	‘dry’
ca.so	ca.so	‘case’
e.tú.pi.do	es.tú.pi.do	‘stupid’
do	dos	‘two’ (p. 3)

Hypercorrection can insert a coda /s/ (in the “hablar fisno” speech style):²⁴

<i>Dominican fisno</i>	<i>Conservative</i>	
e.tús.pi.do	es.tú.pi.do	‘stupid’
de.des	des.de	‘since’
in.vis.tado	in.vi.ta.do	‘guest’
co.mos	co.mo	‘like’ (p. 4)

And there can be variation:

<i>Dominican fisno</i>	<i>Conservative</i>	
as.bo.ga.do ~ a.bos.ga.do ~ a.bo.gasdo ~ a.bo.ga.dos	a.bo.ga.do	‘lawyer’ (p. 4)

But, apparently there can only be one inserted s:²⁵ *as.bo.ga.dos, etc.

- o Any ideas, for each theory?

14. Optionality and self-bleeding: French schwa-deletion

Indo-European language from France and surroundings with 67.8 million speakers worldwide.

There’s a big literature on this; Dell 1970²⁶ is a good place to start.

/ə/ optionally deletes, except when it would create a bad consonant cluster.

/suvəniR/	→	[suvəniR] ~ [suvniR]	‘to remember’
/pasəRə/	→	[pasəRə] ~ [pasRə]	‘will pass’
/parvəniR/	→	[parvəniR] *[parvniR]	‘to reach’ ([RV] bad coda, [vR] bad onset)
/sufləRə/	→	[sufləRə] *[sufRə]	‘will blow’ ([VfR] unsyllabifiable)

²² Bradley, Travis G. 2006. Spanish rhotics and Dominican hypercorrect /s/. *Probus* 18.1:1-33.

²³ Núñez-Cedeño, Rafael. 1994. The alterability of Spanish geminates and its effects on the Uniform Applicability Condition. *Probus* 6: 23-41.

²⁴ though not before an otherwise intervocalic tap or trill, which would be phonotactically illegal

²⁵ See p. 24 for discussion of an apparent counterexample given by Harris.

²⁶ Dell, François (1970). *Les règles phonologiques tardives et la morphologie dérivationnelle du français*. MIT dissertation.

/ãri dəve partir/ → [ãri dəve partir] ~ [ãri dve partir] ‘Henri had to go’
 /ʒak dəve partir/ → [ʒak dəve partir] *[ʒak dve partir] ‘Jacques had to go’ ([kdv])

- What does basic SPE predict for this form (pretend the rule is obligatory): /ty dəvəne/ ‘you were becoming’
- Actual result is (supposedly) [ty dəvəne] ~ [ty dvəne]²⁷ ~ [ty dəvne], but *[ty dvne]—discuss.

15. Anderson’s (1974)²⁸ solution

- Find all segments eligible for the rule and circle them.
- For each circled segment, underline the smallest environment that lets the segment meet the rule’s structural description.
- If the rule is optional, you may uncircle some of the eligible segments and de-underline their environments.
- If any circled segment is contained in some other circled segment’s underlined environment, uncircle (and de-underline the environments of) as few segments as possible to get rid of these overlaps.
- Now apply the rule simultaneously to the remaining circled segments.

(Of course, circling and underlining themselves have no theoretical status—this is just a convenient way to say “identifying targets and environments”)

- What does Anderson’s proposal predict for French /ty vudre kə sə kə lə bədo/²⁹ ‘you would like that what the beadle...’?
- Does Anderson’s proposal help with Klamath? Kikuyu? Latvian? Tianjin?

²⁷ Some speakers have said they don’t like this one...

²⁸ Anderson, Stephen (1974). *The Organization of Phonology*. New York: Academic. (See chapter 13.)

²⁹ I got this from an online appendix to David Odden’s *Introducing Phonology* (2005: Cambridge UP): <http://www.ling.ohio-state.edu/~odden/IntroducingPhonology/Theory%20Discussion.html>