Class 8: Issues in process application: multiple targets, directionality, iterativity

To do
- Project: We'll see some more good project topics today and Thursday, so keep looking around

1. Before we get to today's topic: We need a better theory of faithfulness

- Trick question: fill in the constraint violations:

	/tui/	IDENT(round)	IDENT(back)
a	[ty]		

- In Prince & Smolensky 1993, an output candidate contains the input form—you can see what's been inserted or deleted.
  - This is retrospectively known as the containment approach.
  - But changing features gets tricky, and metathesis gets very hard.

2. The correspondence relation

McCarthy & Prince 1995 proposed replacing containment with **correspondence**.

- Every segment in the input bears a unique index (maybe every feature, mora, syllable…).
- Units of the output also bear indices (instead of the output containing input material).
  - It's *Gen*'s job not just to apply every combination of rules, but also to add every possible indexation.

- An input segment and an output segment are *in correspondence* iff they bear identical indices.

	/$t_1u_2i_3$/	IDENT(round)	IDENT(back)
a	[t_1y_2]		*
b	[t_1y_3]	*	

- These indices define a relation between input segments and output segments:

input output
/t/ —— [t]
/u/ —— [y]
/i/

That is, the relation =
{(/t/, [t]), (/u/, [y])}—candidate *a*

- /$p_1a_2t_3o_4k_5$/ → [$p_1a_2t_3o_4k_5$] means Corr(/p_1/, [p_1]), Corr(/a_2/, [a_2]), etc., where Corr(*x*, *y*) means "*x* corresponds to *y*".
- These are also output candidates for that input: [$p_5a_1t_4o_2k_3$], [$p_1a_1t_1o_1k_1$], [$p_6a_7t_8o_9k_{10}$].
  - But they're so outrageously bad we wouldn't normally bother including them in a tableau.
- When you see a candidate in a tableau without indices, you can assume that the correspondence relation is the obvious one.
- Sometimes it's not clear what the obvious correspondence relation is; in that case, spell it out.

3. What the point of the indexation is: constraints on the relation

- The purpose for adding this relation to each input-output pair is so that constraints can judge it.
- Faithfulness constraints (sometimes also called *correspondence constraints*) are constraints that care about various aspects of the correspondence relation.
- Here are the most important ones proposed by McCarthy & Prince:

MAX-C MAX-V	(don't delete)	Every consonant in the input must have a correspondent in the output. Every vowel in the input must have a correspondent in the output. (*maximize* the preservation of material in the input)
DEP-C DEP-V	(don't insert)	Every consonant in the output must have a correspondent in the input. Every vowel in the output must have a correspondent in the input. (every segment in the output should *depend* on a segment in the input.)
IDENT(F)	(don't change feature values)	If two segments are in correspondence, they must bear identical values for feature [F]. This constraint doesn't care about *whether* segments *have* correspondents or not; only about making sure feature values match *if* two segments do correspond.

- There are also constraints against merging, splitting, and reordering segments, as well as special correspondence for edges of units like words and phrases.
  - See McCarthy & Prince 1995 for a full list.

4. Process vs. target

- Here's a difference between SPE and OT in typological predictions.
  - SPE might predict that similar rules (processes) should be seen across languages
  - OT predicts that a markedness constraint should trigger diverse repairs across languages.

Some terms, coined by McCarthy, that you might run into:

Homogeneity of target

= languages impose the same well-formedness conditions on outputs

Heterogeneity of process

= languages use different means to satisfy the well-formedness conditions

5. On to this week's main topic: Multiple application

- What to do with a form that, for some rule A → B / X__Y or constraint *XAY, contains multiple instances of *XAY*
  - either because *XAY* straightforwardly occurs twice in the form...
  - or because there are multiple ways of interpreting *XAY* (say, in a rule schema).
- And, what if the output of the rule creates or destroys instances of *XAY*?

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

Great secondary sources for term-paper topics, which I also relied on to get many of this handout's examples: **Howard 1972, Johnson 1970**, and **Anderson 1974**. Stay away from the stress cases, though, since their rule-application issues tend to go away under metrical stress theory. **Vago & Battistella 1982**, **Battistella 1979, Jensen & Stong-Jensen 1973**, **Jensen 1973, Vago 1992** could be good places to find a topic too.

6. 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 again (Austronesian language from Palau (Micronesia) with about 25,000 speakers. Data from Josephs 1990.). Recall vowel reduction:

X	*his/her/its X*	
ɾákt	ɾəkt-él	'sickness'
sɛ́səb	səsəb-él	'fire'
bótk	bətk-él	'operation'
ɾíŋəl	ɾəŋəl-él	'pain'

- How should your rules apply to an underlying representation like /ðilobaʔ + ɛli/ 'his injury'? (real outcome is [ðələbəʔél])

- Let's sketch an OT analysis—any problems?

7. Eastern Ojibwa glide formation: self-bleeding

(Algonquian language of Canada with about 25,000 speakers [Lewis 2009]. Taken from Johnson/Howard [see there for a complication], originally from Bloomfield 1956—but see Miner 1979 for a criticism of similar data in Menominee)

- $\left\{\begin{matrix} o \rightarrow w \\ i \rightarrow "y" \end{matrix}\right\}$ / __ V : what will happen to /eninioak/?
- Correct surface form is [eniniwak]—discuss.

8. Klamath (self-bleeding)

(Penutian language of Oregon, very endangered [Lewis 2009]. Data and description taken from Kisseberth 1972; originally from Barker 1963)

glottalized stops:	p̓ t̓ č̓ k̓ q̓
glottalized sonorants:	m̓ n̓ y̓ w̓ l̓
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

q̓→q / _n̓	nčo**q̓**-a	'is deaf'	nčo**q**-n̓apg-a	'is almost deaf'
p̓→p / _t̓	**p̓**et̓-a	'a hole enlarges'	p̓e-**p**t̓-a	'dist. holes tear out'
t̓→t / _k̓	m-p̓e**t̓**-a	'enlarges hole'	m-p̓e**t**-k̓y-o:l-a	'chips open a hole'
q̓→q / _č̓	**q̓**oč̓-a	'bends'	q̓o-**q**č̓-a	'dist. bend'
p̓→p / _W	nt̓o**p̓**-a	'rots, spoils'	nt̓o**p**-Wi:y-a	'almost rotted'
p̓↛p / _y			nt̓o**p̓**-ye:g-a	'starts to spoil'
t̓↛t / _w			wLe**t̓**-wal	'lies spread eagled on top of'
	cf.		wLe**t**-pga	'is lying flat on back'
n̓→n / _k̓	**n̓**o-k̓a	'little head'	n̓o-**n**-k̓a	'dist. little heads'
w̓→w / _č̓	**w̓**ič̓-a	'is breathless'	wi-**w**č̓-a	'dist. are breathless'
y̓→y / _G[1]	ʔ-iw**y̓**aq	'put in pl. obj.'	ʔi-ʔo:**y**Ga	'dist. put pl. obj. into'
l̓→l / _l	k-bo**l̓**-a	'hits in stomach'	w-bo**l**-lG-a	'falls on stomach'
w̓→w / _l	ga**w̓**al	'finds'	ga**w**l-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: q̓l̓q, p̓l̓q?

[1] Kisseberth has *g* with a dot below, but dot won't show under the *g* in my font.

Here are the data:	/q̊laq/:	nčo**q**-**l̊aq**-Wi:y-a	‘ears are stopped up’
		nčo**q̊**-**lɢ**-a	‘ears are almost stopped up’
		hos-ta**q**-**l̊aq**	‘make him stop!’
		hos-ta**q̊**-**lɢ**-a	‘makes someone stop an action’
		to**q̊**-**lɢ**-a	‘stops an action’
	/p̊laq/:	sno-nta**p**-**l̊aq**-s	‘rotted wokas[2]’
		sno-nta**p̊**-**lɢ**-a	‘causes to rot down’

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

9. 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)

k → ɣ / __V_0[voiceless stop]

- What should happen to /ne**k**a**k**aakeroma/ ‘he will bite him’ in SPE? OT?

Here’s the datum: [ne**ɣ**a**ɣ**aakeroma] (*[ne**k**a**ɣ**aakeroma]) [Is it reduplicated, though?]

10. 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] V_0 __

u-kwač-i**l**e	‘he took’	u-d^{y}im-i**n**e	‘he cultivated
ku-kwač-i**l**-a	‘to take (ben.)’	ku-d^{y}im-i**n**-a	‘to cultivate (ben.)’
u-kwač-i**d**^{y}-i**l**e (l→d^{y}/__i)	‘he took (ben.)’	u-d^{y}im-i**n**^{y}-i**n**e	‘he cultivated (ben.)’

- In an OT analysis, can we easily rule out *u-d^{y}im-i**n**^{y}-i**l**e? *u-d^{y}im-i**l**^{y}-i**l**e?

[2] some kind of aquatic plant gathered for food

11. Self-counterfeeding?

- Howard 1972 presents some possible cases but reanalyzes them.
- Kaplan 2008, as you read, reanalyzes many purported cases of self-counterfeeding.

Kavitskaya & Staroverov 2010 present a case from Tundra Nenets (Nenets is a Uralic language of Siberia and Arctic Russia with 31,300 speakers):

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

/xʌr**ʌ**/	→ xʌr	'knife-*nom.sg.abs.*'	
/xʌr**ʌ**-r**ʌ**/	→ xʌ.rʌ-r	'knife-*2sg.poss*'	I assume [rr] is a bad coda.
/xʌr**ʌ**-ta/	→ xʌr.-da	'knife-*3sg.poss*'	
/xar**ʌ**t**ʌ**/	→ xa.rʌd	'house-*nom.sg.abs.*'	[see below]
/xar**ʌ**tʌ-r**ʌ**/	→ xar.dʌ-r	'house-*2sg.poss*'	
/xar**ʌ**tʌ-ta/	→ xar.dʌ.-da	'house-*3sg.poss*'	

/nult**ʌ**nʌ-s^{j}**ʌ**/ → nult.nʌ-s^{j} 'house-*3sg.poss*'

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

/xar**ʌ**tʌ-ta/ → xar.dʌ.-da ; xar.d**ʌ**.-da ↛ xard.da (though *rdd* is apparently legal)

- Can we capture this with rules? OT?
- Consider /xar**ʌ**t**ʌ**/ → xa.rʌd, *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 OT machinery we won't have a chance to cover in this course, Candidate Chains (McCarthy 2007)..]

12. Self-counterfeeding again: morphological truncation

- In Lardil (which you read about in Prince & Smolensky 1993, based on Hale 1973), /pulumunitami/ → pulumunitam (FREE-V) → [pulumunita] (CODACOND)
  - but this doesn't cause any further deletion
  - See Round 2011, though—there's more it

- Tohono O'odham (variety of O'odham, Uto-Aztecan language from Arizona and Sonora with about 9,600 speakers; Lewis 2009). Data here are from Fitzgerald 2002:

imperfective	*perfective*	
mɨḍ	mɨː	'running'
ǰúɲ	ǰúː	'being a certain time of day or night'
hím	híː	'walking'
húg	húː	'eating object'
nóɗ	nóː	'bending object'
ɲɨ́ɲ	ɲɨ́ː	'waking up'
wúḍ	wúː	'tying object with rope'
ʂíːsp	ʂíːs	'pinning'
híkčk	híkč	'cutting'
bídʂp	bídʂ	'painting object'
híhim	híhi	'walking (pl)'
híhink	híhin	'barking (pl)'
ɲíŋok	ɲíŋo	'speaking (pl)'

- Let's compare basic SPE and OT analyses.

- Wolf 2011 discusses a similar example from Chemehuevi (also Uto-Aztecan) and cites (p. 106) several more truncation cases that would make good **term paper topics** (where not already reanalyzed by Kaplan): Catalan, Hidatsa, Karok, Latvian, Lithuanian, Odawa, Ponapean, Woleaian.

13. 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?

Now some directionality issues...

14. *If time:* Tricky case from Latvian; from SPE, pp. 365-366[3]

glide formation: $\begin{bmatrix}\text{–cons}\\ \text{+high}\end{bmatrix} \rightarrow$ [–syll] / ___ [+syll]

truncation: V → Ø / __ #

- 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?

15. 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?

16. Tianjin tone sandhi

A northern dialect of Mandarin. (Milliken et al. 1997, Chen 2000; see also Kuang 2008)

the tones	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	

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'

[3] Originally from Halle & Zeps 1966. But see Christina Skelton's 200A paper from 2009: the data are uncertain and the underlying forms are open to question.

Why *these* rules? Who knows! Tone sandhi tends to be pretty arbitrary synchronically. See Mortensen 2006 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 leave some of this as a paradox—there's an extensive literature you can check out, though.

Next time: Application issues with optional processes.

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