Class 11: Process interaction II

To do
- Tomorrow: Hakha Lai **assignment** is due (after that, you have a week off from problem sets)
- **Project**: Talk to me about a **topic** if you haven't already. Then, do **primary-vs-secondary-source report**, due any time next week.
- K&K ch. 10, Kiparsky **reading** questions due Monday

Overview: We'll look more carefully at the types of process interaction that (might) exist, and which theories can handle them.

1. Where we were last time

- Opacity (counterfeeding, counterbleeding) is easy in SPE, where a language can impose any order it wants on rules.
- But some researchers have proposed that at least sometimes, rule are *intrinsically* ordered

2. Koutsoudas, Sanders, & Noll 1974: Simultaneous repeated application (review)

- = all rules apply simultaneously to the UR, then again to the result, and again until no more application is possible. This results in *maximal application* (feeding rather than counterfeeding, counterbleeding rather than bleeding).

o Let's try a simple example, /panipa/ with V → Ø / VC__CV and nasal place assimilation

Plus an additional principle, "proper inclusion precedence"

- Latin American varieties of Spanish, rather abstract analysis (Harris 1983?):

	/akeʎ/	/akeʎ+os/	
1. ʎ → l / __ #	akel	---------	
2. ʎ → j	----	akej+os	
	'that'	'those'	(but see Lloret & Mascaró 2007)

o What kind of rule ordering is this? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

o Try to apply these rules simultaneously and repeatedly to /akeʎ/—what's the issue?

- Koutsoudas & al. propose (p. 9):
  "For any representation R, which meets the structural descriptions of each of two rules A and B, A takes applicational precedence over B with respect to R if and only if the structural description of A properly includes the structural description of B."

the structural description (SD) of A properly includes the SD of B = you can match B's SD up with part of A's SD that it is nondistinct from, and still have part of A's SD left over.

- How does the definition apply to the two Spanish rules? *plicker:* Is ʎ → l / __ # Rule A or Rule B?

3. What this theory predicts in general

- Feeding (rather than counterfeeding) and counterbleeding (rather than bleeding)
- So what about real cases of bleeding?

- Schaffhausen dialect of Swiss German:

	/bogə/	/bodə/	/bogə+PL/	/bodə+PL/
1. V → [–back] / *complicated 'umlaut' context, including plurals*	----	----	bøgə	bødə
2. o → ɔ / __ [+cons, +cor, –lat][1]	----	bɔdə	----	----

- Why is this ordering crucial?

- What happens if we use the Koutsoudas & al. approach?

- K & al. propose that in all apparent cases of bleeding (and counterfeeding?), the rules need to be revised. In this case, they propose a context-free rule œ → ø (remember Myers's persistent rules, which apply everywhere in the derivation that they can).

- Apply this solution to /bodə+PL/.

- What additional fact needs to be true in Schaffhausen for this to work?

[1] In the original it's not [+cor] but [–grave]. *Grave* is an acoustic feature (roughly, lower frequencies are stronger for [+grave] segments), not much used these days. Labials and velars are [+grave]; dentals and alveolars are [–grave] (a.k.a. *acute*).

4. Another intrinsic ordering idea: the Elsewhere Condition (Anderson 1969, Kiparsky 1973...)

- Recall once more disjunctive ordering of the rules that a schema expands into:

$$V \rightarrow [+stress] / \_\_ C_0(VC_0)\# \Rightarrow \begin{array}{l} V \rightarrow [+stress] / \_\_ C_0VC_0\# \\ \textit{else } V \rightarrow [+stress] / \_\_ C_0\# \end{array}$$

- Kiparsky argues that disjunctive ordering doesn't really have anything to do with expansion conventions. He proposes that what really drives disjunctive ordering is...

- *Elsewhere Condition (revised in later Kiparsky works)*

(p. 94) "Two adjacent [in the ordering] rules of the form

$A \rightarrow B / P \_\_ Q$
$C \rightarrow D / R \_\_ S$

are disjunctively ordered if and only if:

(a) the set of strings that fit [are nondistinct from] *PAQ* is a subset of the set of strings that fit *RCS*, and

(b) the structural changes of the two rules are either identical or incompatible"

- We also need to define 'incompatible'—probably it means that the results of applying the two rules are *distinct*, in our technical sense.

o What does the Elsewhere Condition say about the pair of stress rules above?

o How does the Elsewhere Condition compare to proper inclusion precedence? Are there cases where the two conditions apply differently? (Let's try Spanish and English from last time)

5. Anderson 1974 ch. 10: natural order

- We won't spend much time on this, because you read about it
- What's special about Anderson's proposal:
  - The order of two rules can be different for different words
  - In that case, the grammar leaves the two rules unordered...
  - ...and for each word, the ordering is determined by whether, *for that word*, the ordering is feeding, bleeding, etc.
  - Some pairs of rules are left unordered by a language's grammar and so apply in their **natural**

- See (Kiparsky 1984) for a totally different analysis of Icelandic in Lexical Phonology.

6. Summary: now we have three main theories...

- **Classic OT**. All candidates are considered: powerful Gen(), Eval() runs just once
- **OT with Harmonic Serialism**. Only "close" candidates are considered: restricted Gen(), Eval() applies repeatedly to its own output
- **SPE**. Fixed sequence of operations (each applied simultaneously to all targets): deterministic Gen(), trivial Eval() (because there is only one candidate)

- ...Plus some **SPE variants**, not so well developed
  - All rules are iterative (apply to their own output till it stops changing).
    - or rules can be tagged as either iterative or not
  - Rules can apply left-to-right or right-to-left
    - maybe this has to be learned for each rule, or maybe it follows somehow from the form of the rule.
  - No rule ordering: all rules apply simultaneously to the underlying form
  - No rule ordering: all rules apply simultaneously to the underlying form; repeat this until no more changes
  - Rules apply in order, but the order needn't be learned, because it follows from the content or potential interaction of the rules themselves
    - This can mean that rules apply in a different order to different underlying forms

Now let's examine the process-interaction typology in more detail

7. The classic interaction typology, for reference

interaction	*definition*	*schematic derivation*	*result*
R1 feeds R2	R1 creates environment for R2 to apply to	/bind/ d → Ø / __# bin n → Ø / __# bi [bi]	transparent: • no [d#] on the surface • no [n#] on the surface
R1 counterfeeds R2	R1 applies too late to create environment for R2	/bind/ n → Ø / __# -- d → Ø / __# bin [bin]	opacity—*underapplication*: • [n#] on surface, despite rule targeting *n#*
R1 bleeds R2	R1 destroys environment for R2 to apply to	/bind/ d → Ø / __# bin Ø → i/ C__C# -- [bin]	transparent: • no [d#] on the surface • no [i] inserted, because no surrounding *C__C#*
R1 counterbleeds R2	R1 applies too late to destroy environment for R2	/bind/ Ø → i/ C__C# binid d → Ø / __# bini [bini]	opacity—*overapplication*: • [i] inserted, despite lack of surrounding *C__C#*

- A rule *underapplies* if there are surface instances of its structural description.
- A rule *overapplies* if there are instances in which it has applied, although the non-affected part of the structural description (the environment) is no longer present.

(The terms *underapplication* and *overapplication* come from Wilbur's (1973) discussion of reduplication. McCarthy 1999 adapts them for discussing opacity.)

8. Baković 2007, Baković 2011: dissociating opacity-vs-transparency from interaction type

Baković argues that the typology is **not**...

	transparency	underapplication opacity	overapplication opacity
feeding	✓		
bleeding	✓		
counter-feeding		✓	
counter-bleeding			✓
non-interaction	✓		

...but rather (at least)...

	transparency	underapplication opacity	overapplication opacity
feeding	✓	✓	✓
bleeding	✓		
counter-feeding	✓	✓	
counter-bleeding	✓		✓
other	✓	✓	

...so process-interaction types actually don't account for opacity vs. transparency.

<u>Let's go through Baković's typology:</u>

9. Counterfeeding-on-environment[2] → underapplication

Bedouin Arabic

UR	badw		
a → i / __ σ	*n/a*	= ℙ	
G → V/ C __ #	badu	= ℚ	
SR	badu	'Bedouin'	(Baković 2007, p. 222; from McCarthy 1999)

- What would be the transparent outcome?

10. Counterfeeding-on-focus → underapplication

Bedouin Arabic again

UR	katab		
i → ∅ / __ σ	*n/a*	= ℙ	
a → i / __ σ	kitab	= ℚ	
SR	kitab	'he wrote'	(Baković 2007, p. 222; from McCarthy 1999)

- What would be the transparent outcome?

[2] Term from McCarthy 1999.

11. "Surface-true counterfeeding" → transparency!

Educated Singapore English: Baković 2011, p. 16;[3] from Mohanan 1992, Anttila et al. 2008

Epenthesis: /reɪz + z/ → [reɪz + əz] (and, I infer, /reɪs/ → [reɪs + əz])

Deletion: /test/ → [tes] cf. /tɛst+ɪŋ/ → [tɛst+ɪŋ]

no data, but Degemination "deletes one of two tautosyllabic near-identical consonants" (p. 16)
/lɪst+z/ → [lɪs]

- In an SPE analysis, what rule order do we need to get [lɪs]? Why does B. call this result "transparent"?

12. Underapplication without counterfeeding (Baković 2011 p. 8ff.)

"Disjunctive blocking" (p. 8)

- How would this rule schema apply to these words: V → [+stress] / __ $(C_2V)C_0$ # ?

/badupil/ /pikomsak/

Remember how expansion conventions work—abbreviates two rules, disjunctively ordered.

- In what sense does underapplication result?

Nonderived-environment blocking—we'll save that till later, but essentially it's when an additional mechanism in the theory says that a rule can't apply if its structural description was already met in the underlying form:

e.g. a → i / __ C# /likat/ *fails to apply* /noka+l/ → [nokil]

Blocking by phonotactic constraint (p. 12)

- Think of vowel deletion in Yawelmani Yokuts, and the constraint that can block it. If we formulate the simple deletion rule (what was it?), then what would be some surface forms in which it underapplies?

[3] Page numbers for manuscript version

(Non-)triggering by phonotactic constraint (p. 13)

- Think of *consonant* deletion in Yokuts, and the constraint that triggers it. If we formulate the simple deletion rule (what was it?), then what would be some surface forms in which it underapplies?

Restriction to certain morphological classes (Estonian V deletion in nominative singular only)

Optionality (French schwas may or may not delete)

Lexical exceptions (English *obesity* fails to undergo 'trisyllabic shortening')

13. Fed counterfeeding[4] on environment→ underapplication

Lardil

		a. /dibirdibi/	b. /yiliyili/	c. /wangalk/
Apocope:	V ⟶ ∅ / σ σ __ #	∅	∅	
Deletion:	[–apical] ⟶ ∅ / __ #	∅		∅
		[dibirdi]	[yiliyil]	[wangal]

Glosses: (9a) 'rock cod', (9b) 'oyster species', (9c) 'boomerang'

(Baković 2011, p. 6; from Hale 1973)

- Why do you think it's called "fed counterfeeding"?

14. Fed counterfeeding on focus = "Duke of York" derivations[5]→ underapplication

Nootka

	a. /mu: q /	b. /ħaju+ q i/	c. /ɬa:k^{w}+ʃitɬ/
Labialization:			
[+dors] ⟶ [+rnd] / [+rnd] __	q^{w}	q^{w}	
Delabialization:			
[+dors] ⟶ [–rnd] / __]$_{\sigma}$	q		k
	[mu: q]	[ħaju+q^{w}i]	[ɬa: k +ʃitɬ]

Glosses: (11a) 'throwing off sparks', (11b) 'ten on top', (11c) 'to take pity on'

(Baković 2011, p. 7; from Sapir & Swadesh 1978, McCarthy 1999, 2003, 2007a, 2007b)

[4] Baković gets the term from Kavitskaya & Staroverov 2009

[5] Term from Pullum 1976

- OT thoughts on Nootka?

15. Counterbleeding → overapplication

Yokuts

UR	ʔili:+l		
[+long] → [−high]	ʔile:l	= ℙ	cf. /ʔili:+hin/ → [ʔile:hin] 'fans'
V → [−long] / __ C#	ʔilel	= ℚ	cf. /pana:+l/ → [panal] 'might arrive'
SR	ʔilel	'might fan'	

(Baković 2007, p. 223; from McCarthy 1999)

- What would be the transparent outcome?

Since counterbleeding is so problematic in OT, here are some other famous cases:

- Canadian Raising vs. tapping in English ("Output-output Correspondence" helps)
- Serbo-Croatian *l*-vocalization (see (Kenstowicz & Kisseberth 1979) ch. 3 exercise)

16. Counterbleeding by mutual bleeding → transparent!

Lardil

		a. /papi+ ɯɻ/	b. /tʲæmpæ+ɯɻ/
Epenthesis:	∅ ⟶ w / i __ u	w	
Elision:	V ⟶ ∅ / V __		∅
		[papi+wɯɻ]	[tʲæmpæ+ɻ]

Glosses: (25a) 'father's mother (acc. fut.)', (25b) 'mother's father (acc. fut.)'

(Baković 2011, p. 22 of ms.; from Hale 1973)

- In what sense is this mutual bleeding?

- OT analysis?

17. "Self-destructive feeding"→ overapplication!

Turkish

UR	bebek+n		
∅ → i / C__ C#	bebekin	= ℙ	cf. /ip+n/ → [ipin] 'your rope'
k → ∅ / V__ +V	bebein	= ℚ	cf. /bebek+i/ → [bebei] 'baby (ACC)'
SR	bebein	'your baby'	

(Baković 2007, p. 226; from Sprouse 1997)

UR	ajak+sɯ		
[+cont] → ∅/ C__	ajakɯ	= ℙ	cf. /arɯ+sɯ/ → [arɯsɯ] 'his bee'
k → ∅ / V__ +V	ajaɯ	= ℚ	cf. /ajak+ɯ/ → [ajaɯ] 'foot (ACC)'
SR	ajaɯ	'his foot'	

(Baković 2007, p. 227; from Kenstowicz & Kisseberth 1979)

- Does this remind you of the Korean verbs assignment?

- What would be the transparent outcome?

18. Here's another one from (Lee 2007)

Javanese (Austronesian from Indonesia with about 84 million speakers; data originally from (Dudas 1976; Lee 1999))

	'skin' /kulit+ne/	/sekolah+an/	/omah+ne/
n → Ø / C__	kulit+e	--	omah+e
h → Ø / V__V	--	sekola+an	oma+e
	[kulite]	[sekolaan]	[omae]

- Could this work in Harmonic Serialism?

19. "Non-gratuitous feeding" → overapplication

Classical Arabic

UR	ktub		
$\emptyset \rightarrow V_i$ / # __ CCV_i	uktub	= ℙ	
$\emptyset \rightarrow$ ʔ / # __ V	ʔuktub	= ℚ	cf. /al-walad-u/ → [ʔalwaladu]
SR	ʔuktub	'write (MASC SG)!'	'the boy (NOM)'

(Baković 2007, p. 231; from McCarthy 2007b)

- What would be the transparent outcome?

20. "Cross-derivational feeding" → overapplication, in a sense

Lithuanian: Baković 2007, p. 234ff.; see there for references

prefix obstruents assimilate in voicing and palatalization :

at-koːpʲtʲi	'to climb up'	ap-kalʲbʲetʲi	'to slander'
ad-gautʲi	'to get back'	ab-gautʲi	'to deceive'
atʲ-pjʲautʲi	'to cut off'	apʲ-tʲemʲdʲiːtʲi	'to obscure'
adʲ-bʲekʲtʲi	'to run up'	abʲ-gʲiːdʲiːtʲi	'to cure (to some extent)'

(p. 234)

epenthesis between stops of the same place (also palatalization before [i]):

atʲi-taikʲiːtʲi	'to make fit well'	apʲi-putʲi	'to grow rotten'
atʲi-tʲeisʲtʲi	'to adjudicate'	apʲi-pʲiːlʲtʲi	'to spill something on'
atʲi-duotʲi	'to give back'	apʲi-barʲtʲi	'to scold a little bit'
atʲi-dʲetʲi	'to delay'	apʲi-bʲerʲtʲi	'to strew all over'

(234)

- Baković 2005 argues that the right analysis here (and in English epenthesis before /-d/ and /-z/) should capture the idea that epenthesis occurs where a geminate *would have occurred* (because of assimilation).
  - Assimilation would have fed epenthesis (which in Baković's analysis is only triggered between identical segments), but assimilation doesn't end up needing to apply (bleeding

- Why is this hard for SPE?

That completes our tour of Baković's typology (I skipped "concealed free rides"). But here are a couple more animals for the menagerie:

21. Wolf 2011: "mutual counterfeeding" in Hindi-Urdu

Indo-European from India w/ about 240 million speakers [Lewis 2009], data and analyses originally from Narang & Becker 1971, Bhatia & Kenstowicz 1972.

- Fill in the SPE-style derivation, including predicted surface form for 'mind':

	/nikəl-naː/	/nikəl-aː/	/angən-on/	/maːnəsi/
schwa deletion: ə →Ø / VC__CV				
V nasalization: $\begin{matrix}V\\1\end{matrix}\ \begin{matrix}C\\[+nas]\\2\end{matrix} \rightarrow \begin{matrix}1\\[+long]\end{matrix}$				
	[nikəlnaː] 'to come out'	[nikl-aː] 'came out'	[ãːgən-õː] 'courtyard-*obl.pl.*'	? 'mind-*adj.*'

- Problem: surface form is actually [maːnsi].
- What rule ordering does this require? What's the problem?

- What outcome do we get if both rules apply simultaneously to the input (no iteration)?

- See Bhatia & Kenstowicz (or Wolf) for arguments that the V nasalization rule doesn't actually exist in this language—nasal vowels are just underlying, so the problem goes away.

22. (Wolf 2010): counterfeeding from the past

- The name comes from (Wilson 2006).
- See the Wolf paper for more cases that would be good term-paper topics (Tachoni?).

Samothraki Greek, (Kaisse 1975):		'carry-past.theme-1.pl'	'day'
		/fér+a+me/	/mér+a/
feeding:	r → Ø / V__V	fé+a+me	mé+a
	{a,e}→ i / __+{a,o}	fí+a+me	mí+a
		[fíami] (other rules apply to last V, I guess)	[mía]

feeding:		'Greek'	'old'	'one'
		/romé+os/	/palé+os/	/mía/
	{a,e}→ i / __+{a,o}	romí+os	palí+os	--
	V → [-syll] / __+V	romj+ós	palj+ós	mjá
		[romjós]	[paljós]	[mjá]

- What's the problem here for putting all three rules in an order? (Hint: *[fjámi])

- Gliding somehow doesn't get to apply if it was originally fed by *r*-deletion. None of our theories predict this (I think), but OT with "candidate chains" does.

23. Paper-topics recap

Here's a summary of areas we've seen so far where different theories make different predictions, or differ in how easily they can handle cases:

- (self-)feeding vs. (self-)counterfeeding—but there are many sub-types
- (self-)bleeding vs. (self-)counterbleeding—but there are many sub-types
- miscellaneous exotic types of opacity
  - good search terms are "ordering paradox", "non-transitive"
- iterative vs. non-iterative rule application
- interaction (or not) of multiple rule targets
- directional rule application
- optionality: global vs. local vs. unique-target; iterative vs. all-or-nothing
- look-ahead: myopic vs. ahead-looking derivations
  - Other good search terms: fell-swoop, global power, globality, peeking, sour grapes, chicken-or-egg problem, top-down

References

Anderson, Stephen R. 1969. West Scandinavian vowels systems and the ordering of phonological rules. MIT dissertation.

Anderson, Stephen R. 1974. *The Organization of Phonology*. New York: Academic Press.

Anttila, Arto, Vivienne Fong, Štefan Beňuš & Jennifer Nycz. 2008. Variation and opacity in Singapore English consonant clusters. *Phonology* 25(2). 181–216. doi:10.1017/S0952675708001462.

Baković, Eric. 2005. Antigemination, assimilation and the determination of identity. *Phonology* 22. 279–315.

Baković, Eric. 2011. Opacity deconstructed. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*. Blackwell.

Bhatia, Tej K & Michael J Kenstowicz. 1972. Nasalization in Hindi: a reconsideration. *Papers in Linguistics* 5. 202–212.

Dudas, Karen. 1976. The phonology and morphology of Modern Javanese. University of Illinois, Urbana-Champaign.

Hale, Kenneth. 1973. Deep-surface canonical disparities in relation to analysis and change: An Australian example. In Thomas Sebeok (ed.), *Current Trends in Linguistics*, vol. 9: Diachronic, Areal and Typological Linguistics, 401–458. The Hague: Mouton.

Harris, James. 1983. *Syllable Structure And Stress in Spanish: a Nonlinear Analysis*. Cambridge, Mass.: MIT Press.

Kaisse, Ellen. 1975. A violation of transitivity in Modern Greek. In Robin E Grossman, L. James San & Timothy J Vance (eds.), *Papers from the 11th Regional Meeting, Chicago Linguistic Society*, 329–339. Chicago: Chicago Linguistic Society.

Kavitskaya, Darya & Peter Staroverov. 2009. Fed counterfeeding and positional reference: re-solving opacity. manuscript.

Kenstowicz, Michael & Charles Kisseberth. 1979. *Generative Phonology: Description and Theory*. New York: Academic Press.

Kiparsky, Paul. 1973. "Elsewhere" in phonology. In Stephen R Anderson & Paul Kiparsky (eds.), *A Festschrift for Morris Halle*, 93–106. New York: Holt, Rinehart and Winston.

Kiparsky, Paul. 1984. On the lexical phonology of Icelandic. In C. C Elert, I. Johansson, E. Stangert, C. C Elert, I. Johansson & E. Stangert (eds.), *Nordic prosody III*, 135–164. Ume? University of Ume?

Koutsoudas, Andreas, Gerald Sanders & Craig Noll. 1974. The application of phonological rules. *Language* 50. 1–28.

Lee, Minkyung. 1999. A case of sympathy in Javanese affixation. In Karen Baertsch, Daniel A Dinnsen, Karen Baertsch & Daniel A Dinnsen (eds.), *Indiana University Working Papers in Linguistics I*, 31–36. Bloomington, IN: IULC Publications.

Lee, Minkyung. 2007. OT-CC and feeding opacity in Javanese. *Studies in Phonetics, Phonology and Morphology* 13(2). 333–350.

Lewis, M. Paul (ed.). 2009. *Ethnologue: languages of the world*. 16th ed. Dallas, TX: SIL International.

Lloret, Maria-Rosa & Joan Mascaró. 2007. Depalatalization in Spanish revisited. In Fernando Martínez-Gil & Sonia Colina (eds.), *Optimality-Theoretic Studies in Spanish Phonology*, 74–98. John Benjamins Publishing Company.

McCarthy, John J. 1999. Sympathy and phonological opacity. *Phonology* 16. 331–399.

McCarthy, John J. 2003. Sympathy, cumulativity, and the Duke-of-York gambit. In Caroline Féry & Ruben van de Vijver (eds.), *The Syllable in Optimality Theory*, 23–76. Cambridge: Cambridge University Press.

McCarthy, John J. 2007a. Derivations and levels of representation. In Paul de Lacy (ed.), *The Cambridge handbook of phonology*. Cambridge: Cambridge University Press.

McCarthy, John J. 2007b. *Hidden Generalizations: Phonological Opacity in Optimality Theory*. London: Equinox.

Mohanan, K.P. 1992. Describing the phonology of non-native varieties of a language. *World Englishes*. 111–128.

Narang, G. C & Donald A Becker. 1971. Aspiration and Nasalization in the Generative Phonology of Hindi-Urdu. *Language* 47(3). 646–667.

Pullum, Geoffrey. 1976. The Duke of York gambit. *Journal of Linguistics* 12. 83–102.

Sapir, Edward & Morris Swadesh. 1978. *Nootka texts: Tales and ethnological narratives, with grammatical notes and lexical material*. New York: AMS Press.

Sprouse, Ronald. 1997. A case for enriched inputs. Berkeley, CA.

Wilbur, Ronnie Bring. 1973. *The phonology of reduplication*. Indiana University Linguistics Club.

Wilson, Colin. 2006. Counterfeeding from the past. Manuscript. UCLA, ms.

Wolf, Matthew. 2010. On the existence of counterfeeding from the past. Baltimore.

Wolf, Matthew. 2011. Limits on global rules in Optimality Theory with Candidate Chains. *Phonology* 28(1). 87–128.