Class 10: Process interaction I

To do
- Friday: Hakha Lai **assignment** is due (after that, you have a week off from problem sets)

Project
- **Meet** with me to discuss term paper by end of this week
- Work on checking that your paper hasn't **already been written**
- Order any **books** you might want from Interlibrary Loan, or SRLF; or recall if checked out

A. Report from AMP—traits seen in talks this weekend (n = 19)[1]

- 84% of talks used OT
- though only 63% had actual tableaux
- 58% presented variation data
- 32% presented a grammar model of variation
- 37% included a human experiment
- 37% used corpus data
- 21% used acoustic analysis

B. Tips on presenting an OT analysis

Minor points I want to touch on
- Definition shortcut for off-the-shelf faithfulness constraints
- Paragraph > Keep with next

Important point
- The brick principle
  - interleaving
  - just-in-time presentation

C. Chilean Spanish discussion

Points I want to touch on
- Shading review
- Constraint atomicity

Overview: Should processes be able to look forward into the derivation? How far? We'll contrast SPE, OT, and a major variant of classic OT, OT with harmonic serialism. Then we'll start to revisit the typology of opaque process interaction and what each theory predicts.

1. Global power

- Can a rule "see" anything other than its immediate input? Can it look further ahead?
- In SPE, rules aren't supposed to have *global power* (term from Lakoff 1970).
- But global power follows naturally in OT: every candidate is the very end of a derivation.
  - Now we have something that OT can handle easily but SPE can't.
  - So how robust are the claimed cases?

[1] Some codings were a judgment call and of course I may have made errors—I was concentrating on the talks!

2. Case of global power in Walker 2010

- Basic metaphony rule again, as seen in many Romance "dialects":

  basic rule: {é,ó} → [+high] / __C_0+C_0[+syll, +high]

- Venetan version (inventory: [i,e,ɛ,a,u,o,ɔ])—more info than we saw last time

tense Vs raise	kals-ét-o	kals-**í**t-i	'sock (m. sg/pl)'
	móv-o	m**ú**v-i	'move (1 sg/2 sg)'
lax or low Vs don't	gát-o	g**á**t-i	'cat (m sg/pl)'
[hi] can spread through unstr. V	órden-o	**ú**rd**i**n-i	'order (1 sg/2 sg)'
... unless that V is /a/	lavór-a-v-a	lav**ó**r-**a**-v-i	'work (1 sg [3sg?] perf/2 sg impf)'
no spreading unless [+hi] will	ángol-o	**á**ng**o**l-i	'angel (m sg/pl)'
get all the way to the stressed V	pérseg-o	p**é**rs**e**g-i	'peach (m sg/pl)'

- Spreading shows "look-ahead"—it sees all the way to the end of its iterative application (hypothetical *[**á**ng**u**l-i], *[p**é**rs**i**g-i], where stressed V is still not high)
  - if the result doesn't solve the fundamental problem of the unraised stressed vowel, then no spreading is done at all (**"sour grapes"**)

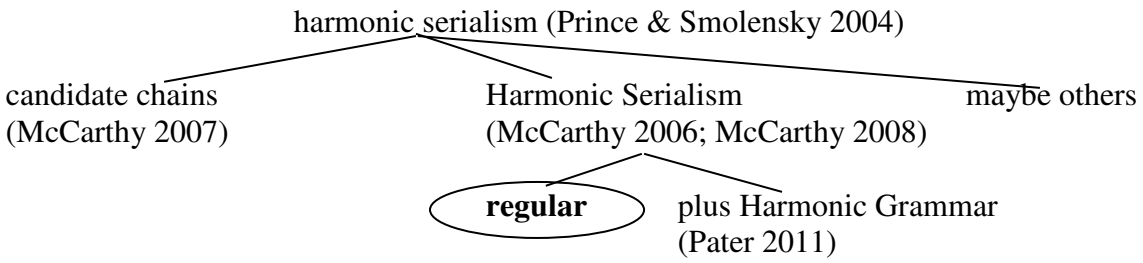
o Let's sketch a rule analysis to see why this is problematic.

o Let's develop an OT analysis.

- See (Kaplan 2011) for a seemingly contrasting case of *non*-lookahead or "**myopia**" in Chamorro.

3. A major variant of OT: Harmonic Serialism

- Distinction between small-*h*, small-*s* and capital-*H*, capital-*S*:



- **Difference #1: Gen()**

Classic OT Gen(/input/) = {all results of applying all rules to input, in any order, repetition OK}
Gen(/ab/) = {ab, b, a, tab, abi, tabi, tabii, tabiii, Ø, ba, qo, ...} (infinite set)

Harmonic Ser. Gen(/input/) = {all results of applying just one minimal change to input}
Gen(/ab/) = {ab, b, a, tab, abi, eb, ɑb, ãb, ap, am, ... }(finite set)

  - A change is minimal iff it incurs just one faithfulness violation (so, constraint inventory matters).

- **Difference #2: Overall architecture**
  - In Harmonic Serialism, keep applying grammar to its own output until the result stops changing.

Dakota, from (Elfner 2016)*—data orig.* (Shaw 1985) *(Siouan lang., U.S. & Canada, 15,400 speakers [*(Lewis 2009)*])*

/čap/	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	STRESSIS FINAL[2]	DEP-V	DON'TDELETE STRESS	MAX-V
a čap	*!	*					
☞ *b* čáp		*	*				
c ča.pa	*!				*		

  - Why is [ča.pá] not a candidate?

feed *čáp* into grammar—again, [ča.pá] is not a candidate (why not?)

čáp	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	STRESSIS FINAL	DEP-V	DON'TDELETE STRESS	MAX-V
d čap	*!	*				*	
e čáp		*!					
☞ *f* čá.pa				*	*		

[2] Not the real constraint—see Elfner, who uses feet.

feed *čá.pa* into grammar:

čá.pa	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	STRESSIS FINAL	DEP-V	DON'TDELETE STRESS	MAX-V
g ča.pa	*!					*	
☞ *h* čá.pa				*			
i čá.pá			*!				
j čáp		*!					*

Input=output, so stop iterating.

- What does this grammar predict for input like /čite/?[3]

- Why can't we get *[ča.pá] in this Harmonic Serialism grammar?

- What happens if we switch the ranking of WORDMUSTHAVESTRESS and NOCODA?

- What happens if we try to analyze Veneto in Harmonic Serialism?

[3] hypothetical—real examples have clusters that muddy the issue

4. Classic look-ahead: (Hill 1970)'s "peeking" rule in Cupeño

Uto-Aztecan language from Southern California with no known speakers today [(Lewis 2009)].

- Read the derivations from left to right:

Figure 1. Application of Rules to Examples (1)–(13) of Section 1.1

	Underlying Forms	A Vowel Deletion	B *-ine, yaxe* Reduction	C *a*-Reduction	D HAB	E ʔ Insertion	Final Form
(1)	cí, HAB	cí, HAB			cí	cíʔ	cíʔ
(2)	hú, HAB	hú, HAB			hú	húʔ	húʔ
(3)	yélice-ine, HAB	yélic-in, HAB	yélic-i, HAB		yélic-i		yélici
(4)	céle-ine, HAB	cél-in, HAB	cél-i, HAB		cél-i		céli
(5)	kʷáwe-yaxe, HAB	kʷáw-yax, HAB	kʷáw-ya, HAB	kʷáw-ye, HAB	kʷáw-ye		kʷáwye
(6)	qáʔaye-yaxe, HAB	qáʔay-yax, HAB	qáʔay-ya, HAB	qáʔay-ye, HAB	qáʔay-ye		qáʔaye
(7)	píneʔwexe, HAB	píneʔwex, HAB			píneʔwex		píneʔwex
(8)	cáṣpele, HAB	cáṣpel, HAB			cáṣpeʔel		cáṣpeʔel
(9)	pácike, HAB	pácik, HAB			páciʔik		páciʔik
(10)	qáwe, HAB	qáw, HAB			qáʔaʔaw		qáʔaʔaw
(11)	cále, HAB	cál, HAB			cáʔaʔal		cáʔaʔal
(12)	tĕwĕ, HAB	téw, HAB*			téʔeʔew		téʔeʔew
(13)	helʸépe, HAB	helʸép, HAB			helʸéʔeʔep		helʸéʔeʔep

(Hill p. 536)

- Step D, Habilitative Formation, adds glottal stop(s) and copied vowel(s) only if the word ends in a consonant at this point in the derivation.
    - Let's practice transformation rule notation by writing the basic rule (say, for (8)).

- The key is that Habilitative copying applies as many times as needed to provide two syllables following the stressed syllable.

- So what's the look-ahead issue? Let's step through the derivation for (13) and think about the first application of copying.

- Hill points out that of course we *can* write complicated rules that will do this without look-ahead, but they seem to miss the point about word shape.

5. Back to process interaction types: (counter){f,bl}eeding

	feeding	*bleeding*	*counterfeeding*	*counterbleeding*
examples so far	▪ Guinaang Kalinga syncope/assimilation ▪ Tshiluba nasalization (self-)	▪ English plurals ▪ Klamath glottalized Cs (self-) ▪ Eastern Ojibwa glide formation (self-) ▪ French schwa deletion	▪ Palauan vowel reduction ▪ Tundra Nenets V deletion (self-) ▪ Morphological truncation (self-)	▪ Polish vowel raising and devoicing ▪ Southern Kikuyu spirantization (self-)
OT	OK	OK	no, except in some cases (scales)	no, except in some cases (fusion)
SPE	OK	OK	OK	OK

- In the rest of today we'll look at what some SPE variants predict
- Thursday we'll complicate the typology

6. *If time: the special cases*

- Another Romance metaphony case from (Walker 2005)

Lena (dialect of Asturian, a language from Spain with about 100,000 speakers)

fí-a	'daughter'	fí-u	'son'
nén-a	'child (fem.)'	nín-u	'child (masc.)'
tsób-a	'wolf (fem.)'	tsúb-u	'wolf (masc.)'
gát-a	'cat (fem.)'	gét-u	'cat (masc.)'

- Account for this with two rules

- What type of rule interaction is this? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

- What's the problem with translating this into OT (hint: [gét-u])?

- Any ideas for playing with our faithfulness constraints to get this?

- A Bedouin Hijazi Arabic case from Al-Mozainy 1981, via Hauser & Hughto 2016 (variety of Arabic spoken by rural population in Western Saudi Arabia)

	/ʃaribat/	/ħaːkim/	/ħaːkim-in/	(H&H p. 1)
Palatalization	--	ħaːkʲim	ħaːkʲimin	
Deletion	ʃarbat	--	ħaːkʲmin	
	[ʃarbat]	[ħaːkʲim]	[ħaːkʲmin]	

- What type of rule interaction is this? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

- What's the problem for OT?

- Let's try a fusion analysis

7. How about variants of SPE that you read about?

- SPE assumes that a language can impose any order it wants on rules. Many researchers have proposed that this is not the case—that at least sometimes, rules are *intrinsically* ordered.
- Let's see ways to do that...

8. 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).

- 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)

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

- 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?

- Aside: if we adopt the analysis above I think it's a bit of a problem for OT. Why is the problematic /ʎ/ resolved by changing place in one instance, and manner in the other?

/akeʎ/	*ʎ	*ʎ#	*ʎV	IDENT(place)	IDENT(manner)	*j#	*lV
a akeʎ	*(!)	*(!)					
☹*b* akel				*!			
💣*c* akej					*	*	

/akeʎ+os/	*ʎ	*ʎ#	*ʎV	IDENT(place)	IDENT(manner)	*j#	*lV
a akeʎos	*(!)		*(!)				
b akelos				*!			*
☞*c* akejos					*		

- The constraints at the bottom can't be ranked any higher, because of forms like *cielo* and (rarer) *ley*.
- Such "constraint-specific repairs" are predicted in SPE or in some versions of rules+constraints, but not in OT.
- I'm not saying OT can't capture the Spanish data—it just can't directly translate the analysis with ʎ → l / __ # and ʎ → j.

9. Bleeding: example originally from Kiparsky (1968?)

- 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][4]	----	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?

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

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

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

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

[4] 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*).

- *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.

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

- How does the Elsewhere Condition compare to proper inclusion precedence? Are there cases where the two conditions apply differently? (Let's try Spanish)

11. Anderson 1974 ch. 10: natural order—skip if no time, since you read about it!

- Example from Icelandic (Indo-European language from Iceland with 250,000 speakers)
  - *syncope, roughly*: certain unstressed Vs → Ø / C __ {l,r,n,ð,s}+V
  - u-*umlaut*: a → ö / __ C_0 u (where "u" usu. = [ʏ], "ö" = [œ])

barn	'child'	b**ö**rn+um	'child-dat.pl.'
svangt	'hungry-neut.nom.sg.'	sv**ö**ng+u	'hungry-neut.dat.sg.'
kalla	'[I] call'	k**ö**ll+um	'[we] call'

(lax, unstressed vowels delete __V)

ham**a**r	'hammer'	hamr+i	'hammer-dat.sg.'
fíf**i**ll	'dandelion'	fífl+i	'dandelion-dat.sg.'
morg**u**nn	'morning'	morgn+i	'morning-dat.sg.'

(ll, nn stand for long *l*s and *n*; syncope is meant to be applicable)

- If syncope precedes umlaut, what kind of process interaction results for the UR /katil+um/ 'kettle-dat.pl'? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

- For /jak+ul+e/ 'glacier-dat.sg.'? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

- What about umlaut before syncope for /katil+um/? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

- /jak+ul+e/ (see data below)? *A: feeding, B: counterfeeding, C: bleeding, D: counterbleeding*

➔ Whether a rule ordering is feeding, bleeding, etc. depends on the particular forms involved

	+r/Ø		*+um*	
/katil/	ketil+l	'kettle'	k**ö**tl+um	'kettle-dat.pl'
/ragin/	regin	'gods'	r**ö**gn+um	'gods-dat.pl'
/alen/	alin	'ell of cloth'	**ö**ln+um	'ell of cloth-dat.pl'
	+ul+r		*+ul+e*, *+ul+an*	
/bagg/	bögg+ul+l	'parcel'	b**ö**gg+l+i	'parcel-dat.sg.'
/jak/	jök+ul+l	'glacier'	j**ö**k+l+i	'glacier-dat.sg.'
/þag/	þög+ul+l	'taciturn'	þ**ö**g+l+an	'taciturn-masc.acc.sg.'

- If the rules are right, we have an ordering paradox!
- Here's how Anderson resolves it:
  - Some pairs of rules are left unordered by a language's grammar and so apply in their **natural order** in each case.
  - Other rules are ordered, but only pairwise (so ordering is not transitive, for instance).

> "where only one of the two possible orders for a given pair of rules is feeding, the feeding order is the natural one; and that where only one of the two possible orders is bleeding, the other order [i.e. counterbleeding] is the natural one. In all other cases […] no natural order is (yet) defined." (p. 147)

- Is this different from the Koutsoudas & al. proposal? (Let's apply their theory to the crucial forms.)

- If a grammar consists of a list of rules and some statements about their orderings, what does a diachronic change from, say, counterfeeding to feeding involve? (Notice the extension of the evaluation metric to rule orderings, and not just the rules themselves.)

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

12. 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

Next time: Looking more carefully at the typology of process interaction—how do the main theories fare?

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