

**Classes 5 & 6: Process interaction**

**To do**

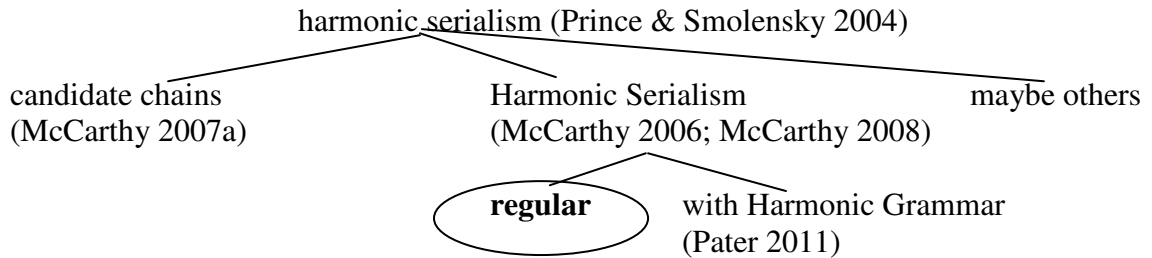
- Woleaian assignment is due Friday, Jan. 27
- Project: do you have a topic? Bibliographic exercise (due Jan. 31) can help you decide.
- Next reading: Hayes 1995 study questions also due Jan. 31

**Overview**

Last week we saw how a process can interact with itself. In what ways can processes interact with each other? Which types of interaction are easy to capture in each theory?

**0. First, we review Harmonic Serialism**

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



**Difference #1**

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

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

**Difference #2**

In Harmonic Serialism, keep applying grammar to its own output until the result stops changing.

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

/čap/	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	FEETARE IAMBIC	DEP-V	DON'TDELETE STRESS	MAX-V
<i>a</i> čap	*!	*					
<i>b</i> (čáp)		*	*				
<i>c</i> ča.pa	*!				*		

feed output (čáp) into grammar :

(čáp)	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	FEETARE IAMBIC	DEP-V	DON'TDELETE STRESS	MAX-V
<i>d</i> čap	*!	*				*	
<i>e</i> (čáp)		*!					
<i>f</i> (čá.pa)				*	*		

feed output (čá.pa) into grammar:

(čá.pa)	WORDMUST HAVESTRESS	NOCODA	DON'TADD STRESS	FEETARE IAMBIC	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 /cite/<sup>1</sup>
- Why can't we get \*(ča.pá) in Harmonic Serialism?
- What happens if we switch the ranking of WORDMUSTHAVESTRESS and NOCODA?

⇒ One advantage of Harmonic Serialism is it can both bleeding and counterbleeding (Elfner).

### 1. The classic interaction typology, for reference

<i>interaction</i>	<i>definition</i>	<i>schematic derivation</i>	<i>result</i>	
R1 feeds R2	R1 creates environment for R2 to apply to	$d \rightarrow \emptyset / \_ \#$ $n \rightarrow \emptyset / \_ \#$	/bind/ bin 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	$n \rightarrow \emptyset / \_ \#$ $d \rightarrow \emptyset / \_ \#$	/bind/ -- bin [bin]	opacity— <i>underapplication</i> : • [n#] on surface, despite rule targeting <i>n#</i>
R1 bleeds R2	R1 destroys environment for R2 to apply to	$d \rightarrow \emptyset / \_ \#$ $\emptyset \rightarrow i / C\_C\#$	/bind/ bin -- [bin]	transparent: • no [d#] on the surface • no [i] inserted, because no surrounding <i>C__C#</i>
R1 counterbleeds R2	R1 applies too late to destroy environment for R2	$\emptyset \rightarrow i / C\_C\#$ $d \rightarrow \emptyset / \_ \#$	/bind/ binid bini [bini]	opacity— <i>overapplication</i> : • [i] inserted, despite lack of surrounding <i>C__C#</i>

- How would we get counterbleeding [bini] in Harmonic Serialism
- 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.)

<sup>1</sup> hypothetical—real examples have clusters that muddy the issue

## 2. Baković 2007, to appear: 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			✓

...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.

### Let's go through Baković's typology:

#### 3. Counterfeeding-on-environment<sup>2</sup> → underapplication

*Bedouin Arabic*

UR	badw	
$a \rightarrow i / \_ \sigma$	$n/a = P$	
$G \rightarrow V / C \_ \#$	badu = Q	
SR	badu 'Bedouin'	(Baković 2007, p. 222; from McCarthy 1999)

- What would be the transparent outcome?

#### 4. Counterfeeding-on-focus → underapplication

*Bedouin Arabic again*

UR	katab	
$i \rightarrow \emptyset / \_ \sigma$	$n/a = P$	
$a \rightarrow i / \_ \sigma$	kitab = Q	
SR	kitab 'he wrote'	(Baković 2007, p. 222; from McCarthy 1999)

- What would be the transparent outcome?
- Both of these counterfeedings are hard for OT (why?). But counterfeeding-on-focus is fairly salvageable. Let's discuss some options...

<sup>2</sup> Term from McCarthy 1999.

### 5. “Surface-true counterfeeding” → transparency!

*Educated Singapore English*: Baković to appear p. 16; from Mohanan 1992, Anttila et al. 2008

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

Deletion: /test/ → [tes] cf. /test+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”?
- OT analysis?

### 6. Underapplication without counterfeeding (Baković to appear p. 8ff.)

“Disjunctive blocking” (p. 8)

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

/badupil/

/pikomsak/

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

- In what sense does underapplication result?

Nonderived-environment blocking—we’ll discuss it more later, but essentially it’s when a rule can’t apply if its structural description was already met in the underlying form:

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

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’)

### 7. “Fed counterfeeding”<sup>3</sup> on environment → underapplication

Lardil

	a. /dibirdibi/	b. /yiliyili/	c. /wangalk/
<b>Apocope:</b> V → ∅ / σ σ __ #	∅	∅	
<b>Deletion:</b> [-apical] → ∅ / __ #	∅		∅
	[dibirdi]	[yiliyil]	[wangal]
	Glosses: (9a) ‘rock cod’, (9b) ‘oyster species’, (9c) ‘boomerang’ (Baković to appear, p. 6; from Hale 1973)		

- Why “fed counterfeeding” here?
- Ways to do this in OT?

### 8. Fed counterfeeding on focus = “Duke of York” derivations<sup>4</sup> → underapplication

Nootka

	a. /mu: q /	b. /haju+ q i/	c. /t̥a:k <sup>w</sup> +fit̥/
<b>Labialization:</b>			
[+dors] → [+rnd] / [+rnd] __	q <sup>w</sup>	q <sup>w</sup>	
<b>Delabialization:</b>			
[+dors] → [-rnd] / __ ]σ	q		k
	[mu: q]	[haju+q <sup>w</sup> i]	[t̥a: k +fit̥]

Glosses: (11a) ‘throwing off sparks’, (11b) ‘ten on top’, (11c) ‘to take pity on’  
(Baković to appear, p. 7; from Sapir & Swadesh 1978, McCarthy 1999, 2003, 2007a, 2007b)

- Why “fed counterfeeding”?
- Ways to do this in OT?

### 9. Counterbleeding → overapplication

Yokuts

UR	ʔili:+l		
[+long] → [-high]	Pile:l	= P	cf. /ʔili:+hin/ → [Pile:hin] ‘fans’
V → [-long] / __ C#	Pilel	= Q	cf. /pana:+l/ → [panal] ‘might arrive’
SR	Pilel	‘might fan’	

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

- What would be the transparent outcome?
- Any ideas for how to do this in OT?

<sup>3</sup> Baković gets the term from Kavitskaya & Staroverov 2009

<sup>4</sup> Term from Pullum 1976

**10. Counterbleeding by mutual bleeding → transparent!***Lardil*

	a. /papi+ uɿ/	b. /tʲæmpæ+uɿ/
Epenthesis: $\emptyset \rightarrow w / i \_ \_ u$	w	
Elision: $V \rightarrow \emptyset / V \_ \_$		∅
	[papi+wuɿ]	[tʲæmpæ+ɿ]
<u>Glosses:</u> (25a) ‘father’s mother (acc. fut.)’, (25b) ‘mother’s father (acc. fut.)’	(Baković to appear, p. 22; from Hale 1973)	

- In what sense is this mutual bleeding?
- OT analysis?

**11. “Self-destructive feeding” → overapplication!***Turkish*

UR	bebek+n				
$\emptyset \rightarrow i / C \_ \_ C\#$	bebekin	= P	cf. /ip+n/ → [ipin]	‘your rope’	
$k \rightarrow \emptyset / V \_ \_ +V$	bebein	= Q	cf. /bebek+i/ → [bebei]	‘baby (ACC)’	
SR	bebein			‘your baby’	
(Baković 2007, p. 226; from Sprouse 1997)					
UR	ajak+suw				
[+cont] → ∅ / C ∅	ajakuw	= P	cf. /aruw+suw/ → [arusuw]	‘his bee’	
$k \rightarrow \emptyset / V \_ \_ +V$	ajauw	= Q	cf. /ajak+u/ → [ajauw]	‘foot (ACC)’	
SR	ajauw			‘his foot’	
(Baković 2007, p. 227; from Kenstowicz & Kisseberth 1979)					

- What would be the transparent outcome?
- Any ideas for how to do it in OT?

**12. “Non-gratuitous feeding” → overapplication***Classical Arabic*

UR	ktub				
$\emptyset \rightarrow V_i / \# \_ \_ CCV_i$	uktub	= P			
$\emptyset \rightarrow \text{ʔ} / \# \_ \_ V$	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?
- Ideas for how to do this in OT?

### 13. “Cross-derivational feeding” → overapplication, in a sense

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

prefix obstruents assimilate in voicing and palatalization :

at-ko:pʲtʲi	‘to climb up’	ap-kalʲbʲetʲi	‘to slander’
ad-gautʲi	‘to get back’	ab-gautʲi	‘to deceive’
atʲ-pjʲautʲi	‘to cut off’	apʲ-tʲemʲdʲi:tʲi	‘to obscure’
adi-bʲekʲtʲi	‘to run up’	abi-gʲi:dʲi:tʲi	‘to cure (to some extent)’

(p. 234)

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

atʲi-taikʲi:tʲi	‘to make fit well’	apʲi-putʲi	‘to grow rotten’
atʲi-tʲeisʲtʲi	‘to adjudicate’	apʲi-pʲi:lʲtʲi	‘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).
- He’s proposing a typological prediction:
  - OCP constraints are strict: they penalize only perfect identity, not near-identity
  - So, there’s no reason for epenthesis to break up near-identical clusters...
  - ...unless an independently occurring assimilation process would have made them identical.
- Let’s try to reconstruct Baković’s OT analysis.
- Any ideas for how to capture Baković’s idea in SPE? Are we stuck with an epenthesis rule that recapitulates the assimilation facts?

### 14. Paper-topics recap

Here’s a summary of areas we’ve seen so far where theories make different predictions:

- (self-)feeding vs. (self-)counterfeeding—but there are many sub-types
- (self-)bleeding vs. (self-)counterbleeding—but there are many sub-types
- 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

*coming up*

- look-ahead: myopic vs. fell-swoop/global-power/peeking derivations (cf. “sour grapes” phenomena)
- conspiracies vs. constraint-specific repairs
- saltation
- exchange rules: e.g., [αvoice] → [-αvoice] / \_\_#
- rule-ordering paradoxes

## 15. Global power

- Can a rule “see” anything other than its immediate input? (see Lithuanian)
- In SPE, rules aren’t supposed to have *global power* (term from Lakoff (1970); cf. Hill 1970 for a proposal that Cupeño has a “peeking rule” that can look ahead in the derivation.
- But global power follows naturally in OT: every candidate is the very end of a derivation. So now we have a type of phenomenon that OT can handle easily but SPE can’t. So how robust are the claimed cases?

## 16. Case of global power in Walker 2010

Basic metaphony rule seen in many Romance “dialects”:

$$\{\acute{e},\acute{o}\} \rightarrow [+high] / \_C_0+C_0 \begin{bmatrix} +syll \\ +high \end{bmatrix}$$

Venetan version (inventory: [ i,e,ε,a,u,o,ɔ])

<i>tense Vs raise</i>	kals-ét-o	kals-ít-i	‘sock (m. sg/pl)’
	móv-o	múv-i	‘move (1 sg/2 sg)’
<i>lax or low Vs don’t</i>	gát-o	gát-i	‘cat (m sg/pl)’
<i>can spread <u>through</u> unstressed V</i>	órden-o	úrdin-i	‘order (1 sg/2 sg)’
<i>unless it’s /a/</i>	lavór-a-v-a	lavór-a-v-i	‘work (1 sg perf/2 sg impf)’
<i>no spreading if there’s “no point”</i>	ángol-o	ángol-i	‘angel (m sg/pl)’
	pérseg-o	pérseg-i	‘peach (m sg/pl)’

In other words, spreading shows “look-ahead”—it sees all the way to the end of its iterative application (hypothetical \*ángul-i, \*pérsig-i), and if the result doesn’t solve the fundamental problem of the unraised stressed vowel, then no spreading is done at all.

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

See (Kaplan 2011) for a seemingly contrasting case (Chamorro).

## 17. Constraint-specific repair

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)

- Let’s try an OT translation. What issues do we encounter? Note /rej/ → [rej], /karakol+es/ → [karakoles]



## 18. Saltation

Term coined by Bruce Hayes, as far as I know, but related to use by (Lass 1997).

(White 2012), investigating the learnability of these cases, gathers as many real ones as he can find. There are not many! But here's one, from Campidanian Sardinian (Indo-European lang. from Italy with 345,000 speakers):

/p/ → [β] / V \_\_, but [b] undergoes no change (and similarly for other stops)

/dʒi paɣu s:u binu/ → [dʒi βaɣu s:u bĩu] (Bolognesi 1998) p. 30

- Why is this problematic in OT? Let's fill in the tableaux to see.

/dʒi paɣu/	
<i>a</i> dʒi paɣu	
<i>b</i> dʒi baɣu	
<i>c</i> dʒi φaɣu	
☞ <i>d</i> dʒi βaɣu	

/s:u binu/	
<i>a</i> s:u pĩu	
☞ <i>b</i> s:u bĩu	
<i>c</i> s:u φĩu	
<i>d</i> s:u βĩu	

## 19. Exchange rules

These are common in tone sandhi. Here's a case from (Zhang, Lai, & Sailor 2006), Taiwanese (i.e. Southern Min; Sino-Tibetan language from Taiwan and China with 47 million speakers)

Taiwanese has 5 “unchecked” tones (tones that occur in sonorant-final or open syllables). When non-XP-final, they all change:

(3) Taiwanese “tone circle” for non-checked syllables:

51 → 55 → 33 ← 24  
 ↙ ↘  
 21

(Zhang & al. 2<sup>nd</sup> page)

- Why is this problematic in OT? (See (Mortensen 2006) for a framework).

See (Moreton 1996) for extensive OT discussion of exchange rules and some other types of case.

## 20. If we have time: an example of a rule-ordering paradox

Example from Icelandic (Indo-European language from Iceland with 250,000 speakers).  
Anderson 1974 ch. 10

*syncope, roughly:* certain unstressed Vs → Ø / C \_\_ {l,r,n,ð,s}+V  
*u-umlaut:* a → ö / \_\_ C<sub>0</sub> u (where “u” usu. = [ʏ], “ö” = [œ])

barn	‘child’	börn+um	‘child-dat.pl.’
svangt	‘hungry-neut.nom.sg.’	svöng+u	‘hungry-neut.dat.sg.’
kalla	‘[I] call’	köll+um	‘[we] call’

(*lax, unstressed vowels delete \_\_V*)

hamar	‘hammer’	hamr+i	‘hammer-dat.sg.’
fífill	‘dandelion’	fífl+i	‘dandelion-dat.sg.’
morgunn	‘morning’	morgn+i	‘morning-dat.sg.’

(*ll, nn* stand for long *ls* 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’? For /jak+ul+e/ ‘glacier-dat.sg.’?
- What about umlaut before syncope for /katil+um/? /jak+ul+e/?

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

	<i>+r/Ø</i>		<i>+um</i>	
/katil/	ketil+l	‘kettle’	kötl+um	‘kettle-dat.pl’
/ragin/	regin	‘gods’	rögn+um	‘gods-dat.pl’
/alen/	alin	‘ell of cloth’	öln+um	‘ell of cloth-dat.pl’
	<i>+ul+r</i>		<i>+ul+e, +ul+an</i>	
/bagg/	bögg+ul+l	‘parcel’	bögg+l+i	‘parcel-dat.sg.’
/jak/	jök+ul+l	‘glacier’	jök+l+i	‘glacier-dat.sg.’
/pag/	þög+ul+l	‘taciturn’	þög+l+an	‘taciturn-masc.acc.sg.’

If the rules are right, we have an ordering paradox!  
See (Kiparsky 1984) for a solution in Lexical Phonology.

I don’t think rule-ordering paradoxes form a unified phenomenon. But as a search term, “ordering paradox” will turn up some interesting puzzles worth reinvestigating.

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