Nov. 9, 2010

Class 14: The Too-Many-Solutions Problem

To do
- Malayalam assignment due Friday, Nov. 12 (5 PM)
- Meet with me by end of week about your paper (I'll want to know how the analysis in the secondary source is holding up as you learn more about the data, and what kind of analysis you've got in mind)
- Goldsmith reading questions due Tues., Nov. 16

- **Overview:** As you read in Steriade, for many markedness constraints Classic OT seems to over-predict the typology of repairs. We'll see three proposals for dealing with this.

1. Heterogeneity of process (McCarthy 2001)

We've seen that there can be impressive cross-linguistic exuberance in solving markedness problems.

Different Western Austronesian solutions to the OCP-labial problem in /P-(u)m-…/ or /C-(u)m-…P/, where *P* stands for a labial consonant (Zuraw & Lu 2009)
- change place of stem: /p-um-.../ → [k-um...]; violates IDENT(place)/stem
- change place of infix: /p-m-.../ → [k-n...]; violates IDENT(place)/affix
- change consonantality of infix: /C-m-...p.../ → [C-w...p...]; violates IDENT(cons)
- fuse stem and infix consonants: /p-um-.../ → [m...]; violates UNIFORMITY
- move infix out of constraint's domain of application: /p-um-.../ → [mu-p...]; LINEARITY
- delete the infix: /p-m-.../ → [p...]; violates MAX, REALIZEMORPH
- paradigm gap: /p-m-.../ → *unpronounceable*; violates MPARSE

Different solutions to *NC̥ (Pater 1999; Pater 2001)

a. /mp/ → [mb] (IDENT(voice)), [bp] (IDENT(nasal)), [m] (MAX-C), [p] (MAX-C)

Different ways to handle *{ɪ,ʊ} in Romance metaphony when raising /ɛ,ɔ/ (Walker 2005)

b. /ɛ,ɔ/ raise to [i,u]; violates IDENT(tense)
c. /ɛ,ɔ/ fail to raise; violates HARMONY(high), HARMONY(tense)
d. /ɛ,ɔ/ raise to [e,o]; violates HARMONY(high)
e. /ɛ,ɔ/ raise to [ie,uo] or [iɛ, uɛ]; violates INTEGRITY (no splitting)

2. Limits on heterogeneity

And yet there are limits. Two prominent examples:
- No language consistently deletes C_2 in VC_1C_2V sequences to solve a NOCODA or *CC problem (Wilson 2000; Wilson 2001).
- Many languages devoice to obey $*\begin{bmatrix}-\text{son}\\+\text{voice}\end{bmatrix}\#$, but none delete, epenthesize, etc. (Lombardi 2001).

3. Loan adaptation

Not only must we explain why languages often agree on a repair; we also have to explain how speakers of the same language often agree on a repair when new items enter the language.

Shibatani 1973, writing in favor of surface constraints (as opposed to constraints on underlying forms, or no role for constraints at all):

> "It is the SPCs [surface phonetic constraints] of his language which intrude into the pronunciation of a foreign language when an adult learner speaks. The SPCs are acquired in an early stage of mother-tongue acquisition, and they are deeply rooted in the competence of a native speaker." (p. 99)

4. Loan adaptation: Shibatani on Japanese

URs can end in consonants. Here are some verbs:[1]

UR	*present*	*pres. polite*	*negative*	*past*	
/ma**t**/	mats-u	ma$\widehat{\text{t}}$ʃ-imasu	mat-anai	ma**t**-ta	'wait'
/ka**k**/	kak-u	kak-imasu	kak-anai	kai-ta	'write'
/aru**k**/	aruk-u	aruk-imasu	aruk-anai	arui-ta	'walk'
/jo**b**/	job-u	job-imasu	job-anai	jo**n**-da	'call'
/aso**b**/	asob-u	asob-imasu	asob-anai	aso**n**-da	'play'
/iso**g**/	isog-u	isog-imasu	isog-anai	isoi-da	'hurry'
/hana**s**/	hanas-u	hanaʃ-imasu	hanas-anai	hanaʃ-ita	'speak'
/no**m**/	nom-u	nom-imasu	nom-anai	no**n**-da	'drink'
/kae**r**/	kaer-u	kaer-imasu	kaer-anai	kae**t**-ta	'return'
/gamba**r**/	gambar-u	gambar-imasu	gambar-anai	gamba**t**-ta	'hang in there'
/tabe/	tabe-ru	tabe-masu	tabe-nai	tabe-ta	'eat'
/mise/	mise-ru	mise-masu	mise-nai	mise-ta	'show'
/mi/	mi-ru	mi-masu	mi-nai	mi-ta	'see'
/deki/	deki-ru	deki-masu	deki-nai	deki-ta	'can'

- What generalizations can we make about allowable non-prevocalic (i.e., syllable-final) Cs (**bold**) on the surface?

Some recent-ish loanwords:[2]

'**d**re**ss**'	doresu
'**sc**ri**pt**'	sukuriputo
'pe**n**'	peɴ (uvular-ish is the default place of articulation for a final nasal)

- How can we explain this in rule terms?

[1] Not the only analysis out there, but I think it's close to what Shibatani has in mind. I don't remember where I originally got these data, but I checked them at www.japaneseverbconjugator.com.

[2] We could also look at old loans from Chinese, maybe with a different result for final Cs.

Shibatani argues that there was no prior basis for a V-insertion rule in Japanese—but there was a basis for a surface constraint on non-prevocalic Cs.

- In OT terms, I think we can explain why learners (even without seeing the loans) would arrive at a grammar that rules out *[dres], *[skript]. But how do they choose between MAX-C and DEP-V? How do they choose which vowel to insert? Looking ahead, what would Steriade say?

5. Loan adaptation: Shibatani on Korean

Before Chinese (≠ modern Mandarin!) loans came in:

- On the surface, no word-initial liquids → surface constraints *#l, *#ɾ
- But also no morpheme-initial liquids underlyingly → could just as well have MSCs *#l, *#ɾ

(Morpheme-internal short liquids: [ɾ] intervocalically, [l] syllable-finally)

These loans don't tell us if it's a surface constraint or an MSC (why not?):

nok-	'green' < Ch. lok
nam-	'blue' < Ch. lam
namp^{h}u	'lamp' < Jp. rampu[3]

- What do these compounds, which use loan stems, tell us about the URs of the loans (assume they are synchronically related)?

no in (**老**人)	'old man'	tʃo **ɾo** (早**老**)	'premature old age'
nak wɔn (**樂**園)	'paradise'	k^{h}wɛ **ɾak** (快**樂**)	'enjoyment'

Like Japanese, Korean is displaying an 'extra' rule here that wasn't previously needed/attested.

- How do we explain why the grammar ruled out *[lo in], *[lak wɔn]? *[o in]? *[to in]?

6. Answer #1: P-map (Steriade 2001)

As you read, Steriade proposes that...

a. Speakers have a "P-map", implicit knowledge of perceptual distance between pairs of sounds (potentially tagged for their contexts): e.g., Δ(d/V__#, Ø/V__#) > Δ(d/V__#, t/V__#) [Δ for difference]
b. Faithfulness constraints can refer to details of their target and their surface context:
   - not just DEP-V, but DEP-i, DEP-a, DEP-ə
   - DEP-V/s__t, DEP-V/t__r
c. Faithfulness constraints get their default rankings from the P-map: constraints penalizing big changes should outrank constraints penalizing small changes.

[3] This must be a somewhat archaic word—the Naver online dictionary (krdic.naver.com) doesn't have it, though it does have direct-from-English-looking [ɾɛmp^{h}ɨ].

Presumably these default rankings can be overturned by the learner in response to contradictory data, but they will be a drag on language change.

Let's review how this plays out in final devoicing (simplest cases)

I → O	faith. violated	perceptual comparison	distance between comparanda (arbitrary units, fake values)
/rad/ → [rat]	IDENT(voice)/V__#	d/V__#, t/V__#	4
/rad/ → [ra]	MAX-C	d/V__#, Ø/V__#	8
/rad/ → [ran]	IDENT(nasal)	d/V__#, n/V__#	6
/rad/ → [ratə]	DEP-ə	Ø/C__#, ə/C__#	9

This yields a default ranking of the constraints (we could make them more fine-grained, but this will do): DEP-ə >> MAX-C >> IDENT(nasal) >> IDENT(voice)/V__#.

And we see why final devoicing is the cross-linguistically preferred outcome—no matter where we rank the markedness constraint in relation to this fixed hierarchy, the winner is either *b* or *a*:

	/rad/	*[–son, +voice]#	DEP-ə	MAX-C	IDENT(nasal)	IDENT(voice)/V__#
a	[rad]	*!				
b	☞ [rat]					*
c	[ra]			*!		
d	[ran]				*!	
e	[ratə]		*!			

7. Some things to ponder about the P-map

Exactly what is being compared when a faithfulness constraint gets its default ranking?

- Output vs. input? That's kind of funny because the input isn't a pronounced form, so its perceptual properties are hypothetical.
- Output vs. faithful output (candidate *a* in the above)?
- Output vs. related output? E.g., [rat] vs. [rad-im]. Those are both real, pronounced forms, but it's tricky because the target segments are in different contexts. Do we measure Δ(d/V__V,t/V__#)?

How well connected is the P-map? Can Δ(X,Y) be measured for absolutely any X,Y? Or only for close-enough pairs?

8. Solution #2: targeted constraints (Wilson 2000; Wilson 2001)

The "letkujaw" problem: Diola Fogny (a.k.a. Jola-Fonyi; Niger-Congo language from Senegal, Gambia, and Guinea-Bissau with 340,000 speakers) doesn't allow consonant clusters except place-agreeing nasal+stop.

	/let+ku+kaw/ 'they won't go'	*CC	MAX-C
a	[letkujaw]	*!	
b	☞ [lekujaw]		*
c	?? [letujaw]		*

This is typical cross-linguistically. The intuition is that the *t* is less perceptually salient: its place is cued mainly by the formant transitions into it. Whereas the *k*'s place is cued by both outgoing formant transitions and the release burst.

- We could try positional faithfulness constraints (Beckman 1998), which refer to output context, like IDENT(voice)/onset >> IDENT(voice).
- But that won't work here: MAX-C/onset wouldn't be violated by either candidate, because if a C is deleted, it's not in the onset!
- So we need these strange constraints that have come up before, where the *underlying* context matters: MAX-C$_{/_V/}$

Wilson proposed to avoid this kind of thing with constraints that, instead of imposing a stratified preference ordering on all the candidates, have only certain pairwise preferences:

⊙CC (not exactly Wilson's constraint, but close):

> Let *A* be the set of candidates that satisfy *CC better than candidate *x*. ⊙CC prefers a candidate *y* over *x* iff *y* is the member of *A* that is most similar [assuming a P-map] to *x*.

For some pairs of candidates, this constraint will have no preference.

Here, *x* is [letkujaw] and *A* is {[lekujaw], [letujaw]}.
If Δ(letujaw, letkujaw) > Δ(lekujaw, letkujaw), then *y* is [lekujaw]:

	/letkujaw/	⊙CC	MAX-C
a	[letkujaw]	1 violation of *CC	
b	☞ [lekujaw]	no violations of *CC	*
c	?? [letujaw]	no violations of *CC	*
preference imposed by this constraint		b | a	a / \ b c
overall preference so far		b | a	b | a | c

The overall preference relation gets assembled constraint by constraint; pairwise preferences that contradict the already-established ordering are ignored.

9. Solution #3: Evolutionary Phonology (Blevins 2003)

Blevins gives a very important caution about using typological data:

- Does final devoicing prevail because learners prefer it?
- Or simply because it tends to arise diachronically?

Moreton 2008 refers to this distinction as analytic bias vs. channel bias.

Assume the same perception facts that Steriade does, except assume that speakers don't internalize perceptual facts, and instead simply misperceive accordingly. Can we still get final devoicing to prevail?

- Suppose there is a language that tolerates final voiced obstruents: /rad/ → [rad].
- Suppose that the most common misperception of [rad] is as [rat].
- Then learners will think they're hearing a certain amount of alternation like [rad-im] ~ [rat], and not much, e.g., [rad-im] ~ [radə].
- If this happens enough and catches hold, the language will eventually acquire final devoicing (rather than epenthesis after final voiced obstruents), but not because learners prefer it.

So, even if we can control for sampling bias and historical accident, typological data is still problematic.

What can we do? Essentially, we have to find ways to put speakers in a position where their behavior is not constrained by their language-specific learning (see lit reviews in Moreton 2008, Zuraw 2007, Hayes et al. 2009 for examples).

10. Back to examples of heterogeneity of process

Kennedy 2005:

- In various Micronesian languages, initial geminate consonants were created by reduplication.
- Word-initial position is a tough place to maintain a C-length distinction, especially for stops, because you need to perceive when the consonant begins ([pa] vs. [ppa], as opposed to [apa] vs. [appa])
- If a diachronic change were to happen, we'd expect it to just be degemination.
- But the changes turn out to be diverse.

Pohnpeian	*ppek	>	mpek	IDENT(nasal)
Marshallese—Ratak	*kkan	>	kekan	DEP-V/C__C
Marshallese—Ralik	*kkan	>	yekkan	DEP-V/#__C
Pingelapese	*ttil	>	iitil	IDENT(syllabic)
Woleaian	*kkaše *kaše	> >	kkaše xaše	 IDENT(continuant)

11. So what makes some repairs homogeneous and others heterogeneous?

Who knows, but here are some speculations (from Zuraw & Lu 2009):

- The origin of the markedness constraint
  - Is it driven by articulatory considerations?
  - by perceptual difficulties?
  - by motor planning difficulties?
- The formal complexity of the markedness constraint:
  - How long a string must be inspected to determine if there is a violation?
  - Is the constraint sensitive to morphological information or other hidden structure?
  - How many features are involved?
- The nature of the changes available—is there one that can count as "smallest change"?
  - Is one change perceptually closer to the original than the others?
    - If so, does it achieve the status of "only solution" by falling below some threshold of perceptual distance?
    - Or must the difference between the closest change and the next-closest fall above some threshold?
  - Does one change affect fewer segments, fewer features, or less-important features?
  - If each change is formulated as a rule, does one change have a simpler structural description?

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