Class 14: Lexical Phonology part III; Too-many-solutions problem

To do
- due Friday: lexical phonology in Spanish
- project: meet with me again by the end of next week (syllabus says this week, but I think we can afford this flexibility)

Where we've been
- Basic OT and basic SPE
- Comparing their predictions for process application and interaction
- Seeing some other rule theories (intrinsic or variable ordering, directional application...)
- But two things held us back
  - Our theory of morphology-phonology interaction was primitive ("concatenate morphemes, then do all the phonology")
    - We fixed this last week and do a bit more today
    - Certain cases of directionality, opacity, or rule-ordering paradoxes go away
  - Our theory of representations is still primitive (sequence of feature matrices)
    - We attack this Thursday, with better representations "below" the segment (features)
    - We'll continue in weeks 8, 9, and 10 with better representations "above" the segment (syllables and bigger constituents)

Overview of today: A few last things about the Lexical Phonology model. Then, as you read in Steriade, for many markedness constraints Classic OT seems to over-predict the typology of repairs.

1. Dissent to Lexical Phonology

- Some have argued that affixes don't fall neatly into 2-3 discrete categories (e.g., Level 1, 2, 3)
  - and/or that an affix's behavior can be predicted from its phonological makeup (e.g., C-initial vs. V-initial) and its distribution (Plag 1999; Hay & Plag 2004; Raffelsiefen 1999; Hay 2003).
- Some argue that a word "sees" (in OT, is faithful to) not just its immediate morphological predecessor, but also other related words (Steriade 1999, Burzio 1998)
- One postlexical phonology probably isn't enough.
  - Some have argued that different postlexical rules can be assigned to different-sized phonological domains such as phonological phrase, intonational phrase, utterance (Selkirk 1978; Selkirk 1980; Nespor & Vogel 1986, Jun 1993)
  - Others argue that these phonological domains influence phonological rules quantitatively, not categorically (Féry 2004), so the postlexical level can't be neatly divided up.
- And how productive are early-level phonological rules anyway?
  - See Pierrehumbert 2006 for evidence that English velar softening is pretty productive—but only for novel words that resemble the existing targets of the rule (syllable count, stress pattern, quality of last vowel...)

2. One last bit about the model: Non-derived-environment blocking (NDEB)

- We won't try to solve this problem, but you should be aware of the phenomenon.

Finnish (Kiparsky 1973, pp. 58-60 plus a few dictionary and Verbix examples)
Ignore various other rules: vowel harmony, degemination, a~o…

to X	*Let him/her X!*	*'active instructive infinitive II'*	*she/he was Xing*	
halu**t**+a	halu**t**+koon	halu**t**+en	halu**s**+i	'want'
noe**t**+a	noe**t**+koon	noe**t**+en	noke**s**+i	'smudge (?)'
pie**t**+æ	pie**t**+køøn	pie**t**+en	pike**s**+i	'pitch'
filma**t**+a	filma**t**+koon	filma**t**+en	filma**s**+i	'film'
These show that the [t] above isn't part of the suffix:				
oll+a	ol+koon	oll+en	ol+i	'be'
aja+a	aja+koon	aja+en	ajo+i	'go'
puhu+a	puhu+koon	puhu+en	puhu+i	'speak'

- The data above suggest t → s / __ i. Can we modify the rule for these cases?

tila	'room'	lahti	'Lahti'	cf.	
æiti	'mother'	mæti	'roe'	paasi	'boulder'
silti	'however'	limonaati	'lemonade'	sinæ	'you (sg.)'
valtion	'public'			kuusi	'six'

- Another rule is needed to account for this vowel alternation:

jok**e**+na	'river' essive sg.	jok**i**	'river' nom. sg.
mæk**e**+næ	'hill' essive sg.	mæk**i**	'hill' nom. sg.
These suggest the above words end in /e/			
æit**i**+næ	'mother' essive sg.	æit**i**	'mother' nom. sg.
kahv**i**+na	'coffee' essive sg.	kahv**i**	'coffee' nom. sg.

- How should the two rules be ordered, given these data? (ignore h~k alternation)

ve**te**+næ	'water' essive sg.	ve**si**	'water' nom. sg.
kæ**te**+næ	'hand' essive sg.	kæ**si**	'hand' nom. sg.
yh**te**+næ	'one' essive sg.	yk**si**	'one' nom. sg.

- What's the problem in *vesi*?

- The phenomenon is known as **non-derived environment blocking (NDEB)**.
  - See also Kiparsky 1985; Kaisse & Shaw 1985; Booij & Rubach 1987; Hualde 1989; Kean 1974 ...
- The proposal in Lexical Phonology: the "Strict Cycle Condition" (Mascaró 1976)
  - lexical rules (at least those that change feature values, rather than filling in underspecified feature values or adding syllable structure) can apply only to environments newly made, by either a morphological operation or a phonological rule *in the same cycle*.
- In my opinion, this solution was never totally satisfactory, so I don't want to go through the details of the proposals.

- As Wolf 2008 discusses, there are only about 3 cases in which some derived-environment-only rule can be fed by either a morphological or a phonological operation, and they can be re-analyzed (e.g., Hammond 1991 for Finnish).
  - So maybe we don't need a general theory of NDEB, just a theory of morphology-sensitivity (which we already have) and a theory of "needing to be fed by phonological rule"
  - For some alternative theories, see Wolf 2008, McCarthy 2003, Lubowicz 2002

3. I thought it would be fun to see partial boxologies proposed for some more languages

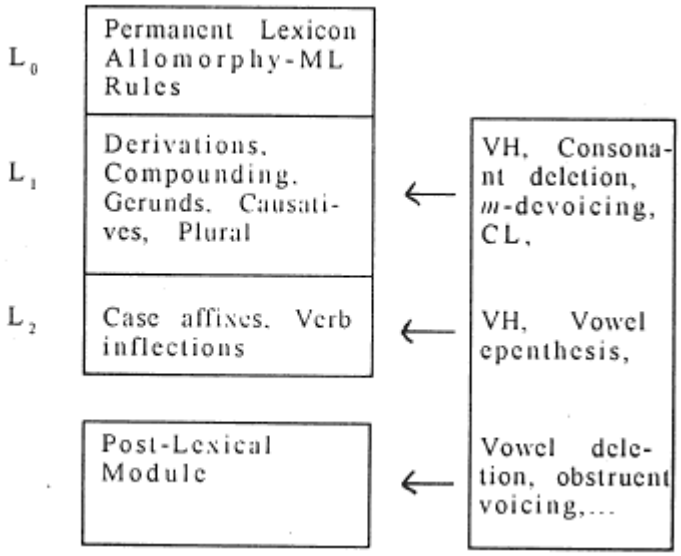
- German, per Wiese 1996 (p. 128, partial):

(18) Lexicon of German

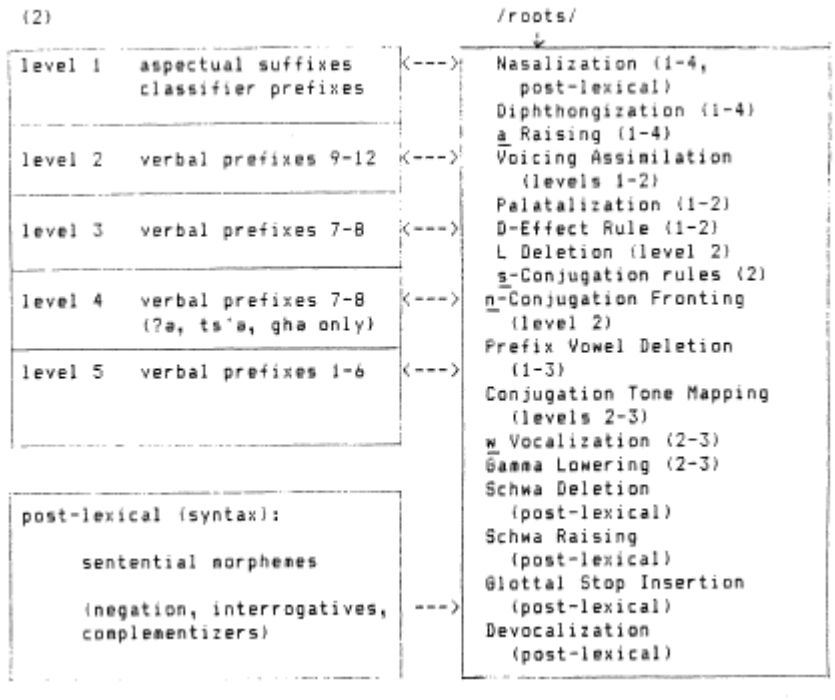
	morphology		phonology
level 1	irregular inflection class I affixes	⇄	Word Stress
level 2	compounding class II affixes	⇄	Compound Stress
level 3	regular inflection	⇄	Schwa Epenthesis

- Telugu, per Sailaja 1995 (Dravidian language of India with 70 million speakers [Lewis 2009]) (p. 108):

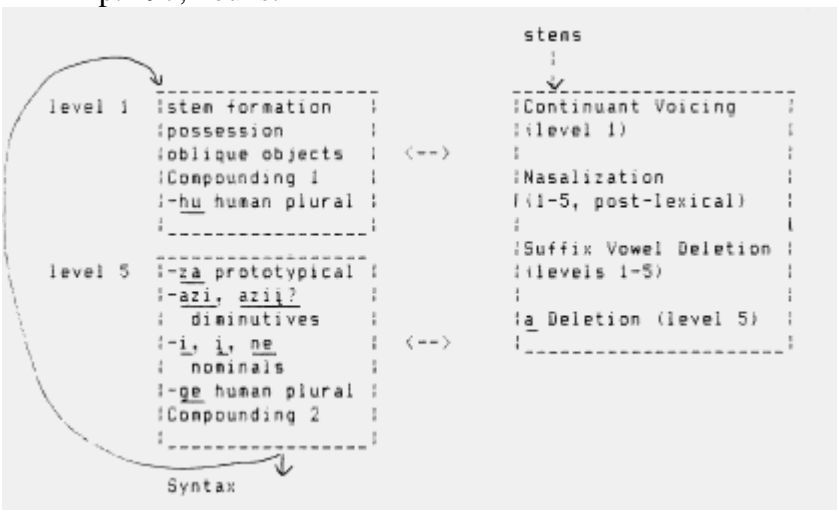
31.



- Sekani, per Hargus 1985 (Na-Dene language of Canada, nearly extinct [Lewis 2009])
  - p. 75, verbs:



  - p. 197, nouns:



Now, on to the too-many-solutions problem...

4. Heterogeneity of process McCarthy 2001

- 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)

5. 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).

6. 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)

7. 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	mat͡ʃ-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 loanwords of the past century:[2]
  - '**d**re**ss**' doresu
  - '**scr**i**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?

- 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?

[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.

8. 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]?

9. Answer #1: P-map Steriade 2008

- 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.

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

[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].

- 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]		*!			

- Personally, I find the traditional faithfulness constraints unwieldy in a P-map theory
- I prefer to use constraints that directly penalize mappings, which you can then look up in the P-map (Zuraw 2007, Zuraw 2013):
  - e.g., *MAP(^{V}d$^{\#}$, ^{V}t$^{\#}$)
  - See Löfstedt 2010 for application to paradigm gaps; White 2013 for application to "saltation", a type of underapplication opacity.

10. 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?

11. Solution #2: targeted constraints Wilson 2000; Wilson 2001

- We won't have time to cover this, but the idea relies on relaxing various assumptions about the ordering relation that a constraint imposes on candidates.
  - In Classic OT, the relation is stratified
    - For candidates *a* and *b*, either the constraint says $a \succ b$ or $b \succ a$, or it says they're "the same"—that is, any candidates better than *a* are also better than *b*, and any worse than *b* are also worse than *a*.
  - But a targeted constraint imposes a relation on candidates that's irreflexive, antisymmetric, and transitive, but not stratified.

12. 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.
  - 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 then to understand what analytic bias, if any, exists?
  - A popular approach is 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, Moreton & Pater 2012 for examples).

13. Back to examples of heterogeneity of process

- Kennedy 2005:
  - In various Micronesian languages, initial geminate consonants were created by CV-reduplication followed by deletion of the reduplicant's V.
  - 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)

14. 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?

Next time: Rethinking how features are represented—what if they're entities instead of properties?

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