

## Class 10, 4/28/2020: Paradigm Uniformity I

### 1. Assignments

- Read: pp. 1-51 of Neilson Smith (1973) *The Acquisition of Phonology*, posted on Web site.
  - Purpose: part of doing the Acquisition Homework
- Assignment: Homework 3, on Acquisition. Due Thursday May 7.
- Come talk with me about your term paper if you haven't already.
- Reading to be assigned Thursday: (2015) Bruce Hayes and James White, Saltation and the P-map. *Phonology* 32:267-302. On course web site.
  - Purposes: case of diachronic explanation, getting ready for experimental studies of paradigm uniformity next time.

### 2. Today

- Clean up a few items left unfinished
- Start in on Paradigm Uniformity, mostly with a Socratic data-wallow.

#### CLEANING UP A FEW ITEMS

### 3. Readings: Moore-Cantwell

- Empirically, what we see is something like this:
  - A. In wug- and blick- testing, speakers tend to **frequency-match**, except in the presence of perturbing effects like UG.
  - B. They **accept novel words** even if they violate **weak** grammatical principles (cf. borrowing around the world; English *Katz, Vladimir*; Hungarians accepting [Ci:C-nɔk])
  - C. They **reject novel words** if they violate **strong** grammatical principles (no English speaker ever orders a ['latte] or copes with Persian [gotbzade]; Hungarians outright reject [CyC-nɔk])
  - D. **Higher frequency** lexical items tolerate more exceptionality (English *says* [sez] is the only irregular 3rd singular present).
- Theoretically: goals
  - We want a theory that predicts these things.
  - This will probably embody both a phonological theory and a learning theory.

#### 4. Three approaches covered by Moore-Cantwell

- **Lexical Listing and Faithfulness Theory.** Zuraw (2000, 2010): lexical listing of all irregulars, and perhaps many regulars, with independent learning of the probabilistic grammar.
  - The massive-listing claim is well supported in psycholinguistic work; e.g. Baayen, Harald, Robert Schreuder, Nivja De Jong, and Andrea Krott. "Dutch inflection: the rules that prove the exception." In *Storage and computation in the language faculty*, pp. 61-92. Springer, Dordrecht, 2002.
  - The new-vocabulary phenomena might be attributed to reluctance to learn the improbable; need for massive data
  - The models that break utterances into words mentioned earlier have a probabilistic penalty for new words when these words are unlikely.
- **Constraint Indexation** (Pater 2000, Becker 2005, Pater 2010, et. seq): clone constraints in versions indexed to particular items.
  - The grammar is "pure" and encodes all forms of exceptionality.
  - It also tells you the weirdness level of exceptions.
  - It needs more apparatus to model frequency-matching behavior.
- **Representational Strength Theory** (Moore-Cantwell): words themselves have piecewise "constraints" saying what they should be, weighted against general phonological constraints
  - So learning is all of a piece; nothing but constraint weighting.
  - Bias against Phonological Form Constraints having high weight means only frequent forms can be weird.

#### 5. Wilson and Gallagher reading

- Their main point is that a phonotactic learner without feature theory is in big trouble:
  - Data (in Quechua case) are too sparse to learn the generalizations just over segments.
- They also raise a big problem and do not resolve it:
  - Status of complementary distribution in phonotactic learning
  - "Nonlow vowels are mid next to uvulars, high otherwise"
  - This is straightforward in traditional OT, but not in the all-markedness theory of phonotactics they assume.

#### 6. Last item in learning: hidden structure with Expectation-Maximization

- Recall our tiny problem: 'wheel' [rat] ~ [rad-a] 'advice' [rat] [rat-a]
- Simple MaxEnt falls flat, getting horribly stuck in a local maximum.

#### 7. A tutorial reading on Expectation-Maximization

- Chuong B Do & Serafim Batzoglou (2008) What is the expectation maximization algorithm? *Nature Biotechnology* 26:897-899.
  - On course web site

## 8. Rough intuitive idea

- We don't know what UR words are derived from.
- We make a guess, producing "synthetic frequencies"
- We use the synthetic frequencies to learn, as best as we can, the phonology.
- Then, we hope, the synthetic phonology can be used to produce more accurate synthetic frequencies.
- And back and forth, improving.

The improvement is guaranteed at the local level, but not at the global level.

# PARADIGM UNIFORMITY

## 9. Goals

- Let us try to integrate the sources of evidence that speakers are predisposed to minimize alternation.
  - don't alternate at all
  - make alternation less phonetically salient
- Inspect the ways that such a bias could be implemented as part of the theory of phonological grammar.

## 10. Some ancient observations

- Paradigms often shift in the direction of increasing paradigm uniformity.
  - The usual causal scenario: Junior refuses to believe in the alternations she hears, commits a blunder adopted by her peers.

## 11. Warm-up exercise: rendaku and [ŋ] in Conservative Tokyo Japanese

- Source: Junko Itô Armin Mester (1997) *Correspondence and Compositionality: The Gango Variation in Japanese Phonology*. In Roca, Iggy, ed. *Derivations and Constraints in Phonology*. Oxford University Press.

Rendaku (sequential voicing in compounds)

tama	'ball'	teppoo+ <b>d</b> ama	'bullet'
tana	'shelf'	garasu+ <b>d</b> ana	'glass shelf'

- Allophone of older speakers of Japanese. They quote the great early-20th-century phonologist Nikolai Trubetskoy, whose name is associated with the word *Grenzsignal*.

Trubetskoi (1949 *Principles of Phonology*, 293): "En japonais il existe entre g et ŋ un rapport de variante combinatoire, g n'apparaissant qu'à l'initiale de mot et ŋ qu'entre

voyelles: ici également l'opposition g : ŋ ne peut différencier une pair de mots, mais cette opposition sert à délimiter le mot, g indiquant toujours le début d'un mot."

"In Japanese there exists between g and ŋ a relationship of combinatorial variant, g appearing only at the beginning of a word and ŋ only between vowels; here as well the opposition g : ŋ cannot differentiate a pair of words, but this opposition serves to delimit the word, g always indicating the beginning of a word."

Distributional data, from Ito/Mester:

a. Initial g:		
✓[g ..... ]	*[ŋ ..... ]	
geta	*ŋeta	'clogs'
giri	*ŋiri	'duty'
guchi	*ŋuchi	'complaint'
go	*ŋo	'(game of) Go'
garasu	*ŋarasu	'glass'
b. Internal ŋ:		
*[... g ... ]	✓[... ŋ ... ]	
*kagi	kaŋi	'key'
*kago	kaŋo	'basket'
*kaŋgae	kaŋŋae	'thought'
*sasageru	sasaŋeru	'give'
*uguisu	uŋuisu	'(Japanese) bush warbler'
*tokage	tokaŋe	'lizard'
*igirisu	iŋirisu	'England'

- Stem-final before suffix; suffix-initial:

oyoŋ	+	oo	'swim-HORTATIVE'	}	stem-final
toŋ	+	anai	'sharpen-NEG-PRESENT'		
kayoobi	+	ŋa	'Tuesday-NOMINATIVE'	}	suffix/clitic-initial
mikka	+	ŋurai	'approximately three days'		
gorira+no	+	ŋotoshi	'like a gorilla'		

- Alternations in Sino-Japanese compounds, whose members are all *bound roots*:

## Bound roots:

PrWd[ <b>g</b> ... ..]			PrWd[..... <b>ŋ</b> ..]	
gai + jin		'foreigner'	koku + ŋai	'abroad'
go + zen		'morning'	shoo + ŋo	'noon'
gam + peki		'quay, jetty, wharf'	kai + ŋan	'sea shore'
gi + kai		'parliament'	shin + ŋi	'deliberation'
guu + zen		'accidental occurrence'	soo + ŋuu	'meet accidentally'
gen + zai		'currently'	sai + ŋen	'reappearance'

- How g ~ ŋ works in compounds whose members are **free stems**:

Compounding with g-initial Stem<sub>2</sub>: optional VVN

geta	'clogs'	niwa + { <b>g</b> / <b>ŋ</b> }	eta	'garden clogs'
goro	'grounder'	pitchaa + { <b>g</b> / <b>ŋ</b> }	oro	'a grounder to the pitcher'
gara	'pattern'	shima + { <b>g</b> / <b>ŋ</b> }	ara	'striped pattern'
gei	'craft, art'	shirooto + { <b>g</b> / <b>ŋ</b> }	ei	'amateur's skill'
go	'Go game'	oki + { <b>g</b> / <b>ŋ</b> }	o	'Go played with a handicap'

- How k ~ ŋ works in compounds with a second-position k-stem:

Compounds involving Rendaku: obligatory VVN

kuni	'country'	yuki + { <b>*g</b> / <b>ŋ</b> }	uni	'snow country'
kami	'paper'	ori + { <b>*g</b> / <b>ŋ</b> }	ami	'origami paper'
kaeru	'frog'	gama + { <b>*g</b> / <b>ŋ</b> }	aeru	'toad frog'
keŋka	'fight'	oyako + { <b>*g</b> / <b>ŋ</b> }	enka	'parent-child fights'
kaki	'writing'	yoko + { <b>*g</b> / <b>ŋ</b> }	aki	'horizontal writing'
kusuri	'medicine'	nuri + { <b>*g</b> / <b>ŋ</b> }	usuri	'medical ointment/cream'
kirai	'dislike'	onna + { <b>*g</b> / <b>ŋ</b> }	irai	'woman-hater, misogynist'

- Exercises:
  - formulate an OT analysis of these facts. I suggest \*MAP constraints.
  - Reconstruct the historical chronology by which this pattern came to be.

## 12. Spanish verb paradigms as studied by Harris (1973)

- Reference:
- Irregular verbs preserve ancient patterns of Velar Softening in their paradigms.



## 16. What we might need for OT

- Designation of the base form that rules the roost (cf. research program of Adam Albright).
- Designation of the position, and features, that are regulated.

## 17. Some further data: paradigm uniformity in first-conjugation verbs

‘mark’	‘pay’	
mar[k]o	pa[g]o	1st sing., present indicative
mar[k]amos	pa[g]amos	1st plur. present indicative (1st conjugation)
mar[k]emos	pa[g]emos	1st plur. present subjunctive

- For Harris, these have an underlying /a/ theme vowel, which drops too late to let Velar Softening apply in the front-vowels subjunctive.

## 18. What we might need for diachronic explanation

- What caused little Mercedes to want to regularize
- What led her to take particular forms as the basis for extension.

### TREATMENT OF PARADIGM UNIFORMITY EFFECTS IN *SPE* PHONOLOGY

## 19. The bifurcation

- Inheritance of derived phonological properties: the **cycle**
- Resistance to acquisition of properties: **word-internal boundaries**.

## 20. Cyclic effects

- Already covered in 201A, but a quick example:  
English secondary stresses are (roughly) left-to-right binary, no clash, in the pretonic domain.

Examples from Hayes (1982, *LI*).

àbracadábra	Kàlamazóo		
Lùxipalílla	Hàrdecanúte		
Pèmigewássett	Àllamakée		
Òkefenókee	Ìllilouétte		
Nèbuchadnézzar	Màttamuskéet		
pàraphernália	Àntigonísh		
Kìlimanjáro	Gàllipolís		
Pòpocàtepétl	Òkalòacóochee	Àpalàchicóla	Àntanànarívo
Hànamànióa	ìpecàcuána	ònomàtopóeia	hàmamèlidánthemum

This not respected in suffixed forms, where the principle seems to be inheritance, modulated by the need to avoid clashes and initial lapses:

morphologically derived long words typically do not display the pattern of secondary stress found in monomorphemic words: compare *subliminálity* with *Òkefenókee*, *demòcratizátion* with *Àpalàchicóla*, and *Macàssarése* with *Gàllipolis*.

- Analytic possibility: do not foot what is already footed on a prior cycle, but do resolve certain clashes (*democratization*) and the resulting lapses (*specificity*).

## 21. Boundary effects: the distribution of preantepenultimate stress

- There are no stems whatever ending in stressed plus three stressless: “Hi, I’m \*['pæmələnə]”
- With **productive suffixes**, pre-antepenultimate stress seems rather normal and possible in new words:

-ing    *monitoring, jettisoning*  
 -eth    *seventieth*  
 -ish    *Madison-ish*

## 22. The SPE analysis

- Productive suffixes are treated with “#”. “Readjustment rules” apply.
  - Rule 1: [ ] → [# #]
  - Rule set 2: X #] ation → X ] ation; etc., for the less-productive affixes.
  - Stress rules apply in domains bounded by # #.
  - In translated form (prosodic structure), this is still a living analytic option, see e.g. Peperkamp, S. (1997). *Prosodic Words*. HIL dissertations 34. The Hague: Holland Academic Graphics.

## 23. Paradigm uniformity effects not covered (usually) in SPE

- These words seems to have influence from their base forms.
- But there are funny relations to the base, e.g. truncation of affixes, semantically inappropriate base
  - We will study Steriade’s views on these later on.
- Here is a sorted list from a dictionary search for preantepenultimate stress words
  - ☞ Look at these and tell me the base form, in your fluent-speaker’s opinion

abominable  
 applicable  
 communicable  
 estimable  
 inalienable



incalculable  
inextricable  
innumerable  
inseparable  
interminable  
inviolable  
irremediable  
navigable  
permeable  
tolerable  
venerable  
actionable  
enviable  
fashionable  
fissionable  
impressionable  
knowledgeable  
objectionable  
perishable  
practicable  
questionable  
reasonable  
seasonable  
serviceable  
variable  
amiable  
amicable  
formidable  
indefatigable  
malleable

caricature  
temperature  
literature

communicative  
palliative  
speculative  
cumulative

accuracy  
adequacy  
advocacy  
candidacy  
celibacy

confederacy  
degeneracy  
delicacy  
immediacy  
intimacy  
intricacy  
legitimacy  
literacy  
obstinacy

occupancy  
militancy  
hesitancy  
relevancy  
irrelevancy  
residency  
presidency  
expediency  
incompetency  
constituency

idiocy

## 24. Upshot

- We are seeing not the straightforward inside-to-outside derivations proposed in *SPE*.
- Rather, various quirky relationships within the derivational paradigm.
- ... and the occasionally “*sourceless*” form that nevertheless seems to have the meaning of the relevant affix.<sup>1</sup>

## 25. The apparent virtue of the Paradigm Uniformity approach

- It unifies:
  - affix neutrality (*SPE* boundaries)
  - simply inside-to-outside influences (*SPE* cyclicity)
  - quirk correspondence relations (*SPE* ignored these)

## 26. Rich variety of Paradigm Uniformity types

- Paradigm Uniformity is sensitive to the paradigm involved; i.e. we may need to be quite specific about the morphological relations present. E.g.
  - *-ing* is totally straightforward in selected a sensible, local base and maintaining its phonology
  - *-able* is sometimes *-ing*-like, but prowls around the lexicon for usable bases

---

<sup>1</sup> Proof of this comes from back formations like *aggress*.

- *-ian*, used by academics, is quite productive and can even resurrect lost vowel qualities: *Abelian*, *Sokolian*, *Kruskalian*

## THE PRINCIPLE OF PHONOTACTIC LIBERALITY

### 27. Trying to express the principle

- If you inspect the inventory of monomorphemic forms, you will get a rather strict phonotactics.
- But when forms occur in paradigms, a wider variety of legal forms emerges.

### 28. Sources of richer phonotactics in paradigms

- Suppressed phonology
  - like *'monitoring*, not *\*mo'nitoring*
- Overapplied phonology, like *su<sub>1</sub>blimi'nality*
- Mere concatenation:
  - “Hello, my name is Bill \*[trɛbd]. I and all the other \*[trɛbdz] are very pleased to meet you.”
  - Yet: *rubbed*, *dubbed*, *ribbed*, etc.
  - ☞ What constraints could account for this pattern, including Paradigm Uniformity?

### 29. A classic example from the urtext of Paradigm Uniformity in OT

- Laura Benua (1997) *Transderivational Identity: Phonological Relations between Words*. U. Mass. dissertation.
- Epenthesis:
  - Generally, words in Tiberian Hebrew do not end in consonant clusters.
  - There are a tiny number of lexical exceptions,
  - plus a larger class of systematic exceptions.
- Example:
 

Epenthesis in Tiberian Hebrew is demonstrated in (85) with the monomorphemic word [sɛφɛr] ‘book’, which is related to the input root /sɪpr/ (compare [sɪφrɪ] ‘my book’, in which the root’s consonant cluster surfaces intact in a heterosyllabic parse).
- Jussives are formed by final vowel loss from imperfective base, yet often there is no epenthesis:

## Jussive Truncation

	<u>Imperfective</u>	<u>Jussive</u>	
a.	yiš.bē	yišb	'take captive'
	yiφ.tē	yiφt	'be simple'
	yēš.te	yēšt	'drink'
	yēβ.ke	yēβk	'weep'
	yiš.ṭe	yēšt	'drink'
	yaš.qe	yašq	'cause to drink'
b.	yiγ.lē	yi.γel	'uncover'
	yiβ.ne	yi.βen	'build'
	tiφ.nē	tē.φen	'turn'
	yiβ.zē	yi.βez	'despise'
	yiš.ʕē	yi.šaʕ	'gaze'
	not attested	yi.ħad	'rejoice'

- Figure out an analysis in Classical OT.