Linguistics 219 Spring 2018
Phonological Theory III B. Hayes

Class 8, 4/25/2018: Acquisition II

1. Assignments

- Read: some slides. Megha Sundara, Yun-Jung Kim, James White & Adam J. Chong (2013) There is no pat in patting: Acquisition of phonological alternations by English-learning 12-month-olds. BUCLD slides.
- Third homework (acquisition) due in class April 30.
- Come talk with me about your term paper.

2. Comments on homework #2

- These were quite good.
- A variety of solutions, both paradigm uniformity and generality-based.
- The proof is in the long-term pudding; what works for *all* acquisition?
- Also, I keep yearning for a solution defensible in its own terms, not just from good data fit.

3. Where we are right now

- The Mennian model with the child's efforts divided between:
  - Silent study of ambient lexicon and phonology
  - Audible development of a personal output phonology and lexicon
- Defending aspects of the model with evidence.
- Surveying the application of OT to child phonology: is it appropriate/insightful?
- More generally, adult and child phonology, though thought to be separate systems by Menn, display parallels:
  - constraints used and their phonetic motivation
  - avoidance and the Null Parse
  - near-neutralization

NEAR-NEUTRALIZATION

4. Near-neutralization

- Near-neutralization is by now a widely-studied topic in adult phonetics/phonology, with many studies especially of Final Devoicing. There's a big literature.
- Current theoretical work on near-neutralization:
  - Braver, Aaron (2017) *Degrees of Incompleteness in Neutralization: Paradigm Uniformity in a Phonetics with Weighted Constraints*, Rutgers dissertation. Maxent phonetics with gradient Paradigm Uniformity constraints.

5. A classic case of near-neutralization in children: Macken and Barton on VOT in children

Macken, Marlys and D. Barton (1980) "A longitudinal study of the acquisition of the voicing contrast in American English word-initial stops, as measured by voice onset time," *Journal of Child Language* 7, 41-74.

- Several kids played with a bunch of stop-initial toys in a recording booth,[1] in various sessions, as they got older.
- General age range was 1;5 to 2;4.
- Researchers measured Voice Onset Time for all the word-initial stops.

6. Results

- Early on: vegetative values, including reflection of "more voicing in fronter places," which has an articulatory explanation (Keating and Westbury, *J. Linguistics* 1986).
- Gradually: the clouds of data for the categories voiced/voiceless part, leaving an ever more perceptible distinction.
- During the middle stages: difference is statistically significant, but **transcribers can't hear it**.

7. Near-neutralization II: phrasal compensatory lengthening

- Source:
  - Allyson Carter and Louann Gerken (2004) Do children's omissions leave traces? *Journal of Child Language* 31:561–586.
- Make the kids say this:

Monosyllabic verbs	He pushed Sandy.	He pushed Cassandra.
	He pushed Cindy.	He pushed Lucinda.
Disyllabic verbs	He pushes Sandy.	He pushes Cassandra.
	He pushes Cindy.	He pushes Lucinda.

- *Cassandra* and (less often, since heavy) *Lucinda* lose their initial upbeat syllables sometimes.
- And the preceding verb gets longer!

	Reduced names (_sandra & _cinda)		Non-reduced names (Sandy & Cindy)	
	Mean duration	SE	Mean duration	SE
Monosyllabic verbs	480·91	32·63	399·19	20·24
Disyllabic verbs	627·31	52·64	555·60	34·05

[1] "If your family has a Piglet cuddly, please bring it."

- Perhaps moras are stranded and dock?
- This is of obvious use in syntactic study, since it might reveal intent to utter definite articles, auxes, etc.

8. Near-neutralization III: Tom Priestly pesters his son

Priestly, Tom M. S. (1980) "Homonymy in child phonology," *J. Child Language* 7, 413-427.

D: Turn off the [laɪt].
S: *(does so)*
D: Turn off the [laɪt].
S: *(does so)*
...
D: Turn off the [waɪt].
S: (indignantly) Not [waɪt], [waɪt]!

[+round] [-round] (visual observation; transcription is auditorily correct)

OPACITY

9. Context

- The Classical theory of Faithfulness constraints in McCarthy and Prince (1995) "Faithfulness and Reduplicative Identity" is
  - chosen as the simplest possible theory
  - incapable of dealing with most opacity.
- The latter is considered a property of OT, but I think it might also fairly be regarded as a property of your theory of Faithfulness constraints — richer theories do better.
  - Banning long-phonetic-distance journeys like [i] → [a]
  - Faithfulness to lots of things, like bases, slow speech outputs, contexts within UR.
- It seems that the debates carry over into child phonology, though the forms of Faithfulness would be different (notably: faithfulness of child candidates to the parental representation — perhaps the surface representation).

10. A famous example involving counterfeeding

- Smith (1973) is the data source.
- Scrutiny and reanalysis from
  - Macken, Marlys (1980). The child's lexical representation: the 'puzzle-puddle-pickle' evidence. *Journal of Linguistics* 16: 1-17.
- Disturbingly, people cite the data as an instance of counterfeeding without knowing about Macken's debunking results.

11. Pre-[l] Velarization

- Smith (1973) takes the view that Amahl had a (Lexical) Phonology of Amahl rule:

  alveolar → velar / __ l

  Thus: *puddle* emerged as [ˈpʌgɫ̩]

12. Background of the rule

- Alveolars and velars are very similar acoustically before /l/.
- Cf. dialectal English [dlæs] for *glass*—this is a sound change you can "get away with."
- Reason, possibly: alveolars are laterally released in this environment.

13. Counterfeeding by Fricative Stopping

- /l/ Velarization is apparently counterfed in the Phonology of Amahl; for example:

puddle	*puzzle*	
/pʌ**d**ɫ̩/	/pʌ**z**ɫ̩/	
pʌ**g**ɫ̩	—	Pre-L Velarization
—	pʌ**d**ɫ̩	z → d (etc.) everywhere

14. Further scrutiny of Smith's data by Macken

- Unlike many other rules, Pre-L Velarization was *riddled with exceptions*:

  beetle [ˈbiːgu], later [ˈbiːtɫ̩]
  cuddle [ˈkʌdɫ̩], later [ˈkʌgɫ̩]
  little [ˈdidiː] (this from very first stage of study = 2 yrs 60 days, and quite stable)

- Exception rate: 21%.
- [d] for /z/ substitution, while in effect, was **exceptionless.** No [g] for /z/.
  - Note that the place of /z/ is highly perceptible, there being no such thing as a velar sibilant.
- *Pickle* words were acquired accurately. But toward the end of Amahl's fourth year, two of them **regressed**:

  pickle [pitɫ̩] (earlier, with /k/)
  circle [səːtɫ̩] (earlier, with /k/)

- And there was a case of the opposite substitution:
  winkle [wɪntɫ̩] (new word)

15. My own counts

	Puddle-type words:	*Pickle*-type words:
regress	2	2
wrong throughout	30	1
progress	5	1
right throughout	7	5

- It's possible that these data reflect no real progress at all, only a tendency to start guessing /t/ more often—cf. the linguist's pathetic transcription strategy; "guess the more frequent one".
- Hence I'm not convinced by Smith's and Macken's view that Amahl had gotten it right by the end of the study.

16. Interpretation

- The "puggle" phenomenon seems to have all the traits of perceptual misacquisition: a subtle acoustic distinction, gradual learning, necessity of rehearing a form to get it right.
- *So it's not rule ordering at all, and doesn't bear on any opacity debates.*

17. Implication

- The analyst must inspect diary data carefully for whether a process is the result of misperception or a systematic production module.[2]
- Diagnostic for MD Lexicon: institution of a contrast *faster than it could be gotten by relearning from ambient data* (as discussed earlier).

18. The mystery of late un-confusion

- In infancy, children are universal perceivers, since learning to perceive at this stage is not helped by negative evidence.
- [d]l vs. [gl] involves, I conjecture, very close or overlapping clouds of data points in acoustic space—Amahl must have merged these clouds, forcing himself to rely on guessing when he learned these words.
- How did Amahl ever recover? Perhaps the sample size simply got big enough to reveal the bimodal distribution.

[2] To give Smith credit: he *did* detect misperception in certain other cases; see p. 147 of Smith 1973.

19. Another exercise in child opacity

Voiced and voiceless obstruents word-initially and intervocalically (Barlow & Keare 2008:84)

a.	[dɔ:k]	'dog'	[tʰʌ:p]	'tub'
b.	[bi:ts]	'bridge'	[fis]	'fish'
c.	[tʃi:zi]	'cheese (dim.)'	[fisi]	'fish (dim)'

Voice contrast neutralized word-finally (Barlow & Keare 2008:84)

a.	[dɔ:k]	'dog'	[dʌk]	'duck'
b.	[dʌ:f]	'glove'	[wif]	'leaf'

Morphophonemic alternations for target morpheme-final voiced obstruents (Barlow & Keare 2008:85)

a.	[dɔ:k]	'dog'	[dɔ:gi]	'dog (dim.)'
b.	[dʌ:f]	'glove'	[gʌ:vi]	'glove (dim.)'

- Ultimate source: Barlow, Jessica A. and Amanda Keare. 2008. Acquisition of final voicing: An acoustic and theoretical account. *Indiana University Working Papers in Linguistics*: Volume 6.
- Pasted from: Urek, Olga (2013) Overapplication opacity in phonological acquisition. *Nordlyd* 40: 338 - 358.
- Socrates: What assumptions about the organization of child phonology would make this counterbleeding interaction treatable in standard OT?

20. A case given by Stemberger

- Stemberger, J.P. (1993). Rule ordering in child phonology. In M. Eid & G. Iverson (Eds.), *Principles and prediction: The analysis of natural language* (pp. 305-326). Amsterdam: John Benjamins.
- A child with normal final obstruent devoicing: *bib* and *sad* have [p] and [t].

froggy	*finger*	*sticker*	*egg*	*(sing)*[3]	*sick*	
/fɹɑgi/	/fiŋgɚ/	/stɪkɚ/	/eɪg/	/sɪŋ/	/sɪk/	UR
fɑgi	fiŋŋə	tɪkə	—	—	—	rules not discussed
fadi	finnə	—	eɪd	sɪn	—	nonfinal voiced velars → alveolar
—	—	—	eɪt	—	—	Final Devoicing
[fadi]	[finnə]	[tɪkə]	[eɪt]	[sɪn]	[sɪk]	output

- Socrates: identify and classify the opacity.
- Socrates: what extended forms of Faithfulness might account for this derivation in OT?

WHERE DOES MORPHOLOGY SIT IN THE MENNIAN SYSTEM?

[3] Inferred from Stemberger's description; he cites no form with final /ŋ].

21. A helpful paper

- Stemberger, Joseph Paul and Barbara Bernhard (1998) Phonological constraints and morphological development. In Bernhardt, Barbara and Joseph Stemberger. 1998. Handbook of Phonological Development: From the Perspective of Constraint-based Nonlinear Phonology. San Diego: Academic Press.
- They present a bunch of combinatorial possibilities for English, which we can try to serially analyze.

22. Three ways for Junior to do morphology

- Let the parents do it for you, and memorize their inflected forms.
  - ➢ Prediction: you will flunk a wug test, or fail when you try to inflect a form you haven't heard before.
- Learn a Morphology of Me, apply its rules to base (essentially parental) forms and sent result on the Phonology of Me.
  - ➢ Thus, the concatenated morphemes of the morphology are parental.
- Concatenate morphemes of the Lexicon of Me, then apply Phonology of Me to them.

23. Start with an easy case

Morgan, 2;9-2;10 *Reduction to second consonant*

first	/fɝst/	[foːtʰ]	guessed	/gɛst/	[gɛtʰ]	(cf. guess [gɛs])
soft	/sɑft/	[saːtʰ]	laughed	/læft/	[læːtʰ]	(cf. laugh [læːf])

- Socrates: Analyze with plausible constraints.
- Assess possible approaches.

24. Morphology unexpressed

Gwendolyn, 2;11-3;1 *inflection not expressed*

fox	/fɑks/	[faːs]	rocks	/rɑks/	[waːt]	(cf. rock [waːt])
fix	/fɪks/	[fɪs]	sticks	/stɪks/	[tʰɪt]	(cf. stick [tʰɪt])

- I think we are to assume that vowel-final stems like *boy* would receive a plural suffix.
- So this rules out a morphology-blind Phonology of Me.
- Socrates: what might be a ranking that would work here?

25. Simplify the cluster in a stem, but not in a plural

Gwendolyn, 3;1-3;7

fox	[faːs]	rocks	[waːts]

- Socrates: how to get this one?
- This pattern persists into adult English: a great number of final clusters are possible only in inflected forms (e.g., *rubs* [ɹʌbz]).

26. Another case with different output in affixed vs. monomorphemic form

- From a nice term paper by undergraduate student Angela Uribe, submitted for UCLA's Linguistics 120A.
- s, z → θ in coda:

miss	[mɪθ]	but
Nessa	[nɛsə]	

but inflected forms with underlying /s/ nevertheless get [θ] in intervocalic position.

missing	[mɪθɪŋ]
misses	[mɪθəθ]

- These are very few data but the pattern is plausible and consistent (and attested with other children).
- Socrates: analysis?

27. Another case from Bernhardt and Stemberger: overused of [-əd] allomorph

Morgan, 2;10 *via Schwa Insertion*

first	/fɝst/	[foːtʰ]	kissed	/kɪst/	[tʰɪtʰ]~[tʰɪsəd]
			choosed	/čuːzd/	[tʰuːd]~[tʰuːzəd]

- Amahl likewise misused allomorphs, e.g. [-əz] after [f].
- Cases of non-veridical learning compel our attention!
- I conjecture that Morgan *knows* the parental distribution, but uses her own distribution to ease articulatory difficulty.

28. An elaborate, hard-to-get case

Larissa (Stemberger, 1995) *via double marking of past tense*

seed	/siːd/	[siːd]	round	/ɹaʊnd/	[wawn]
beard	/biɹd/	[biɹd]	act	/ækt/	[ʔæːk]
jump	/ǰʌmp/	[zʌmp]	last	/læst/	[læːs]
peed	/piːd/	[pʰiːd]	turned	/tɝnd/	[tʰɝndəd]
scared	/skeɹd/	[sɛɹd]	walked	/wɑkt/	[wɑːktəd]
jumped	/ǰʌmpt/	[zʌmt]	kissed	/kɪst/	[tʰɪstəd]
see-ed	/siːd/	[siːd]	winned	/wɪnd/	[wɪndəd]
heared	/hiɹd/	[hiɹd]	breaked	/bɹeɪkt/	[veɪktəd]
drinked	/dɹiŋkt/	[ziŋt]	losed	/luːzd/	[luːzdəd]

Some clusters were possible in her speech. Thus, the active constraints were on sequences rather than on complex codas. If the sequence was possible in a tautomorphemic sequence (postvocalic /d/, [ɹd], or a nasal followed by a voiceless stop), it was also possible as a heteromorphemic cluster. If the sequence underwent reduction in tauotmorphemic clusters, the affix was doubled in heteromorphemic sequences. The constraints on sequences held within codas for all sequences, but augmentation was possible only for affixed forms.

- I believe I remember lots of kids saying *drownded* when I was a kid.

LEARNING THE PARENTAL SYSTEM

29. Generalities about research in this area

- Given what we have seen up to now, it seems likely that listening to children will often, at early stages, be *very uninformative* about their knowledge of the parental system:
  - badly mutilated pronunciations
  - data gaps from avoidance
  - purposeful misdeployment of available allomorphs to solve phonotactic problems
- So wug-testing, or other forms of passive testing, are necessary.
  - It's a good thing that testing methodology for little kids has become so sophisticated!
- We also might want to be sure to test the adults before we turn to the children — only a few languages, like Japanese, are currently the subject of a full-scale research program, with
  - formal analysis
  - corpus study
  - productivity experiments
- To my knowledge, the really glorious phonologies, with tons of alternation, are not yet on the table for investigation.
  - What would happen if one monitored a Junior learning Finnish, Sukuma, Luganda, etc.?
  - How and when do children master complex systems of phrasal sandhi, as in Korean (S. Jun diss. 1996) or Toba Batak (Hayes 1986 *LI*) or Sanskrit?

30. Step 1

- Outlining the problem, citing work I'm aware of that seems relevant.

31. How might a child proceed?

- Segmentation: find the units.
  - A revolution in our thinking: from armchair thoughts ("pair [ˈgavagai] with the rabbit-concept whenever you spot a rabbit") to **distributional learning**.
  - A widely cited paper here is Goldwater, S., Griffiths, T. L., & Johnson, M. (2009). A Bayesian framework for word segmentation: Exploring effects of context. *Cognition* 112:21-54.
  - I'm currently working at this for word-internal units (stems and affixes).
- With segmented units, you can do two things:
  - Study their phonotactics
  - Study their alternations
- Yet even when you have done this, you are not done, for a mere analysis does not equip you to take the wug test (which might be a real-life one).
- Let's try to break down these tasks.

32. Learning phonotactics

- You've done this yourselves with a mini-example in maxent.
- Hayes and Wilson (2008, *LI*) represents a scaled-up version.
  - Fancy software with finite-state machines can evaluate constraint violations, indeed Z, for all words.
  - There is also the issue of fabricating constraints; perhaps not that hard given that feature systems only generate ca. 600 natural classes.
- Various subsequent people, doing better
- Phonotactics based on words are presumably far more useful than phonotactics based on utterances — so many constraint refer to word boundaries.

33. Learning alternations

- Sort the units by allomorph.
- Find the changing parts of allomorphs.
- Bifurcate:
  - productive phonology needs to be treated with some kind of GEN + EVAL architecture, which would permit generalization of alternations to novel morphemes (*blitting* [ˈblɪɾɪŋ], reluctantly done by Albright/Hayes 2003 subjects).
  - Else learn to deploy the listed allomorphs properly (below).
- Some work in this area:
  - Gaja Jarosz (2006 dissertation, later work)
  - Ryan Cotterell, Jason Eisner et al. (big ACL bake-off with computer scientists and large data sets. Connectionism wins!)
  - Tesar (2014 book with Cambridge)

34. Deployment of allomorphs understudied but potentially cool

- Recent WCCFL presentations of McPherson and Zhang.

35. Learning to take the wug test

- N.B. Classical phonological analysis does not equip you for this!
  - It only *rationalizes* the data pattern, showing how the data could be derived from a set of underlying forms.
  - To wug test, you must go from surface data to surface data.
- How to fix this?
  - Albrightianism: there are privileged forms in the paradigm that always permit the UR to be inferred (e.g. by grabbing the relevant allomorph and undoing the allophonic rules). E.g. Adam Albright (2010) Base-driven leveling in Yiddish verb paradigms. NLLT 28:475-537.
  - Perception grammars, part of a large bidirectional program by Boersma.

- Bayesianism: evaluate UR's on the basis of the probability with which they would yield observed SR's in general, then predict the SR's you want by applying the grammar in the forward direction from the distribution of UR's you deduced.

36. For next time: Our powerful maxent learning is sometimes helpless in the face of hidden structure